REPORT OF THE FACT FINDING COMMITTEE FOR SURVEY OF SCARCITY AREAS MAHARASHTRA STATE 1973

VOLUME I

CONTENTS

CHAPTER		PAGE
I	Introduction	
II	Historical Background	4
III	Physical Features of Maharashtra	30
IV	Criteria for identification of drought-prone areas in Maharashtra	36
V	Drought Prone Areas in Maharashtra	63
VI	Relief Measures during Scarcity	85
VII	Long Term Strategy (Approach)	116
VIII	Irrigation	123
IX	Ground-water	172
X	Agriculture	184
XI	Afforestation	200
XII	Animal Husbandry	212
XIII	Industries	226
XIV	Drinking Water	232
XV	Rural Credit	241
XVI	Finance	249
XVII	Organisation	253
XVIII	Drought Prone Areas Programme (Centrally Sponsored Scheme)	257
XIX	Summary	269

ANNEXURES

(*i*)	Government Resolution, Revenue and Forests Department, No. SCY. 3672/77052-J, dated the 23rd August 1972.	300
(*ii*)	Questionnaire	303
(*iii*)	Tour Programme	309
(*iv*)	List of officers who assisted the Committee	309

MAPS

(*i*) Normal Annual Rainfall.

(*ii*) Isolines for the number of years with rainfall less than 500 mm.

(*iii*) Isolines for the number of years with rainfall less than 375 mm.

(*iv*) Identified Drought Prone Areas.

(*v*) Irrigation in Maharashtra.

ERRATA

Page No.	Para. No.	Line	Read	For
1	2	3	4	5
		Chapter IV		
		Criteria for Identification of drought prone areas		
40	4.5.4. ..	4 ..	a district with ..	a district which
41	4.6.2. ..	2 ..	quantify ..	quality
		Chapter V		
		Drought prone areas in Maharashtra		
82	Table No. II ..	column No. 5 against Jalgaon.	Bracket to be read upto Erandol.	
		Chapter X		
		Agriculture		
188	Table	.. ..	Grass ..	Gram
190	Item 6, column 6	.. ..	0·028 ..	0·28

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CHAPTER I

INTRODUCTION

1.1. The recurrence of scarcity conditions in the past spelt out the desirability of identifying the areas susceptible to drought and framing special programme for making these areas scarcity resistent. A Fact Finding Committee was appointed in 1958 under the Chairmanship of Shri N. S. Pardasani to identify chronically scarcity affected areas in then Bombay State and to suggest long term ameliorative measures. Subsequent to the submission of its report, in 1960, conditions in the Maharashtra State have changed considerably. Scarcity conditions have also manifested in the areas other than those areas recognised by the Fact Finding Committee 1960. Relief had to be provided to agriculturists and agricultural labourers who were affected by the distress and employment had to be provided on a large-scale to the affected population. The State Government therefore felt the need for inquiring into the problem of drought affected areas afresh.

1.2. The State Government appointed a Fact Finding Committee for survey of scarcity areas in the State with the following persons as Chairman and members in 1972 :—

(1) Shri S. E. Sukthankar, Secretary, Urban Development and Public Health Department.	Chairman.
(2) Shri B. A. Kulkarni, Secretary, Irrigation and Power Department.	Member.
(3) Shri M. A. Telang, Director of Bureau of Economics and Statistics, Bombay.	Member.
(4) Shri M. A. Chitale, Superintending Engineer, Central Designs Organisation, Bombay.	Member.
(5) Shri S. P. Pimplikar, Superintending Agriculture Officer, Amravati.	Member.
(6) Shri B. S. Sheshgiri, Retired Director of Civil Supplies, Bombay.	Member.
(7) Shri V. H. Sakhalkar, Under Secretary to Government, Revenue and Forests Department, Bombay.	Member-Secretary.

1.3. The terms of reference of the Committee are as follows :—

(1) To review the conditions obtaining in Maharashtra State subsequent to the submission of the report in 1960 by the Pardasani Committee with particular reference to the question of the improvement or deterioration in the economic conditions in these areas, the reduction or disappearance of scarcity in these areas and the emergence of conditions of distress in the areas other than those in which such conditions were noticed in the past.

(2) In the light of the changed circumstances since the Pardasani Committee submitted its report to identify those areas of the Maharashtra State in which conditions of scarcity have become frequent but which do not appear in the report of that Committee.

(3) To survey the relief measures undertaken in the affected areas during the conditions of scarcity, to assess their effectiveness in relieving distress as well as to report on the potentiality of these measures for the permanent rehabilitation of these areas.

(4) To assess the working of the rehabilitation schemes undertaken by the State Government with the approval of the Central Government in the drought prone areas, to report on their utility and to suggest modifications, if any, in these measures.

(5) To consider and report on the question whether there is any need for dividing the affected areas into groups depending upon the frequency with which they are affected.

(6) To consider whether the present criteria i.e. annewari, rainfall, etc. for determining the areas affected by scarcity are adequate and if not to suggest other criteria which may be adopted for the identification of such areas.

(7) To make recommendations as to future preventive and ameliorative measures to deal with similar facts.

(8) To suggest modifications, if any, required in the organisation, administrative and financial procedures, etc. in order to implement relief measures with the utmost of expedition and efficiency.

(9) To make such other recommendations of a long term nature as may be necessary for the reduction or elimination of combating of scarcity conditions as the Committee may deem necessary.

1.4. To begin with the Committee prepared a questionnaire (given in appendix) and sent it to officials and non-officials including all M.Ps., M.L.As., M.L.Cs. of Maharashtra and also to economists and social workers in Maharashtra and elsewhere. Over hundred individuals replied, and we are grateful to them.

1.5. The Committee thereafter visited all the district headquarters and held individual and group discussions with officers and representatives of the people. During these tours the Committee also visited numerous scarcity works in progress so as to have a first-hand experience of the scarcity conditions and the efficacy of relief measures. Details of the Committee's tour in the districts are shown in Annexure III.

1.6. During the tour the Committee met local representatives and leaders of various political parties. In all the Committee had discussions with over one thousand persons in these visits. We have considerably benefitted by the views expressed by them. We are grateful to all these persons for the courtsey shown to us.

1.7. The Committee visited some of the districts when the Maharashtra Legislative Assembly and Council were in session at Nagpur. Therefore some of the M.L.As. and M.L.Cs. could not meet the Committee in the meetings held at the district headquaters. The Committee, therefore, held its sitting from the 4th December 1972 to the 6th December 1972 in the new M.L.As'. Hostel at Nagpur, specifically to meet the M.L.As./M.L.Cs. We are happy to record that we recieved a good response from the Legislators. We express our sincere gratitude to them.

1.8. According to the Government orders dated 23rd August 1972 the Committee was to submit its report by the 31st December, 1972. The Committee was, however, constituted as late as on 19th October, 1972. It had to do much touring at the initial stage in November and December to elicit opinions of officials and non-officials and acquaint itself with local conditions. Besides considerable data concerning rainfall, annewari, labour attendance, etc. had to be collected. The Committee held its meetings almost daily since January 1973. The issues that had to be considered were many and varied. The Government, therefore, has extended the time-limit

1.9. This report is in two volumes. The first volume contains recommendations regarding the terms of reference. Volume two consists of annexure containing statistical data and districtwise chapters.

1.10. In our endeavour to analyse the main causative factor of drought, namely, rainfall we received whole hearted co-operation from the India Meteorology Department without whose assistance it would have been difficult for the Committee to attempt at such an analysis. We sincerely thank and express out sense of gratitude to Shri N. M. Philips, Dy. Director General, Poona and Shri C. R. V. Raman, Director, Agrimet Division, India Meteorology Department, Poona and Shri N. J. George, Assistant Meteorologist, Bombay. Our member Shri M. A. Chitale also attended the symposium on Droughts in India held by the Director-General of India Meteorology Department at Poona on the 19th December 1972 and we have considerably benefitted by the papers presented at that seminar. Most of our views on the rainfall pattern, have been based on the discussion with officers of India Metcorology Department and deliberation at the Seminar and the elucidation in the background papers.

1.11. We received considerable assistance from several officers of Government. We acknowledge our debt to them.

1.12. We specifically mention Sarvashri G. N. Joshi, Deputy Director of Agriculture, V. N. Panditrao, Statistician in Irrigation and Power Department and Shri M. S. Mavinkurve, Ecomomic Geographer and Cartographer, of the Maharashtra Industrial Development Corporation for their invaluable assistance. The Committee would like to place on record its appreciation for the ability shown and the strenuous work rendered by our Member-Secretary Shri V. H. Sakhalkar. The Committee is grateful for the willing and wholehearted co-operation given by the members of the staff.

CHAPTER II

HISTORICAL BACKGROUND

2.1. Famines and scarcities resulting from drought appear to have been a regular feature in the country since times immemorial. Ancient literature is replete with references to famine. Yaksha's "Nirukta" (Chapter II, section II), Valmikis Ramayan (Chapter 9, Versus 9 and 10) Jataka stories of Buddhists (Jataka XXII) and Chanakya's "Arthashastra", all contain references to famines. In Rigveda, a prayer is offered to banish poverty and famine. In another hymn, mention is made of having dispelled the danger of famine. The invocation to Lord Indra for banishing famine is also found in this literature.

2.2. *It is seen that the problems of famines and scarcity have been faced by the various countries in the different continents of the world sometime or the other. But from the recent studies made in this respect by the Food and Agricultural Organisation of the United Nations on the basis of the analysis of the authenticated famines in the different countries of the world it is noticed that drought is by far the most common natural cause of famine and the countries within the monsoon system of climate really represent the core of the famine problems, because of the unreliability of rainfall within this system.

2.3. A systematic and complete account of all the famines earlier to 18th century is not available. It is concluded by historians that widespread famines occurred in the country once in fifty years. From the 11th century to the 14th century there were 14 widespread famines. In 90 years from 1765 to 1858, 14 widespread famines occurred and severe scarcity conditions prevailed four times. Between 1860 and 1908, famines or scarcity conditions prevailed in one part of the country or the other in 20 out of 48 years.

2.4. In outlining the history of famines in the State, the first difficulty that one encounters, is to correlate the descriptions in the available literature with the existing district boundaries. During the 18th and the 19th centuries, there had been frequent territorial changes in the district boundaries and district headquarters e.g. Akola and Amravati were not the districts headquarters. In earlier period, administrative units which are called now districts were referred to as regions. In the gazetteers published by the Government of Maharashtra, we find an attempt to describe the history of famines with reference to the existing district boundaries. In outlining historical background in this Chapter we have relied mostly on these district gazetteers.

2.5. *Causes of Famines.*

2.5.1. Various causes of famines have been as mentioned below :—

(*a*) Total or partial failure of rain.

(*b*) Uneven distribution of rain.

(*c*) Untimely rain.

(*d*) Excessive rain.

(*e*) Hail storms—Frost.

(*f*) Locus-pests—rats.

*Famine "Its Prevention and Relief" by G. B. Mansfield (1963).

(*g*) Epedimic—Such as cholera, plague, malaria, etc.

(*h*) Destruction by military operations.

(*i*) Unsettled political condition.

(*j*) Large scale influx of scarcity affected person.

(*k*) Heavy demand, for export of foodgrains out of the district.

3.5.2. Out of these reasons, first three causes seem to have resulted in severe distress to the population affected. It is the famines resulting from these causes with which the Committee is concerned.

2.6. *Pre-18th Century Famines in Maharashtra.*

2.6.1. Famines in the following periods covered almost the entire State :—

(1) 1396—1408	..	..	..	Durgadevi Famine.
(2) 1460	..	..	..	Damaji Pant Famine.
(3) 1520				
(4) 1629—1631				

The famines mentioned in the above periods were very much widespread. The Durgadevi famine caused by drought was the severest famine. It lasted for twelve years and affected the whole country south of the Narmada. It is reported that there was large scale migration of population from Deccan plateau to Malwa and Gujarath. During this famine, large tracts were reported to have been depopulated. Damaji Pant famine was next in severity. This was also caused by drought. The legend of Damaji Pant, a local revenue officer, having distributed foodgrains from government godown is famous in Marathi literature. Bijapur rulers asked him to pay the price for the foodgrains distributed, and the legend goes to say that God Vithoba appeared in the Durbar as a messenger of Damaji Pant and paid the price on his behalf. The famine of 1520 was caused by politically unsettled conditions. Drought of 1629-31 at the time of Shiwaji's birth is famous and it affected the entire area of Deccan, Gujarath, Khandesh, Berar and Daulatabad. We find references of the ravages, wrought by this famine in Dasbodh written by Swami Ramdas. Few verses from the " Dasbodh " are cited below :—

वेळे पाऊस पडेना	नासकवणी उघडेना	१
ऐसें कुळवाड्याचे भंड	दु:ख जाहलें उदंड	२
व्हुपडी आलें संत	रेड्यापाड्याचे आउत	धृ.
कांही केल्याने पिकेना	धान्य वेळेसी विकेना	३
फाळा लाविला उदंड	आवघें जाहले थोतांड	४
वारी रांग्याची वाजती	नाना आभाळ फिरती	५
ढोक पक्षी मृषकादिक	खाती श्वापदे अनेक	६
दांवेदाराची यातना	चोर चोरटे राहेना	७
नित्य पोटाचा मजुर	वेठीखाली निघे बुर	८
घर कोमटे मोडके	एक पटकर फाटके	९
बरेगाने गुरे गेली	धारणाने मुलें मेली	१०
सर्व संसार बुडाला	दास म्हणे जोगी जाला	११

2.7. *Famines of the 18th century.*

2.7.1. *Western Maharashtra Region.*—After the severe drought of 1629-30, surprisingly there is no mention of any famine in this region till 1790-91 i.e. for nearly 160 years. In the year 1790, two districts of Konkan—namely Thana and Ratnagiri and Ahmednagar district were the only parts affected by drought. The subsequent drought of 1791-92 was widespread as it affected 6 districts i.e. Ahmednagar, Sholapur, Satara, Sangli, Pocna and Nasik. In the following year 1792-93, only Poona and Ahmednagar districts were again affected. In 1793-94, the Ahmednagar district was again visited by famine for the 4th year in succession. In 1791-92, the distress caused by failure of rains was aggravated by emigration of population from the adjoining districts of Karnatak because of the existence of severe famine conditions in that area also.

2.7.2. *Marathwada Region.*—In respect of Osmanabad and Nanded regions 1713, 1747 and 1787 have been mentioned as years of famine due to drought. Aurangabad region was affected by drought in 1703-06, 1747, 1749 and 1787. Nanded region was again affected by famine in 1792.

1702 is mentioned as the year of famine due to excessive rains for the Osmanabad, Aurangabad and Nanded regions. In case of Parbhani district also, it is stated that the first of the famines of this century was caused by excessive rain which destroyed the kharif crops and reduced the yield of rabi crops considerably. The year is, however, not mentioned. But most probably it must be the same year as 1702. Subsequently it is stated that Marathwada region suffered from another famine which occurred after 36 years. Famine of 1727-28 was caused by military operation in Aurangabad region.

2.7.3. *Vidarbha Region.*—There is no mention of famines in any of the districts of this region in the 18th century. In fact, the information prior to the 19th century is not available in respect of Yeotmal, Akola, Nagpur, Amravati, Chandrapur and Bhandara districts. And in respect of Buldhana, and Wardha districts, though mention is made of the famines of 14th to 17th centuries, information for the 18th century is lacking.

2.8. *Famines of the 19th century.*

2.8.1. Sufficiently detailed accounts of famines of 1802 and onwards are available in *the Gazetteers* of all the districts.

2.8.2. *Western Maharashtra Region.*—The first famine of this century occurred in 1802. This continued for 2 successive years viz. 1802-03 and 1803-04. This famine was wide-spread and affected almost all the 12 districts of this region except Kolhapur but this famine was not due to drought. No crops could be sown because of military operations. Between the period 1804-24, Kolaba district was affected in 1817-18, Sholapur in 1818 and Poona in 1819-20 by droughts accompanied also by epidemics. The drought of 1824-26 was again of 2 years duration and was equally wide-spread. Even Thana and Ratnagiri districts were affected. With the exceptions of Kolhapur and Kolaba districts the whole of Western Maharashtra was affected by this famine. After this, the scarcity of 1832-33 by excessive rain and wide-spread drought affected Ahmednagar, Sholapur and Poona districts. Khandesh districts of Dhulia and Jalgaon suffered for 3 years successively from 1833-36. In Nasik also, there was temporary scarcity in 1833 due to failure of kharif crops. Again in 1844-46, Ahmednagar, Sholapur, Poona, Dhulia and Nasik districts were again severely affected by drought. Sholapur and Nasik districts were again visited by famine in 1854 on account of drought. Thana district was also affected in that year. Scarcity of 1855-56 due to drought affected only the Khandesh districts of Dhulia and Jalgaon. Famine of 1862 caused by intense and wide-spread drought, ravaged very large tracts of Western Maharashtra which included Ahmednagar, Sholapur, Satara, Sangli, Poona, Nasik, Dhulia and Jalgaon districts. Parts of Nasik and Khandesh districts suffered on account of drought in 1866-69 and 1871-72. The Great Famine of 1876-77 due to severe drought is reported to have affected large areas all over India. It was the most severe in intensity and duration. It is described as the most grievous calamity of its kind that the country had experienced till then since the beginning of the 19th century. This famine affected almost the whole of Western Maharashtra with the exception of only Thana region. In the following year 1877-78 however only Thana region was affected. In 1878-79 Poona district suffered due to excessive rain. This is the only solitary example of famine due to excessive rain in this region. The famine of 1896-97 caused by absence of rain was more wide-spread and more severe than any of its kind, the country had experienced before. It was officially described at the time as the most disastrous famine of the century. This famine affected more or less every part of India. In Western Maharashtra region, exceptions were those of Satara, Sangli, Nasik, Thana, Ratnagiri and Kolaba districts. The famine of 1899-1900 followed so closely on the heels of 1896-97, that both the Government and the people were taken aback. In spite of relief afforded on a hitherto unprecedented scale, it caused intense suffering and heavy mortality of both human beings and cattle. This famine was described by Lord Curzon as the severest and most terrible of all the famines that had affected the country in the nineteenth century. In this region, the same districts which were affected by 1896-97 famine were again the sufferers. Even Thana district which escaped the previous famine (of 1896-97) was also affected this time.

2.8.3. In addition to the above famines, local famines due to droughts which were mainly of sporadic character occurred in the following districts :—

Ahmednagar district ..	.. 1868.
Sholapur district ..	.. 1879.
Sangli district ..	.. 1878.
Poona district ..	.. 1823-24, 1833-34, 1835-36, 1838, 1863-64, 1877-78, 1900-1901.
Nasik district ..	.. 1869, 1871, 1894.
Dhulia district ..	.. 1900-1901.
Jalgaon district ..	.. 1866, 1900 1901.
Thana district ..	.. 1837, 1838-39, 1848, 1850, 1853-55.
Kolaba district ..	.. 1817-18, 1855, 1871, 1875.

Also there is a mention of famine in Kolhapur district in 1884-85 due to influx o a large number of people into the district from the adjoining areas where the army operations had caused devastation. Similarly in Kolaba district there was famine due to excessively heavy rains in December 1852 between the 7th and 12th when the grain and other produce stocked in the fields were damaged and in 1854, a terrible hurricane on 1st November damaged the exceedingly good harvest whether standing or stacked.

2.8.4. *Marathwada Region.*—Relatively Parbhani, Nanded and Bhir districts are seen to be fortunate, as compared to Osmanabad and Aurangabad districts in this century. Following are the famine years in the 5 districts, due to droughts :—

Parbhani	.. 1804, 1876-77 and 1899-1900.
Bhir	.. 1812, 1823, 1877, 1897.
Nanded	.. 1804, 1819, 1897 and 1899-1900.
Osmanabad	.. 11 famines between 1804-1877 respectively in 1894, 1897-98 1900-1901.
Aurangabad	.. 1824-26, 1834, 1846, 1855, 1862-66, 1871-72, 1876-77, 1877-78 1890-1900.

Osmanabad and Aurangabad districts were affected by severe distress at intervals of 7 to 10 years. There were only 4 famines by droughts in each of the remaining three districts. In addition to the above famines, Parbhani district was affected in 1819 and Osmanabad district in 1825 due to excessive rains. There was great distress in 1802-03 caused by lawlessness by hordes under Amirkhan who destroyed the harvest.

It is noticed that western parts of Aurangabad and Osmanabad districts that are bordering on the eastern parts of Ahmednagar and Sholapur districts and are very much similar in character appear to have been affected by the same famines which had affected the adjoining portions of the latter districts.

2.8.5. *Vidarbha Region.*—This region was relatively free from severe or acute famine conditions due to drought in this century. Especially Buldhana, Yeotmal, Akola and Chandrapur districts experienced less number of famines from drought as compared to the four other districts of this region, viz., Wardha, Amravati, Nagpur and Bhandara. Following are the years of scarcities in this region on account of drought :—

Buldhana district	.. 1804, 1871-72, 1896-97, 1899-1900.
Yeotmal district	.. 1803, 1867-68, 1871-72.
Akola district	.. 1871, 1896-97, 1899-1900.
Amravati district	.. 1803, 1833, 1839, 1845, 1896-97, 1899-1900.
Wardha district	.. 1868, 1877-78, 1891-92, 1896-97, 1898-99, 1899-1900.
Nagpur district	.. 1818-19, 1825-26, 1868, 1896-97, 1899-1900.
Bhandara district	.. 1822, 1832, 1868-69, 1878-79, 1866-67, 1895-96, 1900-1901.
Chandrapur district	.. 1868-69, 1896-97, 1899-1900.

In addition to these famines. there were quite a few famines which were caused by excessive rain, particularly in the four eastern districts. There were 3 such years in Wardha district and 4 in Bhandara and Nagpur districts, namely :—

Wardha district	.. 1831-32, 1892-93, 1894-95.
Nagpur district	.. 1831, 1892-93, 1894-95.
Bhandara district	.. 1892-93, 1893-94, 1894-95.

At times famines were also caused by some other factors such as raids and large-scale export of grains to other districts and influx of people from adjoining districts Such years were—

Chandrapur district	.. 1804, 1818, 1832.
Buldhana district	.. 1833, 1877-78.
Yeotma ldistrict	.. 1896-97, 1899-1900.
Akola district	.. 1896-97.

A few more years have been mentioned as scarcity years but not severe in distress and no relief measures were considered necessary in these years. These are—

Buldhana	.. 1893.
Yeotmal	.. 1833, 1839, 1862.
Wardha	.. 1893-94 (Cotton and Til were damaged by rain).
Chandrapur	.. 1892-95.

2.9. *Famines of the 20th Century.*

2.9.1. *Western Maharashtra Region.*—In the 20th Century the records show that the five districts of Ahmednagar, Sholapur, Satara, Nasik and Poona suffered due to famine and scarcity condition almost once in every 3 years. As some of the *Gazetteers* were published prior to 1964 and (Pocna in 1954) the information cannot be said to be up to date. Only two were very wide-spread droughts of 1901-02, 1952-53. A number of other famine years have been mentioned in the *Gazetteers*, but their severity and spread were not the same. Though no special relief works were started, other relief measures such as remission and suspension of land revenue, granting of *tagai* loans for deepening or repairing of wells, etc. were given, and have been recorded in the *Gazetteers*. On the other hand in some cases it is mentioned that formal scarcity was not declared by Government but relief was provided. The details of scarcity conditions since 1960 have been referred to by us in a subsequent Chapter.

2.9.2. *Marathwada Region.*—Generally the information given in the *Gazetteers* of the districts of this region is scanty, the number of pages devoted to this topic in 3 *Gazeteers* published so far is also only 2 to 3 as compared to the coverage for the districts of the old Bombay State, probably because the information is not available. It will, therefore, be not correct draw any definite conclusion from this meagre data. The information available in the *Gazetteers* regarding drought years is given below:—

(1) Bhir district : 1908, 1913, 1921-22.

(2) Parbhani district : 1911-12, 1921, 1934.

(3) Osmanabad district : 1916-17, 1918-19, 1946, 1950.

(4) Aurangabad district : 1911-12, 1912-13, 1935, 1950, 1960, 1965-66.

(5) Nanded district : 1911-12.

In addition there is mention of famines due to excessive and untimely rains in following years :—

1. Parbhani district: 1959, 1961.
2. Aurangabad district : 1916-17, 1917-18.
3. Nanded district : 1910-11, 1916-17, 1917-18.

Similarly due to other reasons such as epidemics there was great distress in few years as below :—

1. Bhir district: 1919-20, 1920-21.
2. Parbhani district : 1915-16, 1918-19, 1919-20.
3. Osmanabad district : 1902, 1903, 1904, 1923, 1926, 1930.
4. Aurangabad district : 1902, 1903, 1904, 1948.
5. Nanded district : 1918-19.

Also a few years are mentioned as years of agricultural distress without any details—

1. Parbhani district : 1916-17, 1917-18.
2. Osmanabad district : During 1911-1921, in 7 out of 10 years rainfall was deficient or irregular.

2.9.3. *Vidarbha Region.*—There is no available information about the famines for a considerable period, in the *Gazetteers* of some of the districts of this region. These districts and periods are as under :—

Buldhana	—	1901-1958.
Yeotmal	—	1901-1960
Amravati	—	1901-1930
Chandrapur	—	1909-1957
Bhandara	—	1910-1931

In this case also, therefore, no conclusions can be drawn from the incomplete data available.

All the available information is presented in the enclosed table (No. 1) from which can be seen that in this region, the problem of excessive rains, frost and floods, has an equally important role in causing widespread distress. Generally two crops (both kharif and rabi) are taken in most of these districts and though there may be failure of one crop, instances of failures of both the crops are rare. In case of Nagpur, several years mentioned as scarcity years because of damages to cotton and betel crops in Ramtek and Umrer talukas, because of excessive rains. In case of Amravati district, there are no famines mentioned but following 8 years of floods have been recorded 1930-31, 1940-1941, 1944-45, 1950-51, 1956-57, 1959-60, 1961-62, 1962-63 the extent of damage is not known. In case of Buldhana, details of floods and flood damages during 1959, 1961 and 1968 have been mentioned in the *Gazetteers*. From this record it can be seen that all the districts have been visited by famines at one time or other. But the frequency of occurrence and their severity and extend varies from district to district.

2.10. *Characteristics of famines in the past.*—Following features were associated with the famines till the end of the 19th century and early part of the 20th Century :—

(*a*) Failure of rains-drought.

(*b*) Withering of crops.

(*c*) Burning of grass.

(*d*) Reduction in drinking water supply.

(*e*) Rise in prices of grains.

(*f*) Increased demand for employment.

(*g*) Starvation deaths and deaths from epidemics.

(*h*) Loss of cattle due to fodder shortage.

(*i*) Migration of cattle.

(*j*) Sale of ornaments.

(*k*) Thefts of grass.

(*l*) Emigration of persons in search of employment.

(*m*) Increase in mortality.

Some of the important characteristics alongwith available statistical information are described in the following paragraphs.

2.10.1. *Loss of Life.*—Famines were characterised by loss of human life enslavement of children and even cannibalism. In the absence of surplus economic resources to rely in the years of distress, heavy mortality could not be avoided. It is recorded that in 1802-03 in Poona district the river was covered with dead and rotten bodies. There is no authentic account of mortality due to famines for all the years. However some figures mentioned in some of the districts *Gazetteers* are quoted below :—

Serial No.	Name of the District	Year of Famine	No. of persons dead	Remarks
1	2	3	4	5
1	Ahmednagar	1803	5000 to 6000	
		1899-1902	7850	3800 due to dysentry and diarrhoea. 1031 due to Cholera.
2	Sholapur	1818	Thousands of persons.	
		1896-97	11000	
		1899-1900	18750	
		1900-1902	9000	4069 due to dysentry and 1413 due to Cholera.
3	Satara	1802-1804	10000	In Wai alone.
		1876-77	11414	
4	Nasik	1802-04	700 to 1000	
		1845	1000	
		1854	500	
		1876-77	4500	
5	Thana	1899-1900	322	On relief works alone.
6	Nagpur	1831	5000	

The main cause of the high rate of mortality is the epedimics like cholera, small-pox and malaria caused due to inadequacy of food which reduced the power of resistence. Similarly continued privation, hard work in uncongenial atmosphere and psychological strain undermined the health and led to increased susceptibility to disease.

2.10.2. *Migration.* Another characteristic of famine was large scale migration of the people in search of employment. During the earliest famine on record, viz., Durga Devi of 1396-1408 which affected the areas south of the Narmada, it is reported that many districts were depopulated. The rulers had to make special efforts to resettle the persons who migrated by giving lands at concessional or free of rent. It is recorded that about 1 lakh people left Poona district during the famine of 1876-78 for Bombay, Gujarat, Gangathadi and Berar. Similarly in 1802-03 a large number migrated to the Konkan. Some instances of distress in the areas on account of in flux of population in the districts free from famine are also recorded.

2.10.3. *Rise in Prices.*—In the absence of means of communication and public distribution system of essential commodities, the rural population had to rely on the buffer stocks of foodgrains in the years of distress. If the stocks of foodgrains were depleted in a year of famine the area experienced absolute shortage of food. With the advent of fairly good means of communication, absolute shortage of food as a characteristic of famine was replaced by rise in prices. The rise in prices was one of the yardstick for ascertaining the severity of famine. The existence of speculators and hoarders resorting to anti-social-activities for achieving their ends further accentuated the problem of spiralling prices. Added to this was the absence of any ban on export of foodgrain and the policy of non-interference with normal trade channels prompted by laissez-faire principle.

2.10.4. *Relief Measures in the past.*—Reliable account of relief measures undertaken in the Pre-British period is not available except few references to the policy of prohibiting exports, encouraging improvements in cultivation, adopted by the rulers. The Peshwas are reported to have imported large quantity of foodgrain in 1802, and to have granted land revenue remissions. The social institutions then existing also helped in ameliorating the conditions through private charity. The joint family system and caste system imposed social obligation on the members of these institutions to help the persons in distress, and such obligation was willingly discharged.

During the earlier stages of its rule, the British East India Company continued the policy of native rulers as in the famine of 1802-03 in Bombay. Import of foodgrains and prohibition of exports and control of prices were undertaken by the authorities.

British rulers on the contrary adopted laissez faire policy till the end of the 19th century. Exports continued unabated from Bombay Presidency even upto September 1896 when famine conditions were imminent. It resulted in Public agitation and unrest in Bombay against continuing exports of food grains from the presidency at a time when people faced the threat of famine. The policy of non-intervention in trade was carried to absurd limits. Some municipalities in Bombay Presidency who tried to open fair price shops were admonished for the same. The Government of India, during 1943 Bengal Famine tried to control prices but did not try to control the supply. This resulted in supplies going underground and appearance of black marketing and corruption of officials.

Relief measures adopted during the famines 1876-78 and 1896-98 consisted of the following :—

(1) Opening of scarcity relief public works:—

(*a*) Road Works,

(*b*) Irrigation works-canals and tanks and gav-talavs,

(*c*) Desilting of tanks,

(*d*) Metal collection,

(*e*) Construction of railway embankment.

(2) Suspension of land revenue.

(3) Grant of loans for digging wells.

(4) Advances for seed and cattle at the time of the commencement of the rains.

(5) Gratuitous relief to incapable poor, having no security for the advances.

(6) Doles of grains or money to the aged, the poor, the sick and the destitute.

(7) Loans to land owners for improvements of lands for employment of their tenants.

(8) Opening of kitchens for distribution of cooked food.

(9) Establishment of poor houses.

(10) Advances to weavers.

(11) Allowances to village officials of Government as their normal wages were in the shape of rent of free lands.

(12) Remissions of grazing fees in Government forests.

(13) Giving grains compensation to Government servants.

The chief objectives of the relief measures were to save every life and also to secure the maximum economy in relief expenditure. The Famine Commission (1880) framed a model code and submitted it along with its report based on the above mentioned code. Famine Relief Code for Bombay Province drafted in 1885 laid down the detailed instructions and rules for the guidance of the Provincial Government officials, in the matter of dealing with the famine. This included instructions in respect of :—

(*i*) Establishment of a system of continuous flow of information from every local area to the Provincial Government bearing on the onset of the scarcity or famine;

(*ii*) Type and nature of relief works to be constructed;

(*iii*) Classification of relief labour and the scale of wages to be paid;

(*iv*) Organisation of gratuitous relief ;

(*v*) Establishment of a system of village inspections;

(*vi*) Suspension of revenue ;

(*vii*) Grant of taccavi loans;

(*viii*) Relaxation of forest laws for the duration of the famine ; and

(*ix*) Protection of cattle,

Various relief measure, adopted during the British rule were according to this Code.

2·11. *Famine Commissions*

2.11.1. The ravages caused by famines in the 19th century were so devastating that three Famine Commissions had to be appointed within two decades to investigate the nature and causes of famine, assess the relief measures and suggest measures for overcoming similar situation in future.

2.11.2. *Famine Commission (1880).*—First such Commission was appointed in 1880. One of the controversial findings of this Commission was that famine in India did not involve a food problem. Two members of the Commission wrote a note of dissent and recommended strongly the adoption of scheme of storage of foodgrain as a means of saving life. The government, however accepted the majority report wherein it was mentioned that there would always be available in India sufficient food in unaffected tracts to feed the inhabitants of the area visited by famine provided the state of communications was improved. This strengthened the hands of the government to continue with laissez faire policy in foodgrains and avoid prohibition of export.

The Famine Commission (1880) in their reports incorporated a model Code and submitted it to the Government of India along with the report. The Code was founded on two postulates. Firstly it was laid down that the state would not undertake to interfere in every individual and isolated case of distress, but it would apply its resources only when a natural calamity affecting material portion of population of a locality occurred. Secondly, it was recognised that the famine in the country being a problem of temporary lack of employment, the principal form of relief was to be offered by opening relief works and employing there those who needed it. It was only in exceptional cases that gratuitous relief was to be distributed to non-working dependents and others.

As regards the relief to the cultivator class the Commission said that the principle on which leneincy could be shown, should be that nobody should be forced in such seasons as these to borrow in order to pay the land revenue and all those who can pay without borrowing should do so. The principle was vague and could not be applied by the revenue administration without knowledge of the financial position of each cultivator. The recommendation was accepted by the government which resulted in almost a denial of the facility of suspension. The Commission also made important recommendation in respect of Land Improvement Act, 1876. It suggested fresh legislation on the subject in order to remove the reluctance of people to apply for loans and to declare that improvements would not be made a ground for enhancement of assessment. The Land Improvement Act of 1883 was passed to give effect to these recommendations.

The question of irrigation policy was reviewed by the Famine Commission which expressed itself strongly in favour of both railways and irrigation works for protecting India against the consequences of drought. Of the two means of protection, the Commission unequivocally expressed in favour of irrigation works. After laying down the broad principles of irrigation policy, the Commission went on to recommend various schemes for the extension of irrigation in different provinces.

2.11.3. *The Famine Commission (1898)*.—The famine of 1896-97 was more widespread and severe than the country had experienced before. The provisions of the Famine Codes were put to a severe test for the first time during this famine. Another Commission under the chairmanship of Sir James B. Lyall was appointed to go into the question of the degree of success achieved by the relief organisation.

The Famine Commission (1898) estimated that average number of labour relieved was 5·2 per cent. of the affected population. The expenditure in the famine of 1896-97 in Bombay presidency was Rs. 1·18 crores. The loans to the tune of Rs. 18·55 lakhs were advanced. The general conclusion which the Famine Commission arrived at after reviewing the relief administration was that the success actually attained in the relief of distress and saving of human life was, if not complete far greater than any that has been recorded in famines that are at all comparable with it in point of extent, severity or duration.

The classification of labour and various tests envisaged by the code books were enforced in the famine of 1896, in almost all the provinces. Famine Commission recommended a change from four fold code classification of famine labour based on the assumed differences in the efficiency of different class of workers to a simpler classification based on the nature of work to be performed by a labourer. In the matter of nature and size of works the Commission expressed the view that while large works should ordinarily be regarded as the mainstay of relief operation, there were occasions when small works must also be largely resorted to and be carried out by professional and civil agency, according to the circumstances. The Famine Commission refused to accept the plea of enforcing distance test so as to effect economy in expenditure. The Commission observed that works should not be started at a distance for the sake of instituting distance test but because the work was in itself more useful than the work near the villages. The Famine Commission favoured the adoption of a system known as the Blackwood system of payment by results with maximum limit on daily earnings. But it recommended the retention of the provision relating to the minimum wage.

The Famine Commission (1898) commented on the very small suspension and remission of land revnue as the most questionable feature of the scheme of relief adopted. It recommended more positive approach in the policy regarding suspension and remission of land revenue.

The Commission observed that there was no absolute dearth of food supply and food had always been purchasable though at high and in some remote places excessively high prices. The problem of food supply during a period of distress appeared to the Government of India as well as to the Famine Commission to be merely one of ensuring supplies in the market. The more fundamental and important problem of the price at which food was sold failed to receive the attention of the Commission.

2.11.4. *The Famine Commission (1901)*.—The famine of 1899-1900 followed so closely on the heels of that of 1896-97 that it was described by Lord Curzen as the severest and most terrible of all famines that had afflicted the country in the ninteenth century. Another Famine Commission was appointed in 1901.

The Commission reviewed the relief in the famine of 1899-1900. The maximum expected limit of 15 per cent. of the affected population seeking relief in the worst months of famine was exceeded. During the famine of 1899-1900 in Bombay province this limit was exceeded only in the begining of August for a short time. The Commission estimated the cost of relief in the country at Rs. 15 crores. The Commission concluded from the numbers given relief and the cost incurred on it that taking the famine period as a whole the relief distributed was excessive. The Famine Commission were astonished at the novel experience that the numbers on relief continued to swell even after the rains had started and showed little inclination to return to their works. Besides the exhaustion of the affected population, loss of cattle amounting to two million throughout the country was according to the Commission mostly responsible for such a situation.

One of the significant recommendations of the Famine Commission of 1901 was in favour of village works. It outlined the advantages of village works and further expressed that there was a large influential body of opinion in favour of village works. The Commission further observed that good results of village works were heavily discounted in the recent famine by the universal absence of a programme and that in consequence the system had not been given a proper trial. As regards wage policy, the Commission of 1901 was of the strong opinion that the minimum wage for able bodied worker had been the stumbling block of relief administration. The Commission, therefore, recommended the abolition of minimum wage for all the able bodied in all future schemes of relief and the adoption of a system of payment by results. The existing system of fines and minimum wage was to be replaced by the modified intermediate system which was a pure system of payment by results supplemented by relief to dependents with a maximum limit on daily earnings.

Another significant contribution of the Commission was its unequivocal acceptance of liberality in the collection of land revenue. It observed that any harshness in the collection of land revenue, particularly in ryotwari Provinces, reduced the gratitude which the people felt toward the Government for their rescue from starvation. The effect of this recommendation was the passing of the New Land Revenue Policy of 1902 which emphasised that in the matter of suspension of land revenue, the interests of Government were identical with the interests of people and it was unwise to extract from the impoverished a revenue which they really could not pay.

The Commission for the first time spelt out that in the scheme of famine relief the preservation of cattle should occupy a significant place. It laid the emphasis on the growth of fodder crops during the period of distress especially by grant of land. It further laid that the direction of policy should be towards the decentralisation of relief operations and providing the means of preserving cattle at home within the village.

Above paragraphs summarise in brief, the historical background of famine prior to Independence.

TABLE No. 1

Details of Famines in 20th Century in Vidarona Region

Serial No.	Name of District	Years of famines due to droughts	Years of famines due to excessive rains/hailstorm	Years of famines due to other reasons
1	2	3	4	5
1	Buldhana ..	1959-60, 1960-61, 1965-66	1959-60	....
2	Yeotmal ..	1962-63, 1964-65, 1965-66, 1966-67, 1967-68.	1961-62, 1963-64 ..	....
3	Akola ..	1920-21, 1935, 1939-40, 1961-62, 1963-64, 1965-66, 1966-67, 1967-68.	1926-27, 1931-32, 1942-43, 1949-50.	1918-19.
4	Amravati ..	....	....	....
5	Nagpur ..	1907-08, 1918-19, 1920-21, 1921-22, 1939-40, 1940-41, 1942-43.	1919-20, 1925-26 to 1930-31, 1932-33, to 1938-39.	....
6	Wardha ..	1907-08, 1918-19, 1920-21, 1927-28, 1929-30, 1936-37, 1939-40, 1949-50, 1950-51, 1955-56.	1917-18, 1926-27 ..	1928-29.
7	Chandrapur ..	1957, 1965-66 ..	1959-60 ..	1901-02.
8	Bhandara ..	1901-02, 1902-03, 1940-41, 1950-51, 1952-53, 1953-54, 1965-66, 1966-67.	....	....

TABLE II

Statement showing Frequency of Famines/Scarcities due to drought in Maharashtra State

Serial No.	Name of the District	14th Century		15th Century				Remarks
		1378-95	1396-1408	1417	1422	1460	1472-73	
(A) Western Maharashtra—								
1	Ahmednagar	....	†	....	....	†	....	
2	Sholapur	....	†	....	....	†	....	
3	Satara	....	†	....	....	†	....	
4	Sangli	....	†	....	....	†	....	
5	Poona	....	†	....	†	†	†	
6	Nasik	....	†	....	....	†	....	
7	Dhulia	....	†	....	....	....	....	No Famine recorded till 1629 after 1396-1408.
8	Jalgaon	....	†	....	....	....	....	No Famines recorded till 1629 after 1396-1408.
9	Kolhapur	....	....	....	....	....	....	No Famines recorded prior to 1804.
10	Thana	....	....	....	....	....	....	No Famines recorded prior to 1618.
11	Kolaba	....	....	....	....	....	....	No Famines recorded prior to 1803.
12	Ratnagiri	....	....	....	....	....	....	No Famines recorded prior to 1803.
(B) Marathwada—								
13	Aurangabad	....	†	....	....	....	....	No. Famines recorded prior to 1790.
14	Osmanabad	....	†	....	....	....	....	
15	Bhir	....	....	....	....	....	....	No details prior to 1812, available.
16	Parbhani	....	....	....	....	....	....	No details prior to 1630 available.
17	Nanded	....	†	....	....	†	....	....
(C) Vidarbha—								
18	Buldhana	....	....	....	....	....	....	No proper history prior to 1853 except during 1378, 1473 and 1474, it is mentioned that there was large scale emigration to Malwas and Gujrat due to famines.
19	Akola	....	....	....	....	....	....	No details prior to 1871 available.
20	Amravati	†	....	†	....	....	†	....
21	Yeotmal	....	....	....	....	....	....	No details available prior to 1803.
22	Wardha	†	....	†	....	....	†	....
23	Nagpur	....	....	....	....	....	....	No details available prior to 1818-1819.
24	Bhandara	....	....	....	....	....	....	No details available prior to 1822.
25	Chandrapur	....	....	....	....	....	....	No details available prior to 1804.

† Indicates occurrence of scarcity or famine

TABLE No.

Statement showing Frequency of Famines/

Serial No.	Name of District		17th Century 1618	1628	1629	1630	1631	1659	1685
(A) Western Maharastra—									
1	Ahmednagar ..	..	....	....	†	†	....	....	....
2	Sholapur ..	..	....	....	....	....	....	....	....
3	Satara ..	..	....	....	†	†	....	....	....
4	Sangli ..	..	....	....	†	†	....	....	....
5	Poona ..	..	....	....	†	†	....	....	....
6	Nasik ..	..	....	....	†	....	....	....	....
7	Dhulia ..	..	....	....	†	....	....	....	....
8	Jalgaon ..	..	....	....	†	....	....	....	....
9	Kolhapur ..	..	....	....	....	....	....	....	....
10	Thana ..	..	†	....	....	....	....	....	....
11	Kolaba ..	..	....	....	....	....	....	....	....
12	Ratnagiri ..	..	....	....	....	....	....	....	....
(B) Marathwada—									
13	Aurangabad ..	..	....	†	....	....	....	....	†
14	Osmanabad ..	8	Famines between 1629-1685 out of which 4 were due to droughts						
15	Bhir ..	..	....	....	....	....	....	....	....
16	Parbhani ..	..	....	....	....	†	....	....	†
17	Nanded ..	..	....	....	†	†	....	†	†
(C) Vidarbha—									
18	Buldhana ..	..	....	....	....	†	....	....	....
19	Akola ..	..	....	....	....	....	....	....	....
20	Amravati ..	..	....	....	....	†	†	....	....
21	Yeotmal ..	..	....	....	....	....	....	....	....
22	Wardha ..	..	....	....	....	†	†	....	....
23	Nagpur ..	..	....	....	....	....	....	....	....
24	Bhandara ..	..	....	....	....	....	....	....	....
25	Chandrapur ..	..	....	....	....	....	....	....	....

† Indicates occurrence

II—*contd.*

Scarcities due to droughts in Maharashtra State

18th Century									Remarks
1703-06	1713	1747	1749	1787	1790-91	1791-92	1792-93	1793-94	
....	....	....	....	....	†	†	†	†	
....	....	....	....	....	....	†	....	...	
....	....	....	....	....	....	†	....	...	
....	....	....	....	....	....	†	....	...	
....	....	....	....	....	....	†	†	...	
....	....	....	....	....	....	†	....	...	
....	....	....	....	....	....	....	....	...	
....	....	....	....	....	....	....	....	...	
....	....	....	....	....	....	....	....	...	
....	....	....	....	....	†	....	....	...	
....	....	....	....	....	....	....	....	...	
....	....	....	....	....	†	....	....	...	
†	....	†	†	†	....	....	....	...	
....	†	†	....	†	....	....	....	...	
....	....	....	....	....	....	....	....	...	
....	....	....	....	....	....	....	....	...	
....	†	†	....	†	....	....	†	...	
....	....	....	....	....	....	....	....	...	
....	....	....	....	....	....	....	....	...	
....	....	....	....	....	....	....	....	...	
....	....	....	....	....	....	....	....	...	
....	....	....	....	....	....	....	....	...	
....	....	....	....	....	....	....	....	...	
....	....	....	....	....	....	....	....	...	
....	....	....	....	....	....	....	....	...	

of scarcity or famine.

TABLE No.

Statement showing Frequency of Famines/Scarcities

Serial No.	Name of the District	19th				
		1801—1805	1806—1810	1811—1815	1816—1820	1821—1825
(A) Western Maharashtra—						
1	Ahmednagar ..	1803	....	....	....	1824
2	Sholapur	1803	....	....	1818	1824
3	Satara	1802—03	....	....	....	1824—25
4	Sangli	....	....	....	....	1824—25
5	Poona	....	....	....	1819—20	1823—24 1824—25
6	Nasik	....	....	....	....	1824
7	Dhulia	....	....	....	....	1824—25
8	Jalgaon	....	....	....	....	1825—26 1824—25
9	Kolhapur ..	....	....	....	....	....
10	Thana	....	....	....	....	1824—25
11	Kolaba	1803	....	....	1817—18	....
12	Ratnagiri	1802—03	....	....	....	1824
(B) Marathwada—						
13	Aurangabad	....	....	....	....	1824—25 1825—26
14	Osmanabad	1804	1810	....	1819	1825
15	Bhir	....	....	1812	....	1823
16	Parbhani	1804	....	....	....	....
17	Nanded	1804	....	....	1819	....
(C) Vidarbha—						
18	Buldhana	1804	....	....	....	....
19	Akola	....	....	....	....	....
20	Amravati	1803	....	....	....	....
21	Yeotmal	1803	....	....	....	....
22	Wardha	....	....	....	....	....
23	Nagpur	....	....	....	1818—19	....
24	Bhandara	....	....	....	....	1822
25	Chandrapur	....	....	....	....	....

II—*contd.*

due to droughts in Maharashtra

Century					
1826—30	1831—1835	1836—1840	1841—1845	1846—1850	1851—1855
....	1832—33	....	1845—46	....	....
....	1832—33	....	1845	....	1854
....	....	....	....	....	....
....	....	....	....	....	....
....	1832 1833 1835	1838	1844—45 1845—46	....	....
....	1833	....	1845	....	1854
....	1833—34 1834—35 1835—36	1838—39	1844—45 1845—46	....	1855—56
....	1833—34 1834—35 1835—36	...	1844—45	....	1855—56
....	....	....	....	....	....
....	....	1837 1838—39	....	1848 1850	1853—54 1854—55
....	....	....	....	....	1855
....	....	....	....	....	....
....	1834	....	....	1846	1855
....	1833	....	....	1846	1854
....	1832	....	....	....	....
....	....	....	....	....	....
....	....	....	....	....	....
....	....	....	....	....	....
....	....	....	....	....	....
....	1833	1839	1845	....	....
....	1833	1839	....	....	....
....	....	....	....	....	....
1825—26	....	....	....	....	....
....	1822	....	....	....	....
....	....	....	....	....	....

TABLE No.

Serial No.	Name of the District	1856—1860	1861—1865	1866—1870	1871—1875	1876—1880
1	Ahmednagar ..	....	1862	1868	....	1876—77
2	Sholapur	....	1862	....	....	1876—77
3	Satara	....	1862	....	....	1876—77
4	Sangli	....	1862	....	....	1876—77 1878
5	Poona	....	1862—63 1863—64	....	....	1876—77 1878—79
6	Nasik	1860—61	1861—62 1862—63	1869	1871	1876—77
7	Dhulia	....	1862—63 1863—64 1864—65	1865—66 1868—69	1871—72	1876—77
8	Jalgaon	....	1862	1866 1868—69	1871—72	1876—77
9	Kolhapur	....	....	....	....	1876—77
10	Thana	....	....	....	....	1877—78
11	Kolaba	....	....	....	....	1871
12	Ratnagiri ..	....	....	....	....	1876
13	Aurangabad ..	....	1862—63 1863—64 1864—65 1865—66	....	1871—72	1876—77 1877—78
14	Osmanabad ..	....	1862	1866	1871	1871
15	Bhir	....	....	....	....	1877
16	Parbhani	....	....	....	....	1876—77
17	Nanded	....	....	....	....	....
18	Buldhana	....	....	....	1871—72	....
19	Akola	....	....	....	1871	....
20	Amravati	....	....	....	....	....
21	Yeotmal	....	1862	1867—68	1871—72	....
22	Wardha	....	....	1868	....	1877—78
23	Nagpur	....	....	1868	....	....
24	Bhandara	....	....	1868—69	....	1878—79
25	Chandrapur ..	....	....	1868—69	....	....

II—*concld.*

19 th Century				
1881 1885	1886 1890	1891 1895	1896 1900	Remarks
....	....	....	1896-97, 1899-1900, 1900-1901	
....	....	....	1896-97, 1899, 1900-1901	
....	....	....	✓ ✓	
....	....	....	✓ ✓	
....	....	....	1896-97, 1899-1900	
....	....	1894	.1900—1901	
....	....	....	1896-1899, 1900, 1900-1901	
...	....	....	1896-1899, 1900-1901	
....	....	....	1896-1897, 1899-1900	
....	....	....	1899-1900	
....	....	....	....	
...	....	....	....	
....	1890	....	1900	
1884	....	1894	1897-98, 1900-1901	
....	....	....	1897 ✓	
....	....	....	1899-1900	
....	....	....	1897, 1899-1900	
....	....	1893	1896-97, 1899-1900	
....	....	....	1896-97, 1899-1900	
....	....	....	1896-97, 1899-1900	
....	....	....	....	
....	....	1893—94 1891—92	1896-97, 1896-97 1900-1901	
....	....	1893—94 1891—92	1896-97, 1899-1900	
....	1886-87		1896—97, 1900—1901	
....	....	1892—93 1893—94 1894—95	1896-97, 1899-1900	

Statement showing Frequency of Famines/

Serial No.	Name of the District		20th Century				
			1901-03	1904-06	1907-09	1910-14	1915-16
							(A) *Western*
1	Ahmednaga	..	1901-02	1905-06	....	1911-12	....
2	Sholapur	..	1901-02 1902-03	1905-06 1906-07	....	....	....
3	Satara	..	....	....	....	....	....
4	Sangli.	..	....	....	....	....	....
5	Poona	..	1901-02	....	....	1911-12	....
6	Nasik	..	....	....	....	1911	....
7	Dhulia	..	1901	....	....	....	....
8	Jalgaon	..	....	....	....	....	....
9	Kolhapur	..	....	1905-06	....	....	....
10	Thana	..	1901-02	....	1907-08	....	....
11	Kolaba	..	....	....	....	....	....
12	Ratnagiri	..	....	....	....	....	....
							(B) *Marath*
13	Aurangabad	..	....	....	....	1911-12 1912-13	....
14	Osmanabad	..	....	....	....	....	....
15	Bhir	..	....	....	1908	....	1915
16	Parbhani	..	....	....	....	1911-12	....
17	Nanded	..	....	....	....	1911-12	....
							(C) *Vidarbha*
18	Buldhana	..	....	....	....	....	....
19	Akola	..	....	....	....	....	....
20	Amravati	..	....	....	....	....	....
21	Yeotmal	..	....	....	....	....	....
22	Wardha	..	....	....	....	....	....
23	Nagpur	..	....	....	1907-08	....	....
24	Bhandara	..	1901-02 1902-03	....	....	....	....
25	Chandrapur	..	....	....	....	....	....

scarcities due to droughts in Maharashtra

1916-18	1919-21	1922-24	1925-27	1928-30	1931-33	1934-36
Maharashtra						
1918-19	1920-21	1923-24	1925-26 1926-27	1928-29	....	1936-37
....	....	1923-24 1924-25	....	....	....	1936-37
....	....	1925-26	1929-30	1931-32 1932-33	....	1935-36 1936-37
....	....	....	....	....	....	....
1918-19	1920-21	....	....	....	....	1936-37
1918-19	1919-20	....	....	....	....	....
1919	1920	....	....	....	....	1936-37
1918-19	....	....	....	....	....	....
....	....	....	1925-26 1926-27	....	....	....
1918-19	....	....	....	....	....	....
....	....	....	....	....	....	....
1918-19	....	....	....	....	....	
wada						
....	....	....	....	....	....	1935
1916-17 1918-19	....	1925	....	1928 1930	....	....
....	1921	1922	....	....	....	....
1916-17 1917-18 1918-19	1919-20 1921	....	....	....	....	1934
....	....	....	....	....	....	....
....	....	....	....	....	....	....
....	1920-21	....	....	....	1931-32	1935
....	....	....	....	....	....	....
....	....	....	....	....	....	....
1918-19	1920-21	....	1927-28	....	....	1936-37
1918-19	....	....	....	....	....	....
....	....	....	....	....	....	....
....	....	....	....	....	....	....

Statement showing Frequency of famines/

Serial No.	Name of the District		20th Century					
			1937-39	1940-42	1943-45	1946-48	1949-51	1952-54
								(A) *Western Maharashtra*
1	Ahmednagar	..	1938-39 1939-40	....	1945-46	1946-47	....	1953-54
2	Sholapur	..	1939-40	1941-42	1945-46	1946-47	....	1952-53 1953-54 1954-55
3	Satara	..	1937-38 1938-39	1940-41 1941-42	1945-46	1947-48	1950-51 1951-52	1952-53 1953-54
4	Sangli	..	..	1940-41 1942-43	1945-46	....	....	1952-53 1953-54
5	Poona	..	1937-38 1938-39	1941 1941-43	1944-46	....	....	....
6	Nasik	..	....	....	....	1946-47	....	1952-53
7	Dhulia	..	....	....	....	....	1951-52	1952-53
8	Jalgaon	..	....	....	....	1946-47	....	1952-53
9	Kolhapur	..	....	1941-42	....	....	....	....
10	Thana	..	....	1941-42	....	....	....	....
11	Kolaba	..	....	....	....	....	1951	....
12	Ratnagiri	..	....	....	....	....	....	....
							(B) *Marathwada*	
13	Aurangabad	..	....	....	....	....	1950	....
14	Osmanabad	..	....	....	....	1946	1950	....
15	Bhir ..	..	....	....	....	....	....	1952-53
16	Parbhani	..	....	....	....	....	....	....
17	Nanded	..	....	....	....	....	....	....
							(C) *Vidarbha*	
18	Buldhana	..	....	....	....	....	....	....
19	Akola	..	1938-39 1939-40	....	....	....	....	....
20	Amravati	..	....	....	....	....	....	....
21	Yeotmal	..	....	....	....	....	....	....
22	Wardha	..	1939-40	....	....	...	....	....
23	Nagpur	..	1939-40	....	....	....	1949-50 1950-51	....
24	Bhandara	..	....	1940-41	....	....	1950-51	1952-53 1953-54 1954-55
25	Chandrapur	..	....	....	....	....	....	....

scarcities due to droughts in Maharashtra

1955-57	1958-60	1961-62	1964-66	1967-68	Remarks 70-71 71-72
....	....	....	✓	....	– ✓ ✓
....	....	....	1965-66	....	✓ - ✓
....	....	....	65-66	....	– - ✓
1957-58	1958-59	....	65-66	....	– - ✓
....	....	....	65-66	....	– - ✓
1956-57 1957-58	1957-58 1958-59	1959-60 1960-61 1961-62	1963-64 1965-66	....	- - ✓
....	....	1961-62	65-66	....	– – ✓
....	....	....	....	....	✓ - –
....	....	....	....	....	– – ✓
....	....	....	1965-66 1966-67	....	– – ✓
....	....	....	....	....	– – –
....	....	....	....	....	– – –
....	1960	....	1965-66	....	✓ ✓ ✓
....	....	....	✓	....	✓ – ✓
....	....	....	....	....	✓ ✓ ✓
....	1959	1961	....	....	✓ ✓ ✓
....	....	....	....	....	✓ – ✓
....	1959-60 1960-61	....	1965-66	1967-68	✓ ✓ ✓
....	....	1961-62 1963-64	1965-66	1966-67 1967-68	✓ – ✓ ✓ – ✓
....	....	....	....	....	✓ – ✓
....	....	1961-62 1962-63 1963-64	1964-65 1965-66 1966-67	1967-68	Information for 1901 not ✓ available.
....	....	....	....	....	✓ - ✓
1955-56	....	....	....	....	✓ ✓ –
....	....	....	1965-66 1966-67	....	– – –
....	....	....	1965-66	....	– ✓ – Information for 1809 to 1951 not available.

TABLE No.

Statement showing years of Famines/

Serial No.	Name of the Districts		13th Century	14th Century	15th Century	16th Century
1	2		3	4	5	6
				(A) *Western Maharashtra*		
1	Ahmednagar	..	....	....	....	1520
2	Sholapur	..	....	....	....	1520
3	Satara ..	..	....	....	....	1520
4	Sangli ..	..	....	....	....	1520
5	Poona	..	....	....	....	1520
6	Nasik ..	..	....	....	....	1520
7	Dhulia ..	..	....	....	....	....
8	Jalgaon ..	..	....	....	....	....
9	Kolhapur ..	..	....	....	....	....
10	Thana ..	..	....	....	....	....
11	Kolaba ..	..	....	....	....	....
12	Ratnagiri ..	..	....	....	....	....
					(*B*) *Marathwada*	
13	Aurangabad	..	1296-1307	1322, 1341	....	....
14	Osmanabad ..	..	....	....	....	....
15	Bhir ..	..	....	....	....	....
16	Parbhani	..	....	....	....	....
17	Nanded ..	..	....	....	....	....
					(*C*) *Vidarbha*	
18	Buldhana ..	..	....	....	....	....
19	Akola ..	..	....	....	....	....
20	Amravati	..	....	....	....	....
21	Yeotmal ..	..	....	....	....	....
22	Wardha	..	....	....	....	....
23	Nagpur	..	....	....	....	...
24	Bhandara	..	....	....	....	....
25	Chandrapur	..	....	....	....	....

III

Scarcities due to reasons other than droughts in Maharashtra.

17th Century	18th Century	19th Century	20th Century	Remarks
7	8	9	10	11
....	....	1802	....	....
....	....	1802	....	....
....	....	1803-04	....	....
....	....	1802-03	....	....
....	1791-92	1802-03	....	....
....	....	1802-03, 1803-04	....	....
....	....	1802-03	....	....
....	....	1802-03	....	....
....	....	1804-05	....	....
....	....	1802-, 1803-04	....	....
....	....	1852, 1854	....	....
....	....	....	....	....
1686-1691	1702, 1727-28	1802-03, 1897	1902-1903-4 1916-17 1917-18, 1948	....
4 Famines between 1629 1685	1702	1825	1902, 1903-04 1923, 1928 1930	....
....	....	....	1919-20 1920-21	....
....	1702	1819	1915-16 1918-19, 1919-20, 1959-61	....
1631, 1650 1682-83	1702	....	1910-11 1916-17 1917-18, 1918-19	....
....	....	1833, 1877-78	1959-60	....
....	....	1896-97	1918-19 1926-27 1942-43 1949-50 1957	....
....	....	....		....
....	....	1896-97 1899-1900	1961-62 1963-64	....
....	....	1831-32 1892-93 1894-95	1917-18 1926-27 1938-39	....
....	....	1831-1892 1893, 1994-95	1919-20 1926-30 1931-39	....
....	....	1892-93 1893-94 1894-95 1896-97	....	....
....	....	1804, 1818 1832	1901-02 1959-60	....

CHAPTER III

PHYSICAL FEATURES OF MAHARASHTRA

3.1. The State of Maharashtra lying between 22.1 and 16.4 degrees north latitude and 72.6 and 80.9 degrees east longitude forms a major part of peninsular India on the western side with the total area equal to approximately 10 per cent of the area of the country. The State is entirely situated within the tropics. It is flanked on the western side by the Arabian Sea, on the north and north-western side by Gujarat and in the north and east by Madhya Pradesh. On the south-east it has Andhra Pradesh and on the southern side Mysore and Goa States. Historically the State has been composed of three regions, namely Western Maharashtra (Greater Bombay and Bombay and Poona Divisions) Vidarbha (Nagpur Division) and Marathwada (Aurangabad Division) being the parts of former Bombay, Madhya Pradesh and Hyderabad States respectively. Administratively it is divided into four divisions and 26 districts.

3.2. Physiographically the State may be divided into four regions (1) Konkan Coastal Strip ; (2) Deccan Plateau ; (3) Tapi Trough and (4) a very small area of the Narmada Trough.

3.2.1. *Konkan Coastal Strip.*—The Sahyadri hills form the Western Ghats which run quite close and parallel to the west coast, leaving a narrow strip of land in between which is the Konkan Coastal Strip extending to a maximum width of about 40 Km. from the coast. The altitude of the region does not have an impact on the temparature as it is hardly 25 Metres in some places only. The region thus combines the characteristics of the mountain tract and shore lands, extreme humidity and heavy rains. The area has many low spurs of the main Sahyadri range which have made it generally undulating. It is more hilly in Ratnagiri district than in the two northern districts of Kolaba and Thana. Northern Konkan has a flat level belt along the coast formed of rivers Ulhas and Vaitarna in the lower courses. This belt is not more than 40 Km. wide with a series of parallel ridges in the background. The narrow strips of valleys and the sharp slope towards the sea and the heavy rainfall concentrated in about 60 to 80 days have combined to make the soil shallow in the upper regions. Comparatively deeper soils enrich the bottom of valleys.

3.2.2. *Deccan Plateau*—To the east of the Sahyadris stretches a vast plateau intercepted by rivers which rise in the Sahyadris and flow eastward. In the north is the Satpuda range which runs almost in a straight line from east to west. Thus the the Sahyadris running north-south and the Satpudas running east-west, with their meeting point in the north-west of Dhulia district hold between them the vast plateau of the Deccan. The altitude of the plateau in the Godavari and Krishna basins varies from about 610 m. in the west to about 152 m. near the eastern boundary of the State. The Tapi basin has very low levels from 400 m. in the east to 150 m. in the west.

The Deccan Plateau in Maharashtra state mainly consists of the Krishna and Godavari basins. The Godavari basin, of the Deccan plateau lies between the Satmala range and the Balaghat range. Except for small strip of 15 to 25 Km. near the Western Ghats, the basin is broad and flat. The Krishna basin includes the Bhima sub-basin. The Bhima sub-basin lies between the Balaghat range and the Mahadev range. The Krishna basin proper extends from the Mahadev range to the southern border of the State. Except for a small hilly strip of 40 to 55 Km. from the western edge, the rest of the basin consists of undulating lands of the Deccan Plateau.

3.2.3. *Tapi Trough.*—In between the Satpuda range in the north and the Satmala range in the south lies the Tapi Trough. The valley of the Tapi is a transition between Central India and the Deccan. The Tapi rising in the Satpudas, flows westward with the Purna flowing into it in its upper course. The Tapi valley mainly comprises of western parts of Vidarbha and the districts of Jalgaon and Dhulia. The valley is generally flat with large stretches of deep soil.

3.2.4. *Narmada Trough.*—To the north of the Tapi basin towards the west is a small part of the Narmada basin which is mainly hilly.

3.3. *Climate.*

3.3.1. *Temperatures.*—On the basis of the temperature, the Maharashtra State can be divided into four main regions. The first region comprises of the coastal districts which have low annual variation in temperature. The winters in this region are very mild and the humidity relatively high. The second region comprising of the districts of western Maharashtra is characterised by relatively hot summers, humid and temperate rainy season and moderately cold winters. The third and fourth regions comprising the remaining part of the State differs from each other only in degree, in so far as the temperatures are concerned. The temperature in the fourth region represented by the Vidarbha districts are relatively higher in summer than in the third region. In both the regions, the winter temperature is rather low.

3.3.2. *Rainfall.*

3.3.2.1. Major portion of rain is received from the south west monsoon in Maharashtra State. The Major portion of highest rainfall is received in the hilly areas of the Western Ghats. Coastal areas receive high rainfall which decreases as one proceeds from south to north. From the Weatern Ghats rainfall decreases abruptly eastwards and drops to 500 mm. in the hard core of the drought prone areas. The eastern portions of Marathwada and Vidarbha receive good rains and thus the rainfall increases on the eastern portion of the State. The "retreating" monsoon brings rain to some districts in Nagpur and Marathwada in September and October which are useful for the late kharif and rabi crops.

3.3.2.2. Some 85 per cent to 98 per cent of the annual rainfall is received between June and October over most parts of Maharashtra. The monsoon rainfall is the heaviest in Konkan, on the Sahyadri ridges and in Maval area. It decreases rapidly as one moves eastward, the rate of decrease being more rapid towards the east of Sahyadri Range. To the east of Maval area there is 30 to 50 Kms. strip running parallel to the Sahyadri Range known as the transition tract. To the east of this tract lies the low rainfall belt with rainfall averaging less than 625 (mm.) (25 inches) per year and at some places it is only of the order of 500 mm. (20 inches) per year. The precipitation gradually increases as one moves further to the east, and is of the order of 1,250 mm. (50 inches) in the eastern-most districts of the State.

3.3.2.3. There are four distinct rainfall zones in the state of Maharashtra based on the average rainfall of the tracts.

(1) High rainfall zone which covers about 13 per cent of the area with an average rainfall of about 2,000 mm.

(2) Moderately high rainfall zone covering another 13 per cent area with an average rainfall of about 1500 mm.

(3) Assured rainfall zone covering about 40 per cent of the area with an average rainfall of 900 mm.

(4) Low rainfall area comprising of about 34 per cent of the total area with an average rainfall of 600 mm.

The first category of the area consisting mainly of Konkan districts, receives a little more than ¼th of the total quantity of rainfall, with greater intensity of rains during the four months of the south-west monsoon. In the second zone of area consisting of mainly the eastern side of the adjacent western ghats and the eastern most border of Maharashtra, about 19 per cent of the total rainfall is distributed over approximately 13 per cent of the total area of the State. In the assured rainfall zone about 35 per cent of the total rainfall is spread over 40 per cent of the total area getting a fairly equitable distribution. In the last category which comprises of drought prone regions about 20 per cent of total quantity of rainfall is spread over approximately 34 per cent of the area of the State. Apart from erratic and uncertain distribution of rainfall in the last region, the soil cover is poor in many areas on account of paucity of vegetation cover.*

3.3.2.4. Thus a large part of the State suffers from crop failures due to the vagaries of the monsoon. Variations in the aggregate precipitation, in the dates of the onset and cessation of the rainy season, in the number of rainy days and in the frequency and duration of dry spells govern the character of rainy season. The margin between the normal rainfall and the adequacy of rainfall needed for the dominant crops in the region is small, and hence the effects of any small variation in the aggregate rainfall on the crops is more pronounced. Similarly longer dry spells affect crop conditions adversely if the soils are not retentive of moisture. The areas of high rainfall zone are also not immune from crop failures but the crop failures are less frequent because of the large margin between the bare adequacy of rainfall for growing crops in the region and the normal rainfall. The low rainfall belt normally has poor yields of crops and has been considered by Maharashtra State Irrigation Commission as " low productivity area ". Farming practices and cropping pattern are adjusted to the normal character of the rainy seasons. This accounts for agricultural backwardness of the area but it is the departure from the normal pattern of rainfall in the particular year which brings more hardship depending upon the extent of departure and its degree.

3.4. *Geology and soils*

3.4.1. Geologically major portion of Maharashtra State is underlain by basaltic rock known as the Deccan Trap. Only the eastern part of Nagpur district, a small part of Yeotmal district and Chandrapur and Bhandara districts and southern portion of Ratnagiri district are underlain by one or the other of rocks which are much older than the Deccan Trap formation and belong to the Jurassic (Upper Gondwana) the Permean (Lower Gondwana), Upper Carboniferous, Pre-Cambrian (Vidhyan, Cuddaph and Kaladgi systems), Dharwarean and Archean ages. These rock formations consist of sandstones, limestones, shales, coals, schists and quartzites and have intrusive rocks like granites, diorites, etc.

3.4.2. Physiographically the whole State has hilly or undulating topography which has affected the soil formation with varying depths and textures. The soils of the State have been broadly classified into the following groups.

3.4.2.1. *Lateritic Soils.*—Lateritic soils are mainly confined to Ratnagiri district and to a little extent to the adjoining districts of Kolaba, Kolhapur, Sangli and Satara The soils are developed under intense leaching with deep weathering resulting in deep soils. The lateritisation has occurred of the parent material of basic rock in the northern portion of Ratnagiri district and of the acidic rocks in the southern part. This is reflected in the mild acidic reaction (P. H. 6-7) of soils in the northern part and strong acidic reaction (P. H. 4-5-6) in the southern part. Otherwise the soils of the districts are similar in all other respects. The soils are gravelly in texture and have excessive drainage, low exchange capacity, devoid of lime reserve and low in fertility level. Low lying soils are terraced and put under paddy. Soils on slopes are "Varkas" lands and grow hill-millets.

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*Irrigation in Maharashtra by D. G. Kulkarni

3.4.2.2. *Coastal alluvial soils.*—The coastal alluvial soils are developed along the sea coast and creeks. These soils are of variable depth and texture and are more influenced by the kind of alluvium. They are usually neutral with complete absence of Calcium Carbonate. These soils have, however, calcium and magnesium dominant in the exchange complex. They are moderate in available potash and phosphate. Near the coast, saline soils are frequently met with salt due to the ingress of sea water. They are charged with salts to the varying extent. These soils are gradually brought under cultivation by putting embankment to prevent the ingress of sea-water. In the absence of proper reclamation measure, these soils continue to be saline and grow only coarse varieties of paddy. They need adoption of proper reclamation measures to make them free from saline conditions.

3.4.2.3. *Coarse and Loamy Soils.*—These soils are formed in Thana and Kolaba districts, and are developed in hilly, undulating topography, under moderately high rainfall, from the basaltic rock. As a result, loamy and clay loam soils are developed in low lying areas leaving coarse type of soils on higher reaches. These soils are neutral in reactions low in base status and are usually free from Calcium Carbonate. The soils in the low lying areas are usually clay loam to clay in texture and are converted into rice lands by terracing. As the soils are derived from the washings and alluvium from hill slopes, they are fairly good in fertility. The higher reaches are usually under shifting cultivation of hill-millets.

3.4.2.4. *Reddish Brown Soils on Ghats.*—A narrow strip parallel to the Sahyadri Ranges runs right from north to south in the western parts of Nasik, Poona, Satara, Sangli and Kolaba districts. The lighter coloured soils have been developed under high rainfall conditions on the western side and darker soils under low rainfall conditions on the eastern side. They therefore, have mixed soil properties and are known as soils of the transition zone. The soils of this zone are one of the most productive types in the state because of their texture and favourable rains. They are usually neutral in reaction, fairly good status in respect of base exchange capacity and moderate in the lime reserve. The depth and texture varies according to the topographical situations but in general the soils are well drained and are capable of growing a wide range of crops. The soils of these tracts give good yields of crops like sugarcane, chilly, tobacco, groundnut and many other crops.

3.4.2.5. *Soils derived from Trap Rocks under moderate rainfall.*—Soils known as the black cotton soils form extensive areas in Maharashtra State. As these soils are developed on a uniform parent material of the Deccan Trap rock under low rainfall conditions they do not show large variations in chemical properties. Soils of varying depths and textures are, however, found inter-mixed in the whole region according to the topography. The basic character of the parent materials and the restricted leaching have resulted in high lime reserve in these soils, high base saturation and alkaline reaction. The association of shallow, medium and deep soils is commonly met throughout the region. Shallow soils are usually on the high topographical situations, medium deep soils in the intermediate portion and deep soils in the low lying areas. These soils are prone to considerable erosion and require soil conservation measures. Shallow soils are usually coarse with low moisture holding capacity and as such can support only kharif crops. Medium deep black soils usually have good drainage and are capable of good retention of moisture and have fairly good infiltration rate. These soils are, therefore, suitable for both kharif as well as rabi crops depending on the rainfall conditions. These soils are suitable for irrigation and high yields of crops are obtained on these soils under irrigated farming. Deep soils are more retentive and support rabi crops. Deep soils, however suffer from the drawbacks of low infiltration rate, slow transmission of soil moisture and being on flat topography suffer from improper surface disposal of water. Under low rainfall conditions these soils show a tendency towards development of salinity and alkalinity.

3.4.2.6. *Yellowish brown and red soils on mixed geological formations.*—The eastern part of Maharashtra State comprising of Chandrapur and Bhandara districts and the eastern part of Nagpur district have mixed geological formations. As stated earlier the predominant rock formations are Gondwanas, Cadduppa Vindhyan and Archeans consisting of metamorphic, sedimentery and igneous rocks having varied chemical compositions. Various types of soils are therefore, found in this region Broadly, the soils of the tract are classified into (*i*) Loamy soils in Bhandara district (*ii*) Coarse gravelly soils in Chandrapur district, and (*iii*) Deep clay loam to clay in river basins of the Wainganga and Painganga.

(*i*) *Loamy soils.*—These soils predominantly occur in Bhandara district. They are mildly acidic in reaction, low base status with small amounts of lime reserve. Because of the high rainfall of Bhandara district, these soils are put under paddy

(*ii*) *Coarse gravelly soils.*—These soils occur in Chandrapur district and are slightly acidic in nature, low base status with little lime reserve. These soils. are also predominantly under paddy.

(*iii*) *Deep clay Loam to clavey soils.*—These soils are restricted to the river basins of Painganga and Wainganga and commonly occur in the Paoni taluka of Bhandara district and Brahmapuri, Warora and Gadchiroli talukas of Chandrapur district. They are neutral in reaction, fair in base status and moderate in lime reserve. These soils are put under kharif crops.

3.5. *Agro-climatic Zones.*

3.5.1. The choice of crops to be grown, the seasons in which to grow them, the yields the farmer expects from the crops grown are very largely determined by the climate and the soil of the area. The combination of these factors popularly termed as "soil-climate" complex determines the cropping pattern and cropping season. Two regions having similar soil-climate complexes have similar crop pattern, similar requirements and practices of irrigation and cropping season. It is possible to demarcate agro-climatic zones based on these complexes.

3.5.2. The State has been divided into nine agro-climatic zones on the basis of soil-climate complex, relief, cropping pattern and vegetation as follows :—

3.5.2.1. *High rainfall zone with lateritic soils.*—The zone comprises of southern Konkan coast including Ratnagiri district, the southern parts of Kolaba district and the extreme western parts of Kolhapur and Satara districts. The annual precipitation ranges between 2,000 mm. to 3,000 mm. The dominant soil is lateritic formed from basalt. Though paddy is the predominant crop in the low lying areas and inferior millets in the up-lands, fruit farming is also practised on a large scale.

3.5.2.2. *High rainfall zone with non-lateritic soils.*—This zone comprises of the districts of Thana and northern parts of Kolaba district and the extreme western parts of the Nasik, Ahmednagar and Poona districts. Red to reddish brown loams of non-lateritic origin dominate the soil complex. The crops grown are mainly paddy, inferior millets, pulses and market gardening near urban areas.

3.5.2.3. *Ghat zone.*—This zone comprises of the western parts of Kolhapur Sangli, Satara, Poona, Ahmednagar and Nasik districts. The average annual rainfall is between 2,000 mm. and 4,000 mm. Two types of soils are found viz shallow light-brown to dark-brown gravelly loam on the hill slopes and red to reddish brown lateritic soil on the high-level western parts of the zone. The dominant crops are hill millets, 3.5.2.4. *Transition Zone I.*—The eastern slopes of the Western Ghats which fall in the districts of Satara, Poona, Ahmednagar, Nasik, and Dhulia comprise the transition zone, having annual precipitation varying from 1,250 to 2,500 mm. The red and black soils of parent basalt rock are found in the zone. At high elevations paddy is the dominant crop, while lower down, bajra, jowar and groundnut are principally grown.

3.5.2.5. *Transition Zone II.*—This zone is characterised by rolling plains, interspersed with rocky out-crops. It includes the mid-western portions of Dhulia, Nasik, Ahmednagar, Poona, Satara and Sangli districts and the north eastern portion of Kolhapur district. The annual precipitation in this zone varies from 700 to 1,250 mm. Dark-brown soils underlain by the Deccan Trap dominate in this zone. Bajra, jowar and groundnut are the dominant crops.

3.5.2.6. *Scarcity Zone.*—This zone comprises the eastern portions of Dhulia Nasik, Ahmednagar, Poona, Satara and Sangli districts, most of Sholapur district and the western portions of Aurangabad, Bhir, Osmanabad and Jalgaon districts. Brown-black calcarean soils of varying depths and textures dominate the zone. Crops like millets are dominantly grown in this zone.

3.5.2.7. *Assured rainfall zone.*—This zone includes parts of the districts of Jalgaon, Aurangabad, Bhir and Osmanabad and Akola, Amravati, Nanded and Parbhani districts. The annual precipitation varies between 700 mm. to 900 mm. The soils are dark-brown to black calcarean clay-loams of varying depths. Jowar, pulses, cotton and groundnut are the dominant crops.

3,5.2.8. *Moderate rainfall zone.*—This zone consists of gentle rolling plains of about the same altitude as the assured rainfall zone and includes the districts of Wardha and Yeotmal, western parts of Nagpur districts and a portion of the district of Amravati. The rainfall ranges between 900 mm. to 1,250 mm. The brown-black soils of varying depths and texture dominate.

3.5.2.9. *Eastern high rainfall zone*—This zone comprises of Chandrapur and Bhandara districts and the eastern parts of Nagpur district with an average assured rainfall above 1,250 mm. and little beyond 1,700 mm. on the eastern side. The soils are derived from gneiss, granites and schists and are either red sandy loams or deep black clays. Paddy is the predominant kharif crop and wheat and lineseed predominate in the rabi season.

CHAPTER IV

CRITERIA FOR IDENTIFICATION OF DROUGHT PRONE AREAS.

4.1. *Description of the term 'drought'.*

4.1.1. Before examining the objective criteria for the identification of drought prone area, it is necessary to arrive at the precise description of the term 'drought'. There is no universally acceptable definition of the term drought. The term is used differently by different persons, depending upon the context and the purpose for which it is being used. Chambers Twentieth Century Dictionary defines "drought" as "dryness or want of rain". Meteorologist describes drought as a situation for an extended dry period during which some precipitation is normally expected. To the agriculturists, drought is shortage of moisture for the crops. The hydrologists will say that there is a drought when surface and underground water levels are depressed and there is diminution of stream flows. To the economists, drought means a situation where water shortage ultimately affects the established economy of the region. Thus drought is not understood as any absolute condition but is a relative term, its interpretation depending upon the context in which the term is used.

4.1.2. Various authorities have evolved their own definitions of drought. Linsley defined drought as sustained period of time without significant rainfall. American Meteorological Society defined drought as a period of abnormally dry weather sufficiently prolonged for lack of water to cause serious hydrologic imbalance (i.e. crop damage, watersupply shortage, etc.) in the affected areas. It further stipulates that the term should be used for periods of moisture deficiency that are extensive in both space and time. The Australian Bureau of Meteorology suggests that the objective method of specifying drought is to signify the minimum water needs of an area. Drought occurs during an interval when rainfall is less than minimum water needs. In the case of agricultural drought, the minimum water need varies from crop to crop and its stages of growth. Van Barel treats agricultural drought as a condition in which there is insufficient soil moisture available for the crops. Rickard amplified Barel's definition of agricultural drought and considered that agricultural drought exists when the soil moisture in the root zone is at or below permanent wilting percentage. All these concepts may be right, each in its own way.*

4.1.3 In spite of the difficulties in defining the term "drought" with precision it is not disputed that if "agriculture" is to be successful, there must be water available to meet the soil, evaporation and transpiration needs of the crop. Drought results when there is adverse balance between available soil moisture and evapo-transpiration needs of an area. Evapo-transpiration is the loss of water vapour to the atmosphere in the form of evaporation from soil, water surfaces and transpiration from plants. Evaporation in any region is controlled by the availability of moisture at earth's surface and ability of the atmosphere to supply energy to vaporise the water and transport the vapour. The basic characteristic of drought is steady rise in temperature with absence or severe deficiency of rainfall over a long period. Even though drought is the function of interaction of several variables such as precipitation, temperature, wind velocity, sunshine, soil texture, soil moisture and antecedent rainfall, the dominant factor is rainfall, total precipitation, its distribution and variability and its capacity to meet evapo-transpiration needs. In the background of these theoritical premises, the Committee feels that agricultural drought with which this Committee is concerned, is a situation arising out of adverse balance between available soil moistuie and evapo-transpitation needs of an area, impeding normal agricultural operations and ultimately resulting in total or almost total failure of crops.

Note.—Above references are based on Dr. Kotteshwaran's paper presented at the symposium on "Drought in Asiatic Mansoon" at Pune.

4.2. *Distinction between " scarcity " and " drought "*

4.2.1 It is necessary to bring out the distinction between 'scarcity' and drought' at the outset. Scarcity has been described in the Scarcity Manual of Government of Maharashtra as marked deterioration of the agricultural season due to failure of rains or floods or damage to crops from insects resulting in severe unemployment and consequent distress among agricultural labourers and cultivators. It will be obvious from the above description that drought is one of the causes of scarcity. Other causes can be excess rains or infection of crops by pests or diseases. Drought may not necessarily result in the manifestation of scarcity conditions. If drought occurs in a year which is preceded by an abnormally good year, scarcity conditions may not be quite manifest. On the other hand, if droughts occur in succession, the area may experience severe scarcity conditions. While drought is a meteorological phenomenon, scarcity denotes mainly its effects on the socio-economic life of that region. Scarcity may include drought but drought need not necessarily result in scarcity conditions.

4.3. *Distinction between economically backward region and drought prone areas.*

4.3.1 Quite often, the drought prone areas are wrongly identified with economically backward regions. The economically backward regions are characterised by low level of per capita income, employment and economic activity and structural constraints to economic development such as the institutional structure not being conducive to the economic development. The drought prone areas however consist of the areas which are vulnerable to uncertainty in agrarian conditions due to vagaries of the rainfall. It cannot be denied that among backward regions there may be areas susceptible to drought conditions but all backward regions may not necessarily be drought prone areas. In other words, the backwardness of a region may be also due to its drought prone character. But there may be backward regions where there is a continued low level of income and economic activity over a period of years in spite of adequate rainfall. The drought conditions may occur in the economically developed areas also where the character of rainy season is uncertain. The effects of drought on the socio-economic life of a region are more severe in backward regions than in the economically developed areas. The problem of the development of economically backward regions encompasses the entire realm of problems concerned with raising the level of income, whereas the problem of conversion of drought prone areas into dought resistent areas mainly pertains to the development of protective irrigation facilities and substitution of the drought resistent varieties in the cropping pattern of the drought prone areas. The distinction between backward regions and drought prone areas lies not only in the character of the areas but also in the measures for the development of these areas. This distinction has to be borne in mind while arriving at objective criteria for identification of drought prone areas because criteria for identification of underdeveloped regions overlap with those for identification of drought prone area. The problem of economic development of backward regions is an issue which does not come within the purview of this Committee. The Committee is primarily concerned with drought situation and areas where there is a degree of recurrent insecurity arising out of inadequate rainfall. We prefer to call such areas " drought prone areas " which indicates susceptibility of the areas to frequent droughts which is the primary concern, rather than using the term " chronically drought affected " which implies the actual recurrence of drought conditions with its attendant socio-economic consequences in a given time period. Hereinafter while referring to the areas identified by us, we have used the term " drought prone areas ".

4.4 *Criteria Adopted by The Fact Finding Committee (1960).*

4.4.1 The Fact Finding Committee (1960) adopted the following criteria for identification of chronically scarcity affected area:--

(*a*) Rainfall.

(*b*) Annewari and suspension of land revenue ; and

(*c*) Declaration of scarcity in the past.

4.4.2. In its general report, that Committee has outlined the scope of each of the above criteria and the extent to which they have been used in the identification of drought prone areas. It recognised the importance of total precipitation, and its distribution in relation to soils in identifying chronically scarcity affected areas in following words :—

"Where the soil was deep and retentive, normal productivity was generally high and shortages in the rainfall would not constitute a serious threat as in the case of light and non-retentive soils, where the problem of adequate and well distributed water supply was crucial. In the latter soils, delay in the commencement of rains, recurrence of dry spells over a long period or absence of rainfall at certain crucial points in the growth of plants were of special significance."[1] That Committee considered the co-efficient of variation of rainfall of each of the important months or pairs of months as one of the important tools for ascertaining the uncertainty of rainfall. In the chapters on districts, the Committee considered the co-efficients of variation in respect of some districts only, while in a large number of districts, the Committee indicated the yearly and monthly figures of rainfall to exhibit the uncertain character of rainfall in the area. The important aspects of rainfall pattern relating to weekly distribution of rainfall, its relations with soil and cropping pattern of the area was not considered in details by that Committee. On the other hand, the Committee considered annewari as a fairly reliable and convenient index of the incidence of scarcity in the area. It was frank in its admission of the difficulties presented by divergent procedures for declaration of annewari and scales of suspension. But in the final analysis, the Committee laid greater emphasis and reliance on the frequency of suspension of land revenue and declaration of scarcity conditions rather than rainfall. The Committee sorted the revenue circles in each taluka in which not less then ½ number of villages were affected by scarcity or in which annewari was less than 4 annas and graded them in accordance with the number of times, they were affected in the past.

4.4.3. That Committee's reliance on annevari and declaration of scarcity in the past in identifying chronically scarcity affected area is further evident from the basis which it has adopted for gradation of areas. The Committee graded chronically scarcity affected areas only on the basis of frequency with which the area was affected by scarcity conditions in the past. That Committee was aware of the limitations of such approach as it qualified the said approach with further modifications by saying "Due to variations in the normal yields and difference in the system of assessment in different regions, the information regarding annewari and official declarations of scarcity did not give comparable picture for all parts of the State."[2] It emphasised the need for a study of some specific factors affecting agricultural production, independent of annewari. Even after recognising the limitations, the Committee, by and large, relied on annevari and the declaration of scarcity conditions in the past for identification of areas. In very few cases, the Committee did not consider an area as chronically scarcity affected even when the annewari data and the criteria it has laid down indicated such a recognition. The example of Niphad can be cited in this regard. Even when certain portion of Niphad and Lasalgaon circles with the exception of ten villages could be grouped under category 'C', that Committee excluded these parts because of other considerations like better soil and increasing acreage under irrigation. But these instances are only exceptions.

1. Report of Fact Finding Committee (1960). Chapter III, page 9.
2. Report of Fact Finding Committee (1960). Chapter I, page 11.

4.4.4. Even after recognising the subjective element in the determination of annewari and its resulting arbitrary character, the Committee seemed to have been overwhelmed by the absence of any other data for the identification of chronically scarcity affected areas. The Committee particularly was handicapped, while identifying the areas in Marathwada, as there was no settled system of declaration of annewari and declaration of scarcity conditions. Ultimately, these areas were recognised in the lowest category of chronically scarcity affected areas. While we appreciate the limitations placed by the availability of data to make the effort of identification more meaningful, reliance on the subjective factor like annewari entirely has rendered such effort somewhat nugatory. It is, therefore, necessary to probe deeper into the main causative factor of drought namely, rainfall with reference to annual rainfall, its variability and its weekly distribution in relation to soil and cropping pattern of the area, to identify the drought prone areas with precision.

4.4.5. *Criteria adopted by the Second Irrigation Commission (1972).*

4.5.1. Recently the Second Irrigation Commission (1972) was set up by the Government of India to go into the question of future irrigation development in the country in a comprehensive manner. By one of its terms of reference, the Commission was required to analyse the irrigation facilities available in the chronically drought affected and food deficit areas and suggest essential and minimum irrigation works to be promptly undertaken in these areas. The Commission had first to identify the areas which could be considered as chronically drought affected before recommending the measures for the minimum irrigation works.

4.5.2. The Commission gave consideration to the following criteria in identifying the drought affected areas :—

(*a*) Meteorological data,
(*b*) Revenue remissions,
(*c*) Frequency of famine or scarcity, and
(*d*) The availability of irrigation facilities.

Out of these considerations, the Commission dissmissed the method of identification of drought affected areas on the basis of annewari as "the subjective elemet in the assessment of annewari by village officers was so large as to vitiate any delineation of drought areas based on annewari." [1].

4.5.3. The Commission mainly relied on the meteorological data in adopting the criteria for drought affected areas. It adopted the definition of 'drought' set out by the India Meteorological Department "as a situation occurring in any area when the annual rainfall is less than 75 per cent of normal". The Department in its paper on "Rainfall and Droughts in India" published in March 1971 considered those areas as drought areas where above phenomenon has 20 per cent probability of occurrence. Using the annual and south-west monsoon rainfall data from 1901 to 1960 for about 500 stations, the above paper indicated frequency of rainfall variations in the different parts of the country. The Commission also accepted distinction between the drought areas and chronically drought affected areas. Areas where there is 40 percent probability of rainfall departure of more than 25 per cent were identified as chronically drought affected areas. On this basis the Commission considered western part of Rajasthan and Kutch only as chronically drought affected areas. But the Commission clearly stated that the distinction between drought affected areas and chronically drought affected areas is one of degree. The Commission's finding was that most of the areas where the drought occurs were areas falling within arid and semi arid zones. The Commission while outlining the dimension of the problem assumed that the districts which receive less than 750 mms. of rainfall are liable to drought and also further considered districts lying between 750 mms. and 850 mms. of annual rainfall as vulnerable where the rainfall is of doubtful efficacy and the irrigation facilities are limited.

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[1]. Report of the Second Irrigation Commission (1972), Chapter VII, page 172.

4.5.4. The Commission demarcated a broad drought zone by adopting the taluka as unit of identification and excluded (*i*) those talukas which were outside the drought zone, (*ii*) those where 30 per cent or more of the cropped area was under irrigation, and (*iii*) those which comprise only a small portion of a district with an adequate rainfall or irrigation. [The Government of Maharashtra had recognised 53 talukas including some parts of the taluka as chronically scarcity affected following the criteria laid down by the Fact Finding Committee (1960). The Commission eliminated 8 talukas out of them and considered 45 talukas as drought affected (Table No. II Chapter No. V).

4.5.5. We agree with the approach of the Irrigation Commission in identifying the broad drought zone on the basis of rainfall and not on the basis of other factors like annewari. It is the rainfall and its pattern of distribution related with the stages of crop growth and the cropping pattern which are more relevant for the effect of rainfall on agricultural production and consequent scarcity condition. The Commission recognised the significance of the 'timeliness' of rainfall in the following words:—

" It will be noticed that the definition of drought given ....does not take into consideration the timeliness of rainfall. However, because of difference in the cropping pattern and distribution of rainfall from region to region it would be difficult to qualify the definition of drought with sufficient exactness by introducing this element. "[1]We also do not under-estimate the difficulties likely to be encountered in such an attempt because of the difference in cropping patterns and soil characteristics of the different areas. In view of importance of this factor, we have attempted in a later part of this chapter, to introduce this element in our approach to the identification of drought prone areas.

4.5.6. Further, the Committee feels that the exclusion of the talukas on the ground that irrigation is available for 30 per cent of the cultivable area, though in conformity with the unit which the Commission has adopted, is not proper. The parts of taluka which do not enjoy the protection against drought through irrigation facilities require to be recognised as drought prone provided they fall in the broad drought zone and exhibit the erractic character of distribution of rainfall.

4.5.7. While delineating the talukas as drought prone in Maharashtra State as mentioned in Appendix 8·1 of the Commission's report, the Commission appears to have restricted its consideration only to the list of talukas formally declared by the Government of Maharashtra as chronically scarcity affected and not taken into consideration the entire list of talukas suggested by the Government of Maharashtra for inclusion in the drought affected areas, in its memorandum to the Commission. This Committee is of the view that it was necessary for the Irrigaion Commission to consider all the areas in Maharashtra *de novo* and identify the drought affected areas following the criteria laid down by the Commission itself. In fact, Figure 8·2 in the Commission's report which shows the broad drought zone and areas identified as drought affected by the Commission, includes areas in Maharashtra which were not formerly declared by the Government of Maharashtra as chronically scarcity affected. The Commission has, however, neither included all this area under its list in its Appendix 8·1, nor has given reasons for its exclusion in its report.

4.6. *Possible criteria for identification.*

4.6.1. In the replies to our questionnaire and during our discussions with people various criteria have been suggested to our Committee. The Committee feels that acceptable criteria must satisfy three important characteristics. Firstly the criteria should be fairly representative of the drought situation. The best representation

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[1] Report of Second Irrigation Commission (1972), Chapter VII, page 164.

of the drought could be made either in terms of its causes or effects, if the latter is clearly identifiable as on account of drought. If the effect is produced by multiplicity of factors, it must be possible to segnegate the effect produced by causes other than drought.

4.6.2. Secondly, the criteria must lend themselves to quantitative measurement. By quantitative measurement, we mean that it must be possible to quantify drought in terms of the said criteria and to base the identification of areas on the frequency and intensity of its occurrence. Lastly, reliable data must be available for adopting them as criteria. Not only the existence of reliable data is important but also its availability for unit of identification is of paramount significance.

4.6.3. Following criteria can be considered :—

I. Criteria based on causes of drought—

(*a*) Normal precipitation.

(*b*) Timeliness of rainfall with reference to cropping pattern.

(*c*) Soils.

II. Criteria based on the effect of the drought.—

(*a*) Annewari and suspension of land revenue.

(*b*) Declaration of scarcity in the past.

(*c*) Outturn.

(*d*) Marketable surplus.

(*e*) Migration.

(*f*) Fluctuation in the prices.

(*g*) Foodgrains offtake.

(*h*) Density of population.

We discuss below how far each of the above criteria may be useful as a tool for identifying the drought prone areas.

4.7. (*a*) *Normal Precipitation.*

4.7.1. The rains in the monsoon are caused from the seasonal changes in the wind system. The variations from normal changes in the wind system lead to abnormal weather situation like flood and drought. Even though, these variations may be low in intensity they are large in regard to expanse. Annual variations in the local situations take place and are responsible for occurence of droughts or floods of localised character, in some part or other of the State.

4.7.2. Even though yearly variations exist in the pattern of rainfall the variations in the moving averages over a long period are not large and it is possible to classify the regions according to the normal rainfall as areas of high rainfall or low rainfall.

4.7.3. Apart from the total rainfall, the dependability of annual rainfall is also of great significance for agricultural activity in dry farming areas. The analysis of the rainfall figures by Meteorological Department, has however shown that the areas of scanty rainfall are also those of uncertain rains.

4.7.4. In these areas the rainfall is just sufficient to meet the bare minimum needs for agricultural operations. Any variation in the normal pattern affects the agricultural activity in the particular region. On the other hand even large variations in the normal rainfall in the areas of high rainfall, need not necessarily affect the agricultural operations as long as the actual precipitation is sufficient to meet water requirements of the crops.

4.7.5. The variability of rainfall and the periodicity of departure from normal rainfall increase from high rainfall region to low rainfall areas. The variability is also more for the precipitation considered over a smaller period. It has been estimated that in Madhya Maharashtra, the coefficient of variation of rainfall for the period from June to September is as high as 30 per cent to 40 percent. If the weekly distribution of the rainfall is considered, the variability is even larger. The possibilities of introducing the element of timely rainfall in the identification on the basis of weekly rainfall has been dealt with in the later part of this chapter, with the help of a model prepared by the Dry Farming Research Station at Sholapur.

4.7.6. The problem of drought is also closely inter-related with the general climatic classification. The climatic classification is based on the water balance approach of Thornthwaite. The climates have been classified as per-humid, humid, moist sub-humid, dry sub-humid, semi-arid and arid. In these climatic zones, three kinds of droughts have been recognised viz., (*i*) permanent drought of the driest climate ; (*ii*) seasonal droughts in climate having well-defined rainy and dry seasons ; and (*iii*) contingent drought resulting from irregular and variable occurrence of rainfall. Contingent droughts occur almost anywhere but are most characteristic of sub-humid and humid climates. They are usually of a short duration and affect relatively small area.

4.7.7. The problem of properly defining drought has been discussed at length in the earlier part to bring out the complex problems faced in arriving at any universally acceptable definition of drought. When we consider identification of drought prone areas on the basis of rainfall, it involves the quantitative assessment of the severity and intensity of drought as well as frequency of its occurence. Various methods used to quantify droughts can be broadly classified into two categories, namely, (*i*) on rainfall analysis, and (*ii*) water budgetting technique.

4.7.8. In their methods of rainfall analysis British Rainfall Organisation has considered "absolute drought" as a period of at least 15 consecutive days in which the area has not received even 0·1 inch rain. There is another approach given by Bates. On the basis of this approach the Indian Meteorological Department in their paper on "Rainfall and Droughts in India", have considered 25 per cent deficiency in annual rainfall as drought. The findings in the paper have been mainly used by the Second Irrigation Commission (1972) in their approach to the problem of identification of drought prone areas. There has been another approach based on the weekly distribution of rainfall such as by Ramdas which has been discussed in the later part of the chapter.

4.7.9. Another simple measure of the drought prone character of an area can be the frequency of the years in which the precipitation is less than the minimum required for successful agricultural operations. From the rainfall data published by the I.M.D. for the period 1901 to 1960 isolines for the number of years in which rainfall was less than 500 mm. or 375 mm. have been worked out and shown on Maps No. 2 and 3 respectively. It can be seen from these maps that the area within the isohyete of 750 mm. shows a very high frequency of years receiving less than 500 mm. or 375 mm. rainfall. Some areas beyond the isohyete of 750 mm. and upto the isohyete of 800 mm. also exhibit a high frequency of failure years.

4.7.10. An alternative approach is the water balance technique because rainfall only gives an idea of water income but not of water availability. The water availability depends upon such factors as evapo-transpiration, soil moisture desication, soil type, etc. Thronthwaite has described drought as a condition when the amount of water need in the form of evaporation and transpiration exceeds the moisture supply that is available as rainfall and soil moisture. The aridity index thus computed can be used for comparison of drought in space and time. The water balance approach is certainly more objective as it takes into account the precipitation evapo-transpiration and soil moisture storage but the computations involved in such an apporach are more complicated and require considerable data as also further research in our State.

4.7.11. On the basis of water balance approach of Thorthwaite, the Meteorological Department in its monograph on "Rainfall and Droughts in India" has assessed the areas in the country having water surplus and water deficit on yearly basis. For assuming the water need, annual potential evapo transpiration has been calculated. The figure 34 in the said paper indicates the areas of nil water surplus. If the said figure is superimposed on the isoheyetal map of Maharashtra State the area of nil surplus broadly covers the entire region in Maharashtra falling within the isohyete of 750 mm. Similarly the figures drawn by the Meteorological Department to indicate the periodicity of percentage departure from normal rainfall also shows that the areas where there is 20 per cent of probability of 25 per cent deficit of normal rainfall are broadly also areas falling within the isohyete of 750 mm.

4.7.12. As has been mentioned in the earlier part of this chapter there are several factors which play an important role in the growth of plants other than rainfall such as temperature, wind velocity, sunshine and soil textures. In scientific terms, it can be said that the moisture index, the thermal index and the soil type play vital role in the growth of crops. The variations in thermal index are not wide. The variations in soil types are so wide that it is difficult to demarcate areas having heavier soils from the light soils. The moisture index then becomes an important determinant of crop growth. The tract falling within isohyete of 750 mm. has poor moisture index.

4.7.13. From the discussions in the foregoing paragraphs, it is evident that the area falling within the isohyete of 750 mm. is indicated as drought area, by the criteria of water balance, periodicity of departure from the normal rainfall as well as of moisture index. The delineation of the broad drought zone on the basis of total precipitation is simple to understand. The Committee therefore feels that the broad drought zone in the State be demarcated on the basis of total precipitation. In addition to the areas falling within the isohyete of 750 mm. however, there are certain areas located on the South-East thereof upto an isohyete of 800 mm. which deserve to be considered on the basis of one or the other criteria. The Committee thus considers that normal annual rainfall is one of the significant criteria for initially classifying the drought zone in the State.

4.8. (*b*) *Timeliness of rainfall with reference to cropping pattern.*

4.8.1. The growth of plants has certain important phases viz., (*a*) sowing and germination, (*b*) tillering and vegetative growth, (*c*) flowering and grain filling, (*d*) grain drying and harvesting. The water requirements of crops at first three stages is very crucial. If there is prolonged break, drought situation is created and yields are severely affected. There can be generally four types of variations in the normal pattern namely—

(*a*) Delay in the commencement of rains.

(*b*) Considerable prolonged intermediate breaks.

(*c*) Very uneven distribution of rain.

(*d*) Failure of late rain.

4.8.2. If the commencement of rains is delayed, sowing operations are delayed, resulting in the reduction of the period of crop growth and finally affecting the yields adversely. The second and the third situations may result in affecting adversely the vegetative growth, resulting in lower yields depending upon the deficiency of rainfall in these periods. Flowering and grain filling stages require adequate rainfall, failing which the grain size and yields are affected. Very early stoppage of rain may cause shrivelled grains while continuance of rains late in the season is likely to cause lodging of crop and reduction in the yeilds.

4.8.3. The ideal distribution of rainfall in drought prone areas has to be considered in relation to the cropping pattern. Any variation in that distribution particularly relating to the crucial stages of growth may result in either partial or almost total or total failure of crops according to the extent of variation. In dry farming areas, the soil-moisture is the controlling factor for plant growth. The soil-moisture is a function of types of soil and rainfall. There are broadly four types of soil viz., very shallow soils, shallow soils, medium deep black soils and deep black soils. Very shallow soils are sub-marginal lands and the plant growth on these soils faces severe handicaps. Shallow soils have very low moisture retentive capacity due to its limited depth. The precipitation in June and July is able to saturate the soil profile. These soils can also absorb the rain water easily and few showers at crucial stages may yield more than normal harvest. On the other hand, deep soils are heavy in texture and the intensity of rainfall has to be adequate so that the rain water can percolate to the deeper layers to saturate the soil profile. If the soil profile is properly saturated, crops can sustain longer breaks, as there is enough soil moisture in the profile. If the soil profile is not saturated, the crop failure is imminent in the event of longer dry spells. Kharif crops are generally grown on shallow soils, while rabi crops are preferred on medium deep black or deep black soils.

4.8.4. It is possible to work out the minimum requirements of rainfall at various crucial stages for different crops after observing the effect of the quantity of rain on different soil depths, slopes and the location of the site on watershed. A model on the above basis has been built for Sholapur District and similar tract by the Dry Farming Research Centre and is given in the Appendix I to this Chapter. The model denotes the crucial stages, in terms of specific months. It shows some of the situations in which crop failures either partial or total may occur. The crucial periods identified are different for different crops. While considering the requirements of Bajra, the monthly minimum in 4 months of the monsoon period has been worked out. In the case of rabi crop the months of June, July and August are grouped together and fortnightly requirements of next two months and monthly requirement of November are indicated. It will be observed from the situation given in the model that the crop failures partial or total occur when rain fails in two stages out of 4 stages in the case of Bajra either in succession or alternatively.

4.8.5. In case of rabi crops the growth period has been divided into six phases viz., (1) June, July and August, (2) first fortnight of September, (3) second fortnight of September, (4) first fortnight of October, (5) second fortnight of October, and (6) November. The crucial periods which determine the crop conditions are the months of September and October. Crop failures are imminent if rains fail in any three phases out of the total six phases. If the rain fails in two phases out of six there is likely to be half normal crop. The model indicates the maximum number of permutations and combinations of the situation resulting in half normal crop or failure of crops.

4.8.6. The model is illustrative of how the crop failures will occur in the event of uneven distribution of rain. The normal pattern of rainfall in an area is, however, not according to the desired pattern for a particular crop. If such models are developed for major crops in agro-cilimatically distinct small zones, it will be even possible to base the declaration of scarcity on the objective criterion of rainfall by comparing the pattern of rainfall in a year with various situation of half normal yield or failure of crops in the model. But this will require systematic collection of data relating to rainfall and further research in different areas. It is not possible at the present juncture to identify the drought prone area by building such models. Such an attempt will require further research in different parts of the drought prone zone for testing the veracity of this model or for building alternative models and verifying them with the actual rainfall pattern during past years, In simpler terms the model indicates that timely distribution of rainfall is important for the growth of crops.

4.8.7. In the meanwhile there is no other alternative but to consider the weekly distribution of rainfall in some simple form for understanding the effects of drought situation on crops. The period of the south-west monsoon rainfall is from June to October and comprises of 22 weeks. The weekly distribution of rainfall for 15 years was examined by us.

4.8.8. According to Ramdas, drought is an occurrence when the rainfall for a week is half normal or less when the normal weekly rainfall is 5 mm. or more. According to the practice followed by Agricultural Meteorology Division, agricultural drought is considered to be experienced when 4 such consecutive deficient weeks occur in the period from the middle of May to middle of October. The average rainfall of each week for the recent 15 years was calculated. The number of drought weeks in each month was calculated in order to correlate it with the annewari and declaration of scarcity. It was observed that crop failures were generally witnessed when 11 weeks out of 22 weeks were drought weeks. There were also some seasons in which more than 11 weeks were drought weeks but scarcity was not declared. The explanation of this phenomenon may be found in the high intensity of rainfall in weeks other than drought weeks and the retentive character of soil. The Committee, therefore, feels that the frequency of occurrence of 11 drought weeks in the monsoon season (June to October of 22 weeks) can be adopted, within the broad drought zone as one of the convenient indices for verification of the drought prone character of the area.

4.8.9. It is also observed that drought weeks occur in succession. Such large number of deficient weeks occurring in the season for a considerable number of years exposes the erratic character of rainfall in that area. The utility of this factor, however, for identification of drought areas is rather limited for the present because the available rainfall data does not cover large area, on account of limited number of rainguage stations. It would have been possible to identify the drought prone areas more meaningfully and with greater precision on the basis of timelines of rainfall, had there been extensive net work of rainguage stations. We, therefore, strongly recommend that sufficient number of rainguage stations may be established in the drought prone areas so that above criterion can be more scientifically or objectively used.

4.9. (*c*) *Soils.*

4.9.1. Soil-moisture is a limiting factor for plant growth. Even though the rainfall is the main source of soil-moisture, the same quantity of rain will affect soil-moisture differently under different condition of soil depths, slopes and location of the site in the watershed which ultimately result in opportune time for intake of rain water. The soil types can be classified into four catagories :—

Very shallow soils ..	.. ..	Upto 10 cm.
Shallow soils	Above 10 cm.	Upto 22·5 cm.
Medium deep soil	Above 22·5 cm.	Upto 60 cm.
Deep soils	Above 60 cm.	Upto 90 cm.

4.9.2. Very shallow soils mostly observed on the ridges have poor retentive capacity and are unfit for cultivations except for grass or forestry. In shallow soils, the rainfall in June, July and August is able to saturate the soil profile and kharif crops can be grown. Medium deep and deep soils are retentive of soil-moisture and do not come to working conditions, during the kharif season because of their high moisture content at wilting point of the crop. Later rains in September and October are able to saturate the soil profile and rabi cultivation is successful on these soils.

4.9.3. The moisture-retentive capacity of soils thus governs the response of thes soils to varied rainfall conditions and tolerance of dry of spells. The extent of damage to crops on account of failure of rains will also largely depend upon the types of soil. The soil types vary significantly even within a village. It is therefore, difficult to assess the representative soil type of a given area when a comparatively large unit is adopted. Predominant soil type of the area can however be inferred from factors such as its contiguity to river, Within the broad drought zone, the areas having less retentive soils are more susceptible to adverse consequences of drought than those where soils are more moisture retentive. Thus the type of soil is one of the important considerations in assessing the probable effects of a drought situation. Those of the marginal areas favourably disposed in this respect require deletion while the others with unfavourable soil mantle will have to be included in the identified areas even though the rainfall by itself may be somewhat more.

4.10. *Annewari and suspension of land revenue.*

4.10.1. Annewari in a particular season denotes the relative condition of crops for the area. The main purpose of determination of annewari has been to grant relief to the cultivators by suspending the recovery of land revenue and other dues when the crops fail partially or totally. The scale of suspension is also graduated according to the intensity of crop failures.

4.10.2. In the Bombay province, there was no provision for suspension or remission of land revenue prior to 1905 but the Famine Code authorised the Collectors to suspend the recovery in the case of abnormal season. Such suspension was eventually followed by an enquiry into each case as to the desirability of collection or remission. A uniform scale was first introduced in 1905, following the recommendations of Famine Commission (1901). The Commission recommended that relief would not be required when there was half a normal crop. Normal crop was considered as 12 annas and if the crops in any season were below 6 annas, graduated scale of suspension was prescribed in 1907. Later, the rules regarding the suspension of land revenue formed part of the rules framed under Bombay Land Revenue Code.

4.10.3. In Vidarbha region, two scales of suspension prevailed :—

A scale—

4 annas and above but less than 6 annas ..	Half.
Less than 4 annas	Full.

B Scale—

Less than 8 annas and not less than 6 annas ..	Half.
Less than 6 annas	Full.

'A' scale was made applicable to all villages where condition was normal. 'B' scale was to be applied to those villages which had suffered from recent crop failures or deterioration. The sanction of the State Government was required to be obtained for the application of the said scale except in villages where land revenue had been suspended in previous two successive years or in which the outturn of crop was in either of the previous two years had been less than 4 annas.

4.10.4. In Marathwada areas, the remission was governed according to rules framed under the Hyderabad Land Revenue Code. As a rule, remission was not granted in case of dry lands, unless exceptional circumstances justified the grant of such remission. In such circumstances, the Deputy Collector or the Tahsildar was required to submit report to the Collector. The scale of suspension was uniform in respect of wet lands and dry lands. The scale of remission was as follows:—

Produce below 1/8 of normal—Full remission. Produce between 1/8 to 1/4 of normal-Half remission. According to the scale prescribed, full suspension was granted if the annewari was below 4 annas and half suspension if it was between 4 to 8 annas.

4.10.5. There was also no uniformity in the procedure for determination of annewari and its computation till the State of Maharashtra was formed in 1960. In Western Maharashtra there was settled system of declaration of annewari for every village in each revenue year. The procedure consisted of declaration of provisional annewari on the basis of eye estimates in consultation with the committee consisting of local representatives of village and village officers. If there was disagreement among the members of the Committee, the crop cutting experiments were conducted. The provisional annewari was also revised on the basis of results of the crop cutting experiments if the objections were received. If no objections were received after publication of provisional annewari, that annewari became final. In Marathwada areas, there was no settled system of declaration of annewari. The grant of suspension depended on the initiative and discretion of local revenue officers. There was general feeling that the revenue officers showed reluctance in recommending even genuine cases of suspension. In Vidarbha also, the field to field inspection was ordered in case of local calamities but ordering of such inspection was left to the discretion of the Deputy Collectors.

4.10.6. The assumptions regarding the standard yield which formed the basis of comparison also varied in different parts of the State. As observed by Annewari Committee, for determination of Standard yields (1966) in Western Maharashtra, though there was no direct evidence of treating 12 annas yield as standard yield, the usages of the words annewari implied that 12 annas yield was fixed above the arithmetical average. In Vidarbha the figures of standard yields were not computed, but revenue officers made their own estimates on the basis of local enquiries of the normal yield of the crops and these estimates differed from village to village. In Marathwada area, the standard yields were calculated by Dr. Mann. The definition of standard yield corresponded to that of model yield which was slightly higher than the arithmetical average of past yields. The Annewari Committee (1966) however recommended that standard yield of 12 annas should be the average of three best yields in the last ten years.

4.10.7. The Fact Finding Committee (1960) laid greater emphasis and reliance on the annewari for the identification of chronically scarcity affected areas. That Committee tried to overcome the difficulty presented by the existence of different system of annewari in Vidarbha by converting the annewari declared in that area in terms of annewari in Western Maharashtra. While identifiying Marathwada areas, it was particularly handicapped because of the lack of available data relating to annewari on account of the peculiar circumstances existing in the ex-Hyderabad State.

4.10.8. It is necessary to mention the procedure for determination of annewari in detail to appreciate its usefulness as a criterion. The annewari is determined by a Committee consisting of the circle inspector the talathi and two representatives of agriculturists to be elected by the Village Panchayat. The Committee visits a village before harvesting and records its opinion which is communicated to the Tahsildar,

Tahsildar publishes this opinion as provisional annewari at predominant places and invites objections. The objections received are considered by the Tahsildar and the provisional annewari is amended and published again in the same manner where there is no agreement amongst the members of the Village Annewari Committee, the Tahsildar issues orders for ascertaining the annewari by actual crop conditions. The crop cutting experiments are to be carried out by Circle Inspector and the Tahsildar checks them. The observed yield is then used to calculate the annewari of the crops on the basis of the formulae given in the rules.

4.10.9. One of the major defects of the annewari is the subjective or personal element involved in its determination. The eye-estimations of annewari are not entirely objective. Even if the eye is trained to estimate the crop yield, the existence of subjective element cannot be ruled out. If the local population and representatives on the Committees are not alert, this subjective determination may go unchallenged. However, it cannot be denied, that there has been increasing awareness on the part of cultivators to the declaration of annewari. The extension of credit facilities, linking of annewari with the suspension of Government and co-operative dues is also responsible for the growth of such awareness in recent years. In the erstwhile colonial regime, the officers were reluctant to declare annewari below 6 annas as it used to affect the recovery of Government dues. It has been alleged that this traditional reluctance and conservatism on the part of revenue officers in the declaration of annewari still persists.

4.10.10. Apart from the subjective element involved in the eye-estimation of crops there are inadequacies in the procedure and the method of computation of annewari. The first relates to the definition of the standard yield with which the estimated crop outturn in a given year is to be compared. Standard yield is defined as the average of three best yields in a period of the recent 10 years. These standard yields are revised only after another period of 10 years. This procedure fails to take into account the progressive increase in the yields on account of improved agricultural practices. The techniques of agricultural production are fast changing, and the standard yields fixed 10 years back no longer hold good. The comparison of standard yields so fixed with the actual crop outturns may not represent the correct picture of crop conditions. Yet another defect is that the standard yields are determined for each district as a whole but a district is not agriculturally homogeneous unit.

4.10.11. The number of crop cutting experiments conducted for the determination of annewari for each village is very small. Even though there are instructions to select the plots of different grades of soil in the village, selection is likely to be baised by actual condition of crops. Since the selection of plots is left to the revenue officers and the local committee, there is a certain amount of subjective element and biases of the revenue officer in the choice of plots for crop-cutting experiments. Further the formulae for calculation of annewari introduces the soil factor by requiring the ascertainment of the average anna valuation of the soils on which the particular crop is grown. The soil classification was done more than hundred years ago and it must have undergone change in the recent years due to soil conservation measures.

4.10.12. Some of the defects pointed out above are only illustrative. The detailed examination of the procedure relating to annewari and suggestions for improvement is not within the scope of the Committee's terms of reference. The government has already appointed a separate committee to go into the question of revision of the procedure of annewari under the Chairmanship of Prof. V. M. Dandekar.

4.10.13. There are, however, two chief merits of the annewari, which may not be ignored. Firstly, with the introduction of uniform procedure in the determination of annewari and scale of suspension in the recent years, the data relating to annewari is available for all villages in the State. Therefore, it is possible to adopt smaller unit for indentification of drought affected areas, even as small as a village. Secondly, the annewari has been linked with declaration of scarcity and opening of scarcity relief works. The existence of scarcity is thus testified by the labour attendance on these works. This indirectly buttresses the conclusion derived from the declaration of annewari. This advantage is, however, discounted by the fact that there are at present large number of agricultural labourers in the villages ready to offer their labour for any gainful employment provided to them, either in agricultural or non-agricultural sectors. But the defects in the procedure and the subjective element in its determination overwhelm the advantages quoted above and thus it can at best be used only as a supporting evidence, if drought prone character of the area is indicated by scanty rainfall and its erratic character.

4.11. *Declaration of Scarcity in the past.*

4.11.1. In the earlier part of this chapter, the distinction between drought and scarcity has been brought out. Though annewari largely forms the basis of declaration of scarcity, the government considers additional factors, also such as distress sales of cattle, general economic conditions and the demand for employment. In fact, test scarcity works are started much prior to the declaration of annewari and are continued provided, the labour attendance continues on these works.. If there is a meagre response, the works are discontinued. It is the practice to declare scarcity only in areas where annewari is below 4 annas. Since the formation of Maharashtra State, a large measure of uniformity has been brought in adopting the criteria for the declaration of scarcity throughout the State. The declaration of scarcity is made in respect of a village. Therefore smaller unit of identification can be considered.

4.11.2. Further, the significance of declaration of scarcity as criteria for identification lies in the fact that almost positive evidence of scarcity or drought is available in the labour attendance on scarcity works. As pointed out earlier to some extent the factor is discounted by the existence of large unemployed agricultural labour always eager to secure gainful employment.

4.11.3. Since annewari is subjective, the linking of annewari with the declaration of scarcity lends subjective character to the latter.

4.12. *Out Turn*

4.12.1. It was suggested to us that the end result of the agricultural operation is reflected in the out-turn of the crops. The out-turn is adversely affected if there are variations from the normal pattern of rainfall. Hence it is contended that the periodicity of departure of the yield. from the average yields in the area may sufficiently indicate the drought prone character of that area. The method suggested is to quantify drought in terms of percentage deficits of yield in a given year from the average yields. The average yields may be worked out for sufficiently long period. After quantifying drought in the above terms, the frequency of such deficits in a given period may be calculated and such calculation should indicate the drought prone character of the area.

4.12.2. The out-turn of crop is not merely a function of rainfall and climatological conditions but it depends also on the method of production and the character of inputs. If the character of inputs and methods of production undergo rapid change in the given period, one may come accross a large range of variations in the period. Hence the deficits in average yield cease to remain indicative of relative deficits in the crop yield on account of drought. Secondly in areas where the droughts have occurred in a large number of years the average yield itself may be very low and the coefficient of variation may also be small. The Committee attempted to identify the drought prone character of areas on the above basis, by considering the periodicity of departures from the average yield in some of the evidently drought prone talukas and drought free talukas. On the basis of available data relating to the crop cutting experiments of major crops in the area during the last 10 years, it was observed that there was no significant difference in the variations of the yield in the drought prone and drought free areas. Hence this criterion was given up by the Committee.

4.13· *Marketable surplus.*

4.13.1 The drought situation affects production and reduces the marketable surplus. The arrivals of the produce in the market can testify to such phenomenon. It was, therefore, suggested to us that the shortfall in marketable surplus as reflected in the market arrivals may be considered as criterion for identification of a drought condition.

4.13.2 It can not be denied that the distress sales of produce during this period increase as the prices of the produce are remunerative and the holding capacity of the cultivator is low. The reduction in marketable surplus will not be uniform in respect of all commodities. While the cultivators may hold over the foodgrains for self-consumption, the cash crops may not be held. There is, however, no doubt that the decline in production will result in the reduction of market arrivals. Village sales outside the market yard are not recorded, and these sales may increase during the period of scarcity, as the commodities generally fetch more remunerative prices outside the market yard. Therefore, the market arrivals do not necessarily indicate the exact magnitude of the marketable surplus. As the behaviour of the cultivator is different in respect of different commodities, it is difficult to establish a reasonable standard of comparison. It is also not possible to adopt a unit of identification smaller than a taluka on the basis of this criterion for want of necessary data and absence of sufficient number of market yards. Hence the criterion cannot be adopted for identification of drought prone areas.

4.14. *Migration.*

4.14.1 It is generally believed that the occurrence of droughts results in the migration of people from the affected areas and hence the extent of seasonal migration in any area can be one of the indices of the drought prone character of that area. The migration from rural areas can be classified as follows :—

(1) Exodus of the rural population to urban areas in search of more secure and higher incomes.

(2) Seasonal migration of rural population to neighbouring areas during the lean period of agricultural activity.

(3) Temporary migrations due to drought in the normal agricultural season.

4.14.2 The shifts in population of the first type may take place in the wake of the industrialisation of neighbouring areas, when the over populated agriculture may release substantial population for more secure and larger income in non-agricultural operations. This type of migration is not necessarily representative of drought prone character of the area and may perhaps represent the economic backwardness of the area. Similarly in kharif tracts, part of the rural population migrates temporarily to the neighbouring areas during the lean season in search of employment, as the agricultural labourers are either unemployed or under-employed during the lean period. Such migration is also not indicative of drought prone character of the area. Migrations may also take place during the normal agricultural season if the normal agricultural operations cannot be carried out on account of failure of rains. But such phenomenon may not be visible in drought prone areas if the relief works are started immediately. In other words the effectiveness of relief measures lies in preventing such migrations by providing gainful employment to affected population in the period of distress. The migration from particular area in a given period may include all the three types. Apart from the difficulties in getting reliable information regarding the extent of migration in these regions, it will be difficult to segregate the migration in a particular year and attribute it to one cause or the other. In short, apart from the non-availability of reliable data the migration itself is the result of multiplicity of factors and it is not possible to analyse figures relating to migration according to the cause and then establish a reasonable standard of comparison between normal and abnormal seasons. Hence the criterion could not be adopted for identification of drought prone area.

4.15. *Fluctuations in Prices.*

4.15.1. During the period of scarcity, the market forces tend to increase the prices of essential commodities. The fluctuation in prices, it has been suggested, can be considered as an indicator of drought situation. The adoption of this criterion for the purpose of identification of the drought prone areas presents three main difficulties. Firstly, the fluctuations in the prices depend upon the shortages of commodities at the state or national level. If there are bumper crops in adjoining districts of State, the fluctuations in prices may not be large. Secondly, the controls on the movement and distribution of essential commodities do not allow the free play of market forces, to operate and introduce an artificial element in the play of market forces. Thirdly, the increased price may reflect the general inflationary pressures in the economy as a whole.

4.15.2. Apart from the above difficulties, the reliable data for smaller units, such as a revenue circle is not available. Multiplicity of factors are responsible for the fluctuation in the prices rendering it impossible to establish standard of comparison and hence we do not adopt this criterion.

4.16. *Foodgrain off-takes.*

4.16.1. The strain on the public distribution system of essential commodities increases ~~during the period of~~ scarcity ~~as the prices of~~ foodgrain in the local market rise. Hence it has been suggested that foodgrain off-takes from Government godown ~~observed over a~~ period of years may provide useful criterion for identification of drought prone areas.

4.16.2. The adoption of the foodgrain off-takes as criterion present many difficulties. Firstly, the off-takes in particular district depend upon the allotment received from the Government. The off-takes in any case cannot be higher than the allotment. The allotments to the district depend upon the availability of stock with the government and allotments from the Government of India. The allotment of foodgrains received during the month is further allotted to talukas and the fair price shops lift from the godowns at taluka places. Apart from the quantum of foodgrains allotted to the district, there are many operational hazards till the foodgrains reach the consumers. The movement from one district to another depends on the availability of wagons, while intra-district movement depends on the efficiency of transport contractors of the district. Lastly, fair price shop keeper must have financial capacity to lift the entire quantity of grains allotted to the shop. The off-takes therefore do not truely reflect the demand side and its intensity during the scarcity. Further, available statistics relating to the off-takes give the figures of the issues to the fair price shops and not issues to the cardholders. Therefore, the figures of off-takes cannot be construed to reflect true intensity of demand for foodgrains. Hence we do not consider it as a dependable criterion for identification of drought prone areas.

4.17. *Density of Population.*

4.17.1. Human habitation tends to get attracted to areas where the availability of physical resources or employment apportunities ensures certain minimum standard of living. The recurrence of droughts and resulting uncertainty in agrarian conditions in the drought prone areas tends to keep the density of population low. It was therefore, suggested to us that the density of population in the area could be used as an index of its drought prone character.

4.17.2. Though the general trend in the density of population confirms the assumption regarding lower density of population in the drought prone areas, the converse, it is observed, is not always true. The density of population in evidently high rainfall districts of Chanda and Ratnagiri is also low because of the economic backwardness of these areas. Multiplicity of factors influence the density of population in any area and it is difficult to adopt this criterion for identification of drought prone areas. Low density of population in these area can at best be considered as one of the qualitative characteristics of the areas.

4.18. *Method for identification of drought prone area.*

4.18.1. The discussion of the various possible criteria for identifying the drought prone areas given in the preceding paragraphs makes it quite clear that normal precipitation in an area should be the only criterion which can serve as the basis for delineating, broadly, a drought liable zone. This is because firstly, measurement of precipitation is simple and data is available for an extended period. Secondly, it is undoubtedly the basic cause of all droughts. Thirdly, it is not possible to measure quantitatively in a unique manner the effects of a drought situation by using any of the other criteria mentioned above. Fourthly, what is required is a criterion which would correctly indicate the area liable to drought rather than identification of an area precisely affected by drought in a particular year. The Committee thus finally came to the conclusion that it should adopt the normal rainfall as the criterion for demarcation of a broad drought zone. It will be observed that the isohyete of 750 mm. divides some of the talukas. In order that the delineation of broad drought zone on the basis of isohyete does not become too aribitrary, our Committee has included the remaining parts of those talukas in broad drought zone where soils are shallow and the character of rainy season is marked by intermittent breaks even if the rainfall exceeds 750 mms. provided the rainfall does not exceed 800 mm. The droughts may occur in areas falling outside this region but they are of the contingent type. Thus, the areas beyond this region cannot be considered as drought prone. On the basis of this criterion of normal rainfall, the Committee has decided that the broad drought zone should consist of the following areas :—

(*a*) Areas falling within the isohyete of 750 mm.

(*b*) Areas falling within isohyetes 750 mm. to 800 mm. which have shallow soils

4.18.2. We have obtained an official isohyete map of the India Meterological Department for Maharashtra. The map prepared by IMD is based on the rainfall data collected from a sufficiently larger number of rainguages mainly maintained by State authority for over five decades. The I. M. D. considers that the present number of rainguages are reasonably adequate for broad analysis of rainfall for drawing isohyete. We have therefore placed our reliance on this map for the identification of areas within broad drought zone defined above. We are aware that additional rainguages at closer intervals of space are bound to give, a finer picture of rainfall pattern and may aid in closer analysis of the problem of the normal precipitation and the pattern of distribution of rainfall in the State. We strongly recommend setting up of additional rainguages and further suggest that the management of all rainguage stations in the State be entrusted to one department namely Irrigation and Power Department which deals with the water resources of the State.

4.18.3. While discussing importance of the timeliness of rainfall to the plant growth, we have accepted the existence of at least 11 drought weeks in the monsoon season (22 weeks from June to October) as convenient index for revealing the erratic character of rainfall in the drought zone. The Committee collected the data relating to distribution of rainfall since 1958 from the Directorate of Agriculture. Wherever the data was not available since 1958, we had to restrict the consideration to a smaller number of years. In the chapter on identification of areas the number of drought weeks in the monsoon season have been indicated in respect of each taluka.

The frequency of the occurrence of 11 drought weeks during the last 15 years has been used as one of the convenient indices for confirming drought prone character of an area. In some cases the Committee has also taken into consideration the predominant soil type. Generally our Committee has considered taluka as the unit of identification, with a few exceptions.

4.18.4. After identifying the areas on the basis mentioned above the areas, falling in the irrigation command of large irrigation canal systems whose gross commands exceed 10,000 ha. have been deleted as we consider that they have become sufficiently free from adverse socio-economic consequencies of drought.

4.19. *Gradation of drought prone areas.*

4.19.1. The Fact Finding Committee (1960) considered the gradation of areas essential so that areas which suffered intensely due to failures of rainfall at frequent intervals and had therefore little power of resistance could be distinguished from others where failures were less frequent or severe. With this background, that Committee graded the areas as follows.—

Category	Description
A	Total or almost total failure of crops once in three years.
B	Total or almost total failure of crops once in six years.
C	Total or almost total failure of crops once in ten years.

We have already expressed that the subjective element involved in the determination of annewari is so large as to vitiate the identification of chronically scarcity affected areas on its basis. The gradation of the drought prone areas on the basis of the periodicity of the declaration of scarcity conditions, will not serve the purpose, as such gradation may have at best a limited historical significance. The Fact Finding Committee (1960) considered 39 talukas in the State including parts of some talukas as drought affected. Within a span of six years, the Maharashtra Government added 14 talukas to the list of which some were included in 'B' category. The addition of sizeable number of talukas which the Fact Finding Committee (1960) had not considered as chronically scarcity affected within such a short period, brings out the inadequacy not only of the criterion of annewari but also of the method of gradation of drought prone areas based on the annewari. The entire Nasik district was excluded by that Committee as it was considered as drought free. The Government subsequently added 11 talukas in the district in various categories.

4.19.2 In nature a rigid line of demarcation does not exist, as there is a gradual transition in the natural conditions. A fairly large unit for identification was therefore found to be quite suitable and necessary. Any further specific subgrouping of areas on the basis of such over all assessment can not be accurately done and will be in our opinion difficult to justify. The Committee recognises that the exact nature and content of programme may differ on account of the relative intensity and frequency of droughts from one area to another area, based on the quantity and dependability of the main natural resource i.e. water. We have indicated in the chapter on "Irrigation" how different considerations should weigh in adopting irrigation policy and selection of crop for the area where there is high frequency of recurrence of precipitation below a certain minimum that is required for crop growth. Instead of rigidly grading the areas at this stage our Committee prefers to rely on the detailed techno-economic surveys which we have recommended in a later chapter to bring out the differences in the nature and the content of the programme to be adopted in the different parts of the drought prone areas.

APPENDIX I TO CHAPTER IV

Model to assess the crop yields, its relation with rainfall and soil moisture requirement

In dry farming areas, the soil moisture is a limiting factor for plant growth. The primary source of soil moisture is the rainfall. However, the same quantity of rains will affect the soil moistuie differently under different soil depths, slopes and location of the siie in the watershed which ultimately results in opportune time for intake of rain water. This ultimately results in diffrent quantities of moisture available for plant growth. The ielevant details of soil moisture under different soil types are presented in table below :—

TABLE

Soil moisture levels at various tensions (mm).

Soil type (depth) (cm)	Existing total soil moisture as on 1st June.	Moisture at 15 bar.	Moisture at 1/3 bar.	Available Moisture (4—3)	Effective rainfall required to raise the soil moisture to 1/3 par. (4—2)
1	2	3	4	5	6
00-22·5	8	44	81	37	73
22·6-45	48	137	201	64	153
46-60	71	187	274	87	203
61-90	141	288	428	140	287

The order of total moisture in the soil that is held with force, called as tension, is measured in bars. The available soil moisture is bound by the two limits of moisture, at 1/3 and 15 bars. The lower limit of available soil moisture for plant growth is at 15 bars and the upper limit 1/3 bar. The soil moisture beyond this range is not utilized for the plant growth. The relationship of the soil moisture and the probable plant behavior in different soil types are discussed in following paragraphs.

(1) *Shallow Soils*.—

Even though it requires 73 mm. of effective rainfall to saturate the soil profile, kharif crops can be sown if 50 mm. of rain is received. This is because the soils at 15 bar (44 mm.) limit from initial soil moisture at 8 mm. a total of 50 mm. of rains will be required so that pre-sowing tillage operations and sowing can be started.

Considering the run-off to the extent of 10 per cent of the total rains, 50 mm. rains would yield 45 mm. effective rainfall. This 45 mm. effective rainfall will moist the soil to a depth of about 10 cm. considering the pore space as 50 per cent. This moist layer is just sufficient to receive the seed for germination. The depth of sowing the seed is usually 5 to 6 cm. for Kharif.

The above manipulation would indicate that about 10 mm. of available soil moisture would be stored in 10 cm. soil depth. This moisiure would be sufficient for germination and for growth for about 8 to 10 days only, taking into consideration the average rate of evapo-transpiration as 1·5 mm. per day for bajra and tur crops during kharif. However, it is not available to sow crop since this moisture is required for land preparation.

If this is followed by the subsequent rains, amounting to about 25 mm. at a time in a span of about a week, the total soil moisture will be accumulated beyond 44 mm. and thus the resulting available soil moisture would be 30 mm. for plant growth.

If the dry spell continues beyond 15 days, the available soil moisture will be exhausted and the crop will start withering. Thus, it would be evident that the kharif crops would mature on shallow soils, only if frequent rains (once in a forthnight amounting to about 20 to 25 mm. at a time) are received till about 4 good showers amounting to a total of 100 mm. in addition to 50 mm. of rains for land preparation and 25 mm. of rains for sowing. Out of these, if at a stretch 75 mm. ofrains are received, with high intensity a picture would be different as it will induce more run-off resulting less effective rainfall for storing moisture in soil for plant growth. It is, therefore, estimated that about 200 mm. of effective reainfall is essential to mature a kharif crop of bajra on shallow soils.

(2) *Medium deep soils* :—

(*a*) *Soil depth upto* 45 *cm.*—It would be observed that these soils would require about 153 mm. of effective rains to saturate soil profile, making about 64 mm. of soil moisture available for plant growth. These soils come to the stage of pre-tillage operations and sowing after receipt of about 90 mm. of effective rains. Since the storage capacity of the soils is very limited, rabi crops would mature with great difficulty with receding soil moisture. It is, therefore, advisable to put these lands under kharif crops when cycle of accumulating and receding soil moisture are repeated due to rains during June, July and August. These soils can be sown after normal rains during June. However the moisture accumulated would be sufficient only for germination and initial growth. Unless supporting rains are received in July in a span of about fortnight the crop will be affected adversely. A complete dry spell during July would be disastrous. These soils would, therefore, yield the normal crop only if about 3 to 4 showers amounting to 100 mm. are received regularly. Thus it is estimated that about 250 mm. of effective rainfall is essential to mature a kharif crop of bajra on medium deep soils with 45 cm. depth, with correspondingly larger yields.

(*b*) *Soil depth upto 60 cm.*—Medium deep soils of 60 cm. depth come to working condition only after the existing soil moisture level of 71 mm. is raised to 187 mm. It requires about 96 mm. of effective rains. However, looking to the distribution of rainfall during June, only 110 mm. of rains are received followed by 110 and 100 during July and August. These rains, are, however, unassured and characterised by dry spells. Many a times July and August months are totally dry. Therefore, soils are not fit for any kharif crops.

Rains during September and October are sure and amount to about 190 and 70 mm. respectively. These are sure and adequate to saturate the soil profile. When the soil profile is saturated the available soil moisture is 86 mm. on which the crop can be grown. However, this available soil moisture is insufficient so as to completely mature the jowar crop on the receding soil moisture conditions, as the moisture stress is usually felt at cob emergence. If any showers are received by late October or November rains, then the crop matures successfully and would yield normal. If the late October or early November rains fail, the crop on these soils will not yield any grain. Thus for successful crop of jowar on these soils a total of 200 mm of rains prior to sowing and 100 mm during the crop growth is essential for normal yields.

(*c*) *Soil depth up to 90 cm.*—The net quantity of precipitation required to satu ate the soil profile of 90 cm. depth is about 290 mm. In tracts like Sholapur, the total average rainfall during September and October is about 260 mm. However, after deducting the run-off losses of about 10 per cent. the effective rainfall during these months would be about 230 mm. only, which is quite inadequate to sturate the soil, profile, if the soil moisture is not accumulated during June, July and August rains. Under such circumstances, the crop failure is also evident.

However, under normal rainfall conditions, the soil profile accumulates the moisture during June, July and August and the rains during September and October saturate the soil profile. Under such circumstances, the available soil moisture is about 140 mm which is quite adequate for successful crop of Rabi jowar under receding soil moisture conditions. Even though, the late October and November rains fail, the jowar, crop will be normal.

Thus, it would be observed that if the monsoon rains during June, July and August are far below the normal, not only the kharif crops, would fail but alarming scarcity situation would also be expected. The only way out from this situation for predominent rabi cropping is the sufficient November rains which are of remote probability.

If the rains during the June, July and August fail completely as in 1971-72 or if the rains are scanty with prolonged dry spells as in 1972-73, the rains during September and October would fail to saturate the soil. This is because the rain water is lost by run-off as the intensity of rains during these months is high. Under such circumstances crop failure is evident.

Based on the above discussion, the models of rainfall distribution, soil type and the resultant yield are developed which are presented as detailed below. It is presumed while preparing the models that the rains are normally distributed. These models would undergo a change under different intensity and abnormality of rainfall.

MODELS FOR ASSESSING CROPS

MODELS FOR ASSESSING CROP YIELDS RABI CROP JOWAR

Soil type (depth in cm)	Distribution of rainfall during monsoon (mm)						Yield Levels	Remarks
	June, July & August	September		October		November		
		First fortnight	Second fortnight	First fortnight	Second fortnight			
Average Rainfall (*mm*) ..	326	65	125	42	33	31		(1) Normal yield level would be 4·5 q/ha.
Medium deep soil (60 mm) depth.	N	N	N	N	N	N	Normal	
	N	N	N	N	N	X	Normal	(2) Dry spell should not exceed more than 3 weeks upto end of October.
	N	N	N	N	X	N	Normal	
	N	N	N	X	N	N	Normal	
	N	X	N	N	N	N	Normal	
	N	N	N	X	X	N	Normal yield under early Sept. sowing but ½ normal if sown in October.	
	N	X	N	X	N	N	¾ Normal	
	N	N	X	N	N	N	¾ Normal if sown in early September but less than ½ normal if sown in October.	
	X	N	N	N	N	N	¾ Normal	
	N	N	X	X	N	N	¾ Normal, if sown in early September but no yield if sown in late October.	

X	X	N	N	N	N	¾ Normal
N	N	N	N	X	X	½ Normal
N	X	N	X	N	X	½ Normal
N	N	X	N	N	X	½ Normal
X	N	N	X	N	N	½ Normal
X	N	N	N	X	N	½ Normal
X	N	X	N	N	N	½ Normal
N	X	X	N	N	N	Less than ½ Normal
N	N	X	X	N	N	Failure.
N	X	X	X	N	N	Failure.
X	X	X	N	N	N	Failure.
N	N	X	X	X	X	Failure.
N	X	N	N	X	X	Failure
N	X	X	N	N	X	Failure.
X	N	N	N	X	X	Failure.
X	N	N	N	X	N	Failue.
N	N	X	N	X	N	Failure
X	N	N	X	X	X	Failure.

N—Normal rain, X—Less than ½ normal.

Soil type (depth in cm)	Distribution of rainfall during monsoon (mm)						Yield levels	Remarks
	June, July & August	September		October		November		
		First fortnight	Second fortnight	First fortnight	Second fortnight			
Average Rainfall (mm) ..	326	65	125	42	33	31		
Medium deep soils (90 cm depth).	N	N	N	N	N	N	Normal	(1) Normal level would be 6 q/ha.
	N	N	N	N	N	X	Normal	(2) Dry spell should not exceed more than one month upto October end.
	N	N	N	N	X	N	Normal	
	N	N	N	X	N	N		
	N	N	X	N	N	N	Normal	
	N	X	N	N	N	N	Normal	
	N	X	N	N	N	N (late sowing).	Normal	
	N	X	N	N	X	N	Normal	
	N	N	N	N	X	X	$\frac{3}{4}$ Normal	
	X	N	N	N	N	N	$\frac{3}{4}$ Normal	
	N	X	N	X	N	X	$\frac{3}{4}$ Normal	
	N	N	X	N	X	N	$\frac{3}{4}$ Normal	
	N	X	X	N	N	N	$\frac{3}{4}$ Normal (late sowing)	
	N	N	X	X	N	N	$\frac{1}{2}$ Normal	
	N	X	X	N	N	X	$\frac{1}{2}$ Normal	
	X	N	N	N	X	X	$\frac{1}{2}$ Normal	
	X	X	N	N	N	N	$\frac{1}{2}$ Normal	
	N	N	X	X	X	N	Failure	
	N	X	X	X	N	N	Failure	
	X	X	X	N	N	N	Failure	
	N	N	X	X	X	X	Failure	
	X	N	X	N	X	N	Failure	

N—Normal rain. X—Less than $\frac{1}{2}$ Normal.

MODELS FOR ASSESSING CROP YIELDS RABI CROP JOWAR

Soils type (depth in cm.)	Distribution of rainfall during monsoon (mm)						Yield levels	Remarks
	June, July & August	September		October		November		
		First fortnight	Second fortnight	First fortnight	Second fortnight			
Rainfall (*mm*) ..	326	65	125	42	33	31		
Soil (45 cm.) (depth).	N	N	N	N	N	N	Normal	(1) Normal yield level would be 3q/ha
	N	N	N	N	N	X	Normal (Provided sown in early Sept.)	(2) Dry Spell should not exceed more than 15 days up to end of October.
	N	N	N	N	X	N	Normal	
	N	N	N	X	N	N	Normal	
	N	N	X	N	N	N	Normal	
	N	X	N	N	N	N	Normal	
	X	N	N	N	N	N	Normal	
	X	X	N	N	N	N	Normal	
	N	N	N	N	X	X	1 Normal	
	N	N	X	X	N	N	1 Normal (if sown late less than ½ Normal)	
	N	X	N	X	N	X	1 Normal	
	N	N	N	X	X	N	Less than ½ Normal	
	X	N	X	N	X	N	Less than ½ Normal	
	N	X	X	N	N	N	Less than ½ Normal	
	N	N	N	X	X	X	Less than ½ Normal	
	N	N	X	X	X	N	Failure	
	N	X	X	X	N	N	Failure	
	X	X	X	N	X	N	Failure	
	N	X	X	X	X	X	Failure	
	N	X	X	X	N	X	Failure	
	X	X	X	X	N	N	Failure	

N=Normal rain X=Less than ½ Normal.

MODELS FOR ASSESSING CROP YIELDS KHARIF CROP BAJRA

Soil (soil depth) (cm.)	Distribution of rainfall during Monsoon (mm)				Yield levels	Remarks
	June	July	August	September		
Average rainfall (mm)	113	109	104	190		
(1) Shallow soils (22.5 cm. depth)	N	N	N	N	Normal	(1) Normal yield level would be 1.5 q/ha.
	N	N	N	X	Normal	
	X	N	N	N	Normal (late sowing)	(2) Dry spell should not exceed more than two weeks at a stretch.
	N	X	N	N	½ normal	
	N	N	X	N	½ normal	
	X	X	N	N	½ normal (if sown late)	
	N	N	X	X	Failure	
	N	X	N	X	Failure	
	X	N	X	N	Failure	
(2) Medium deep soils (45 cm. depth)	N	N	N	N	Normal	(1) Normal yield level 3 q/ha.
	N	N	N	X	Normal	
	X	N	N	N	Normal (late sowing)	(2) Dry spell should not exceed more than 3 weeks at a stretch.
	N	N	X	N	½ normal	
	X	N	N	X	½ Normal (iate sowing)	
	N	X	N	N	ess than ½ normal.	
	N	N	X	X	Failure	
	N	X	X	N	Failure	
	N	X	N	X	Failure	
	X	N	X	N	Failure	

N=Normal rain]] X=less than ½ Normal

CHAPTER V

DROUGHT PRONE AREAS IN MAHARASHTRA

5.1. We have outlined the procedure we have adopted for identifying the drought prone areas in Chapter IV. The procedure consists of—

(*i*) Identifying a broad drought zone on the basis of normal annual precipitation indicating water balance. The broad drought zone consists of areas falling within the isohyete of 750 mm. along with areas lying in the region between 750 mm. and 800 mm. where the soils are less retentive of moisture.

(*ii*) Verifying the drought prone character of areas falling within the broad drought zone on the basis of frequency of occurence of large number of rainfall deficient weeks in the monsoon period over a period of years and

(*iii*) Eliminating the areas within the broad drought zone which are sufficiently drought resistent on account of the moisture retentive capacity of soils or which have become drought resistent on account of the facility of canal irrigation from assured source namely the command of large irrigation canal systems whose gross commands exceed 10,000 hectres.

5.2. For delineating the drought zone on the basis of normal annual precipitation we have mainly relied on the isohyetal map prepared by the India Meteoreological Department included in the maps of this report.

5.3. Apart from the total precipitation, its timeliness is one of the most important requirements for growth of plants. The discussion on this factor particularly its suitability for adopting it as criterion for identification has already been covered in Chapter IV. The Second Irrigation Commission (1972) considered the introduction of this criterion as desirable but abondoned it on account of the complexities of the problem which it presents. We also cannot suggest any direct and simple measure of timeliness on account of different moisture retentive capacity of the soils and different requirements of various crops at crucial stages of their growth. Hence an indirect measure in the form of a large number of deficient weeks occurring in the monsoon period and the frequency of such occurrence over a period of years has been used to verify the drought prone character of the area falling within the broad drought zone. For this purpose the data relating to weekly distribution of rainfall during the south-west monsoon period (June to October) over a period of the recent 15 years was analysed.

5.4. The Second Irrigation Commission (1972) adopted a taluka as a unit of identification. We have also generally taken the taluka as a unit but wherever areas smaller than a taluka such as a revenue circle showed distinct change in the physical characteristics particularly in relation to moisture retentive capacity of the soils and crop pattern, we have considered a smaller unit of a revenue circle for identification. Though detailed information regarding predominant soil types (particularly percentage of areas covered by various soil types) was not available, general characteristics of the soils in an area were ascertained qualitatively from the published information in the Gazetters, the report of the Fact Finding Commitee (1960) and the publication on soil types of the agriculture department.

5.5. Table No. I attached to this chapter gives the list of talukas in the broad drought zone in each district and the information relating to these talukas with regard to the frequency of occurrence of a large number of deficient weeks, the percentage of net irrigated area to net sown area and the population. Table No. II shows the comparative list of talukas identified by the Fact Finding Committee (1960), the 2nd Irrigation Commission (1972) *vide* their appendix 8·1 and those by us. We have discussed in the following paragraph the reasons for identifying specific circles and talukas, as drought prone areas within the broad drought zone.

5.6.1 *Bombay Division.*

5.6.1. Thana, Kolaba and Ratnagiri districts, popularly known as the Konkan tract, fall in a heavy rainfall zone receiving precipitation above 2000 mm. Hence they do not fall within the broad drought zone. Part of other districts however fall within the broad drought zone and therefore are being considered in following paragraphs.

5.6.2. *Jalgaon District.*

5.6.2.1. Seven talukas in this district and part of Pachora taluka fall in the broad drought zone (receiving precipitation less than 750 mm.). The erratic character of rainfall is also evident from the frequency of occurrence of a large number of deficient weeks.

5.6.2.2. Chopda taluka is situated on the banks of the Tapi river. The soils in this taluka are predominently deep black and are fertile. Even with a rainfall of less than 750 mm. the crops grown on these soils give good yields. Hence we do not include this taluka in the drought prone areas.

5.6.2.3. Two revenue circles in Amalner taluka, namely Patoda and Marvad, are also similarly situated on the bank of the Tapi. The soils in these circles possess the same characteristics as are observed in the case of Chopda taluka. We, therefore, include Amalner and Shirsala circles in the drought prone areas.

5.6.2.4. The Girna irrigation project has benefitted a large number of villages in Erandol, Chalisgaon, Parola and Bhadgaon talukas but the erratic character of rainfall continues to handicap the successful cultivation in the areas which do not receive this benefit. Hence our Committee considers parts of these talukas falling in the irrigation command of this project as sufficiently drought resistent and the rest of the area, as drought prone.

5.6.2.5. Nagardeola circle in Pachora taluka falls within the broad drought zone. The soils of the circle are also generally shallow. Hence we include this circle in the drought prone areas.

5.6.2.6. Thus, the drought prone areas in the Jalgaon district as identified by our Committee are as follows :—

(1) Chalisgaon taluka.	Areas not falling in the command of large irrigation canal systems.
(2) Bhadgaon Taluka ..	
(3) Parola taluka.	
(4) Erandol taluka	

(5) Edlabad taluka

(6) Amalner (Shirsala and Amalner circles).

(7) Pachora (Nagardeola circle).

5.6.3. *Dhulia district.*

5.6.3.1. Six talukas of this district lie in the broad drought zone. The erratic character of rainfall is evident from the frequency of a large number of deficient weeks over a period of years.

5.6.3.2. The Fact Finding Committee (1960) did not consider any part of this district as chronically scarcity affected but it recognised the vulnerability of certain areas in the following words—

"Some parts of Nasik and West Khandesh having lower rainfall have poor and unretentive soil and therefore have suffered failure of crops occasionally in the past. The data available to the Committee however showed that there were no large tracts as such which have suffered by scarcity in the past and therefore no part of any district could be considered as precarious."[1]

The above conclusion of that Committee was based on the data relating to annewari and declaration of scarcity in the past. The 2nd Irrigation Commission (1972) also failed to list any part of this district in the drought prone areas under their Appendix 8·1 even though Fig. 8·2, in the Commission's report shows that a large part of this district falls within the broad drought zone identified by the Commission on the basis of 20 per cent probability of 25 per cent deficit in normal rainfall and considerable part therefore is shown by the Irrigation commission as drought affected. The Commission has not offered any explanation for not including these areas in its list at Appendix 8·1. The Commission applied two criteria for the deletion of areas in the broad drought zone, viz., the extent of irrigation and the industrialised character of the area. It is evident from Table No. II appended to this chapter that none of these talukas have attained the level of irrigation of 30 per cent of the net sown area, which was the minimum considered by the Commission for deletion of areas falling in the broad drought zone. The statistical information also indicates that these areas have not been sufficiently industrialised so as to qualify for being deleted from the list of drought prone areas.

5.6.3.3. On the other hand the district falls in the zone having a co-efficient of variation of monsoon rainfall of more than 30 per cent. Parts of this district (Sakri taluka in particular) fall within the region receiving rainfall of less than 500 mm.

5.6.3.4. Shahada and Shirpur talukas have retentive deep black soils as they are situated on the banks of the Tapi river and the Committee dose not include them in the list of drought prone areas even though they are within the broad drought zone.

5.6.3.5. Part of Nandurbar taluka also has deep black soils and is situated on the banks of the Tapi river. Excluding the revenue circle situated on the bank of the Tapi we recognise the rest of the areas of this taluka as drought prone.

5.6.3.6 We, therefore, include the following talukas in the drought prone areas:—

(1) Sakri taluka.
(2) Dhulia taluka.
(3) Shindkheda taluka.
(4) Nandurbar taluka (excluding Dhanora circle).

5.6.4. *Nasik District.*

5.6.4.1. Nine talukas of this district fall within the broad drought zone. The erratic character of rainfall is evident from the frequency of a large number of deficient weeks occuring over a period of years.

5.6.4.2. The Fact Finding Committee (1960) recognised the vulnerability of parts of this district to drought as will be evident from the extract quoted in an earlier paragraph but because of their reliance on the subjective criterion of annewari alone, no part of this district was included by that Committee as chronically scarcity affected. The Maharashtra Government subsequently re-examined the data of this district and included Kalwan, Satana, Malegaon, Yeola, Nandgaon, Nasik,

[1] Report of Fact Finding Committee (1960), Chapter III, page 14.

Chandor, Sinnar, Dindori and Niphad talukas and four villages in Igatpuri talukas as chronically scarcity affected areas. The Second Irrigation Commission (1972) also recognised all the above talukas except Nasik, Dindori and Igatpuri as drought affected.

5.6.4.3. The Girna canal from Chankapur storage has benefitted a number of villages in Baglan and Malegaon talukas and canals from Gangapur storage along with canals from Kadwa have benefitted some villages from Dindori, Niphad, Sinnar and Yeola but the cultivation in the remaining parts of these talukas continues to be handicapped by the drought prone character. Hence excluding the tracts irrigated by the above projects, the remaining parts of these talukas are considered by us as drought prone.

5.6.4.4 The western part of Dindori taluka adjoining Surgana, Peint and Nasik talukas lies in the high and assured rainfall zone. The eastern parts viz. Wani and Dindori revenue circles clearly fall in the drought zone and are considered by our Committee as drought prone.

5.6.4.5 Thus the following areas in Nasik district are included in the drought prone areas :—

(1) Chandor taluka
(2) Kalwan taluka
(3) Nandgaon taluka
(4) Dindori taluka (Wani and Dindori circles)
(5) Baglan taluka.
(6) Sinnar taluka
(7) Yeola taluka
(8) Malegaon taluka
(9) Niphad taluka.

Areas not served by large irrigation canal system.

5.7. *Poana Division*

5.7.1. The western parts of Poona Division along the Sahyadri comprising of parts of Kolhapur, Sangli, Satara and Poona districts, receive heavy rainfall. But there is an abrupt drop in the rainfall as one moves towards the east. Hence some parts of each district in this division fall in the broad drought zone.

5.7.2. *Poona District.*

5.7.2.1 Nine talukas of Poona district fall in the broad drought zone. The erratic character of rainfall is evident from the frequency of occurrence of a large number of deficient weeks in most talukas except in Haveli.

5.7.2.2. The Fact Finding Committee (1960) considered Sirur, Dhond, Indapur (northern part), Baramati, Purandhar and Haveli talukas as chronically scarcity affected areas. The Second Irrigation Commission (1972) endorsed the findings of the above Committee except in the case of Baramati taluka, which was not included by the Commission on the ground that the irrigated area in the taluka exceeds 30 per cent.

5.7.2.3 The rainfall in Haveli taluka is less erratic as is evident from the fact that only in two years out of eight years deficient weeks exceeded 11. The taluka is also fairly industralised and can withstand adverse socio-economic strains during the period of drought. We have therefore excluded this taluka from the drought prone areas.

5.7.2.4. Parts of Baramati taluka receive irrigation from the Nira left bank canal. As a result of canal irrigation, these parts have become sufficiently drought resistent. Excluding these parts, our Committee recognises this taluka as drought prone. The above remarks apply also to Dhond, Purandhar, Sirur and Indapur talukas.

5.7.2.5. Eastern parts of Junnar taluka lie in the broad drought zone. Our Committee, therefore, recognises Narayangaon revenue circle as drought prone.

5.7.2.6. Eastern parts of Ambegaon taluka viz. Manchar revenue circle lies in the broad drought zone, while western parts receive assured rainfall. We therefore, recognise Manchar circle as drought prone.

5.7.2.7. The eastern parts of Khed viz Chakan and Khed revenue circles adjoining Sirur taluka lie in the broad drought zone. Therefore our Committee recognises these circles as drought prone.

5.7.2.8. Thus we include the following areas of this district in the drought prone area :—

(1) Junnar Taluka (Narayangaon circle).
(2) Ambegaon taluka (Manchar circle).
(3) Khed taluka (Khed and Chakan circle).
(4) Dhond taluka
(5) Baramati taluka
(6) Indapur taluka
(7) Purandhar taluka
(8) Sirur taluka

} Areas not served by the large irrigation canal systems.

5.7.3. *Sholapur district.*

5.7.3.1. All the eleven talukas in the district fall within the broad drought zone. The erratic character of rainfall is evident from the frequency of a large number of deficient weeks in all the talukas. The district has been recognised as drought prone area since long.

5.7.3.2. The Fact Finding Committee (1960) recognised all talukas in the district as chronically scarcity effected areas in various grades. The Second Irrigation, Commission (1972) also recognised the entire district except Malsiras taluka as drought prone. The percentage of irrigated area to net sown area in Malsiras taluka exceeds 30, and hence the Second Irrigation Commission excluded this taluka. But the remaining portion of the taluka cannot be considered as scarcity resistent. We, therefore, include the entire district in the drought prone area excluding the areas served by large irrigation canal systems.

5.7.4. *Ahmednagar district.*

5.7.4.1. All talukas in the district lie in the broad drought zone. The erratic character of rainfall is evident from the frequency of occurrence of a large number of deficient weeks in all the talukas. This district has also been considered as typical scarcity area since long.

5.7.4.2. The Fact Finding Committee (1960) considered Sangamner, Pathardi, Parner, Ahmednagar, Shrigonda, Karjat and Jamkhed as chronically scarcity affected areas in various grades. The Second Irrigation Commission (1972) also recognised these talukas as drought prone.

5.7.2.4. Parts of Baramati taluka receive irrigation from the Nira left bank canal. As a result of canal irrigation, these parts have become sufficiently drought resistent. Excluding these parts, our Committee recognises this taluka as drought prone. The above remarks apply also to Dhond, Purandhar, Sirur and Indapur talukas.

5.7.2.5. Eastern parts of Junnar taluka lie in the broad drought zone. Our Committee, therefore, recognises Narayangaon revenue circle as drought prone.

5.7.2.6. Eastern parts of Ambegaon taluka viz. Manchar revenue circle lies in the broad drought zone, while western parts receive assured rainfall. We therefore, recognise Manchar circle as drought prone.

5.7.2.7. The eastern parts of Khed viz Chakan and Khed revenue circles adjoining Sirur taluka lie in the broad drought zone. Therefore our Committee recognises these circles as drought prone.

5.7.2.8. Thus we include the following areas of this district in the drought prone area :—

(1) Junnar Taluka (Narayangaon circle).
(2) Ambegaon taluka (Manchar circle).
(3) Khed taluka (Khed and Chakan circle).
(4) Dhond taluka
(5) Baramati taluka
(6) Indapur taluka
(7) Purandhar taluka
(8) Sirur taluka

} Areas not served by the large irrigation canal systems.

5.7.3. *Sholapur district.*

5.7.3.1. All the eleven talukas in the district fall within the broad drought zone. The erratic character of rainfall is evident from the frequency of a large number of deficient weeks in all the talukas. The district has been recognised as drought prone area since long.

5.7.3.2. The Fact Finding Committee (1960) recognised all talukas in the district as chronically scarcity effected areas in various grades. The Second Irrigation, Commission (1972) also recognised the entire district except Malsiras taluka as drought prone. The percentage of irrigated area to net sown area in Malsiras taluka exceeds 30, and hence the Second Irrigation Commission excluded this taluka. But the remaining portion of the taluka cannot be considered as scarcity resistent. We, therefore, include the entire district in the drought prone area excluding the areas served by large irrigation canal systems.

5.7.4. *Ahmednagar district.*

5.7.4.1. All talukas in the district lie in the broad drought zone. The erratic character of rainfall is evident from the frequency of occurrence of a large number of deficient weeks in all the talukas. This district has also been considered as typical scarcity area since long.

5.7.4.2. The Fact Finding Committee (1960) considered Sangamner, Pathardi, Parner, Ahmednagar, Shrigonda, Karjat and Jamkhed as chronically scarcity affected areas in various grades. The Second Irrigation Commission (1972) also recognised these talukas as drought prone.

5.7.6.2. The Fact Finding Committee (1960) considered Khandala, Man, Khatav and Phaltan talukas as chronically scarcity affected areas. The Second Irrigation Commission (1972) also recognised Khatav, Man and Khandala talukas as chronically drought affected and Phaltan taluka was excluded by the Commission as the percentage of net irrigated area to net sown area exceeds 30.

5.7.6.3. That part of Phaltan taluka which is served by major irrigation is considered by us as drought resistent. Excluding the irrigated tract of this taluka, we recognise the remaining parts as drought prone. Few villages from Khandala taluka also have the benefit from large irrigation canal system.

5.7.6.4. Karhad taluka is favourably situated on the bank of the Krishna river and has fertile soils. We therefore consider this taluka as sufficiently free from the adverse consequences of drought.

5.7.6.5. Thus the following areas in the district are considered by us as drought prone—

(1) Koregaon taluka
(2) Man taluka
(3) Khatav taluka
(4) Khandala taluka. } Areas not served by large irrigation canal systems.
(5) Phaltan taluka }

5.7.7. *Kolhapur district.*

5.7.7.1. Shirol and Hatkanangle talukas fall in the broad drought zone. Both these talukas are situated in the valley of the Panchaganga river, have good fertile soils and have developed extensive lift irrigation systems. Hence these talukas are not recognised by us as drought prone.

5.8. *Aurangabad Division.*

5.8.1. Two districts of this division namely Nanded and Parbhani fall in moderate rainfall zone receiving annual precipitation of above 800 mm. Rainfall in these two districts is distinctly higher than the rainfall in the remaining three districts. The western parts of Bhir, Osmanabad and Aurangabad districts fall within the broad drought zone identified by our Committee. Historically also these areas are known to have faced severe famines. Because of the absence of any systematic record of annewari in these areas, the Fact Finding Committee (1960) classified some parts of these districts in the chronically scarcity affected areas in class 'C'.

5.8.2. *Aurangabad district.*

5.8.2.1. Seven talukas and a small part of Soegaon taluka fall within the broad drought zone, identified by our Committee. The erratic character of rainfall in these talukas is evident from the frequency of occurrence of a large number of deficient weeks in these talukas.

5.8.2.2. The Fact Finding Committee (1960) considered Vaijapur and Gangapur talukas as chronically scarcity affected areas in class 'C'. The Second Irrigation Commission (1972) endorsed the findings of the Fact Finding Committee (1960). The Commission, however, failed to identify other talukas similarly placed, even though Fig. 8.2. in the Commission's report shows that a large part of this district lies in the broad drought zone identified by it. The Commission has only included Vaijapur and Gangapur talukas. The report of the Commission does not offer any explanation for not including the other parts of the district which have similar characteristics.

5.8.2.3. A small part of Soegaon taluka lies in the broad drought zone, while major part of the taluka lies in the region between isohyetes of 750 mm. and 800 mm. A small part lies also beyond the isohyete of 800 mm. Since a very small part of the taluka lies in the broad drought zone, we do not consider this taluka as drought prone. The density of wells in this taluka is also comparatively high. 1856 wells are in use and the net sown area of the taluka is 36,000 ha.

5.8.2.4. Part of Ambad taluka lies beyond the isohyete of 750 mm. Major part of only two revenue circles lie within the isohyete of 750 mm. Our Committee includes these circles in the drought prone area.

5.8.2.5. Thus our Committee recognises the following areas in the district as drought prone :—

(1) Vaijapur taluka
(2) Gangapur taluka
(3) Kannad taluka
(4) Paithan taluka
(5) Khuldabad taluka
(6) Aurangabad taluka
(7) Ambad taluka (Vadigodre and Ambad Circles).

5.8.3. *Bhir district.*

5.8.3.1. Six talukas in the district lie in the broad drought zone identified by our Committee. The erratic character of rainfall in these talukas is evident from the frequency of occurrence of a large number of deficient weeks in these talukas.

5.8.3.2. The Fact Finding Committee (1960) considered Ashti, Patoda and Manjlegaon talukas and part of Bhir taluka (Pimpalner and Bhir) revenue circles as chronically scarcity affected areas in class 'C'. The Maharashtra Government added Georai taluka to the list of drought prone area. The Second Irrigation Commission (1972) considered Ashti, Patoda, Bhir and Georai talukas as drought affected areas.

5.8.3.3. Manjlegaon taluka was deleted by the Commission. It may be observed from the isohyete map that a major part of this taluka lies in the region between the isohyetes of 750 mm. and 800 mm. while the remaining part lies beyond the isohyete of 800 mm. That part of Majlegaon taluka namely Talkhed and Nitrur circles which fall within the isohyete of 800 mm. is considered by the Committee as drought prone. Part of Kaij taluka excluding Digulamba circle also falls within the isohyete of 800 mm. Hence the Committee considers Kaij taluka (excluding Digulamba circle) as drought prone.

5.8.3.4. We, therefore, recognise the following areas in the district as drought prone :—

(1) Ashti taluka
(2) Patoda taluka.
(3) Georai taluka
(4) Bhir taluka.
(5) Manjlegaon taluka (Nitrur and Talkhed circles).
(6) Kaij taluka (excluding Digulamba circle).

5.8.4. *Osmanabad district.*

5.8.4.1. Bhums and Paranda taluka and parts of Osmanabad, Tuljapur and Kallam talukas lie in the broad drought zone. The erratic character of rainfall in these areas is evident from the frequency of occurrence of a large number of deficient weeks in these talukas.

5.8.4.2. The Fact Finding Committee (1960) considered Bhum taluka and part of Paranda taluka as chronically scarcity affected areas in class 'C'. The Maharashtra Government subsequently added Osmanabad and Kallam talukas and part of Ahmedpur taluka. The Second Irrigation Commission (1972) identified Osmanabad, Kallam, Bhum and Paranda talukas as drought prone area.

5.8.4.3. Fig. 8.2. in the Commission's report shows that Tuljapur taluka lies in the broad drought zone. The report however does not offer any explanation for exclusion of Tuljapur taluka even when the Commission included the adjoining Barshi taluka of Sholapur district in such areas. The isohyete map clearly shows that Tuljapur taluka falls in the broad drought zone identified by us. Only a small part lies beyond the isohyete of 750 mm. Therefore, we recognise this taluka as drought prone area.

5.8.4.4. The isohyete of 750 mm. divides Osmanabad taluka. While major part of the taluka lies in the region between isohyete of 750 mm. and 800 mm., the soils of the taluka are not generally fertile. Hence, we recognise this taluka excluding Thair circle which lies beyond the isohyete of 800 mm. as drought prone.

5.8.4.5. Part of Kallam taluka lies in the broad drought zone identified by our Committee, therefore, we include Kallam and Moha revenue circles of this taluka in the drought prone area of the district.

5.8.4.6. We have not recognised Ahmedpur taluka as chronically drought affected because that taluka does not lie in the broad drought zone and receives annual precipitation exceeding 800 mm.

5.8.4.7. According to us the following parts of the district form the drought prone area :—

(1) Bhum taluka, (2) Paranda taluka, (3) Osmanabad taluka (excluding Thair circle), (4) Tuljapur taluka, (5) Kallam taluka (Kallam and Moha circles).

5.9. *Nagpur Division.*

5.9.1. Major part of this division lies in the moderate and high rainfall zones, with soils derived from parent material of different rocks. Only a small part of Malkapur taluka of Buldhana district lies in the broad drought zone identified by us. The soils of Motala revenue circle in this taluka are also inferior. Hence we recognise Motala circle as drought prone.

5.9.2. Khamgaon taluka of Buldhana district lies in the region between 750 mm. and 800 mm. Part of the taluka particularly, Khamgaon revenue circle has inferior soils. We, therefore, recognise Khamgaon circle as drought prone area.

5.9.3. The drought prone areas as identified by us are shown on the map.

TABLE No. 1

Talukas falling under broad drought zone

Name of Taluka	Total geographical area (Hectares)	Total population	Total Rural population	Net irrigated area (Hectares)	Net sown area (Hectares)	Percentage of net irrigated area to net sown area	No. of years in which No. of deficient weeks exceeded 11	Total No. of years for which data is considered
1	2	3	4	5	6	7	8	9
District Jalgaon—								
1. Chopda	95,438	1,54,249	1,21,593	1,821	60,951	2·99	10	15
2. Amalner	84,420	1,86,973	1,31,429	7,420	68,902	10·77	9	14
3. Erandol	97,457	1,79,593	1,36,323	10,074	75,307	13·38	9	14
4. Parola	79,123	1,01,414	81,956	4,688	59,335	7·90	7	14
5. Bhadgaon	48,554	83,332	83,322	7,150	35,135	13·38	10	15
6. Chalisgaon	1,21,766	2,01,194	1,59,474	4,532	85,509	5·30	9	15
7. Edlabad	64,613	75,905	75,905	1,455	35,179	4·14	N.A.	N.A.
8. Pachora	82,042	1,49,422	1,25,323	3,275	64,128	5·11	11	15
District Dhulia—								
1. Nandurbar	1,13,245	1,82,558	1,28,488	12,345	82,768	14·91	9	15
2. Shahada	1,20,389	1,83,682	1,65,324	10,989	77,077	14·25	9	14
3. Shirpur	1,59,405	1,53,824	1,28,078	1,369	57,596	21·37	11	14
4 Sakri	2,44,122	2,33,319	2,33,319	11,591	1,20,371	9·71	12	14
5. Sindkheda	1,30,619	2,01,730	1,81,545	8,580	95,831	8·95	7	14
6. Dhulia	1,98,822	3,80,841	2,43,712	15,818	1,17,301	13·48	7	14

TABLE No. 1—*contd.*

Talukas falling under broad drought zone

Name of Taluka	Total geographical area (Hectares)	Total population	Total Rural population	Net irrigated areas (Hectares)	Net sown area (Hectares)	Percentage of net irrigated area to net sown area	No. of years in which No. of deficient weeks exceeded 11	Total No. of years for which data is considered
1	2	3	4	5	6	7	8	9
District Nasik								
1. Kalwan	1,19,472	1,24,328	1,24,328	3,475	52,246	6·65	10	13
2 Baglan (Satana) ..	1,61,634	1,97,102	1,80,382	8,391	81,323	10·56	10	14
3 Malegaon	1,93,772	4,26,194	2,22,567	10,050	1,11,351	9·02	12	14
4. Yeola	1,06,043	1,26,855	1,02,322	4,847	77,658	6·28	13	14
5. Nandgaon	1,09,200	1,46,338	83,296	1,939	61,633	3·15	11	14
6. Chandor	95,816	1,17,332	1,08,543	8,173	69,544	11·76	10	14
7. Sinnar	1,34,017	1,63,602	1,43,384	10,127	91,981	11·01	8	14
8. Niphad	1,05,229	2,16,641	1,76,237	18,307	84,616	21.63	10	14
9. Dindori	1,32,319	1,36,886	1,30,335	8,462	74,553	11·35	6	14

TABLE No. 1—*contd.*

Talukas falling under broad drought zone

Name of Taluka	Total geographical area (Hectares)	Total population	Total Rural population	Net irrigated area (Hectares)	Net sown area (Hectares)	Percentage of net irrigated area to net sown area	No. of years in which No. of deficient weeks exceeded 11	Total No. of years for which data is considered
1	2	3	4	5	6	7	8	9
District Poona								
1. Khed	1,37,360	1,97,080	1,92,292	3,622	87,454	4·14	5	14
2. Sirur	1,55,727	1,49,668	1,40,774	14,149	1,23,830	11·42	10	14
3. Dhond	1,28,986	1,45,808	1,09,838	10,932	82,091	13·31	10	14
4. Saswad (Purandhar) ..	1,10,380	1,50,340	1,35,467	9,678	67,304	14·37	7	14
5. Baramati	1,38,248	2,27,707	1,99,795	28,472	94,479	30·23	9	9
6. Indapur	1,46,795	1,96,204	1,66,474	17,720	1,04,316	16·98	9	14
7. Ambegaon (Eastern) ..	1,04,311	1,39,324	1,39,324	3,721	64,138	5·80	6	14
8. Junner	1,38,459	2,08,474	1,93,522	5,209	96,509	6·01	8	14
9. Haveli	1,33,634	3,65,765	2,30,107	6,154	81,611	7·54	2	8

TABLE No. 1—*contd.*

Talukas falling under broad drought zone

Name of Taluka	Total geographical area (Hectares)	Total population	Total Rural population	Net irrigated area (Hectares)	Net sown area (Hectares)	Percentage of net irrigated area to net sown area	No. of years in which No. of deficient weeks exceeded 11	Total No. of years for which data is considered
1	2	3	4	5	6	7	8	9
District Sholapur								
1. Barshi	1,65,424	2,62,716	2,00,342	8,598	1,07,679	8·00	10	15
2. Madha	1,52,618	1,92,710	1,74,848	9,010	1,33,941	6·7	11	15
3. Mohol	1,31,694	1,42,334	1,42,334	8,320	1,07,281	7·7	9	14
4. Pandharpur	1,29,443	1,87,613	1,33,975	10,822	95,761	11·3	13	15
5. Mangalweda ..	1,14,165	1,07,823	92,682	4,845	90,153	5·4	12	14
6. Sholapur(s)	1,19,469	1,33,343	1,33,342	8,131	94,302	8·6	10	15
7. Sholapur(n)	68,305	4,87,134	88,773	4,944	54,169	9·1	10	15
8. Akkalkot	1,40,137	2,06,678	1,62,742	7,241	1,24,250	5·8	8	14
9. Sangola	1,59,429	1,55,516	1,44,327	14,379	95,263	15·1	9	14
10. Malsiras	1,60,807	2,26,480	2,26,480	31,422	63,086	33·7	10	15
11. Karmala	1,59,578	1,51,493	1,37,442	6,055	1,19,586	5·1	10	14

TABLE No. I—*contd.*

Talukas falling under broad drought zone

Name of Taluka	Total geographical area (Hectares)	Total population	Total Rural population	Net irrigated area (Hectares)	Net sown areas (Hectares)	Percentage of net irrigated area to net sown area	No. of years in which No. of deficient weeks exceeded 11	Total No. of years for which data is considered
1	2	3	4	5	6	7	8	9
District Ahmednagar								
1. Akola	1,50,400	1,47,702	1,47,702	1,445	90,153	1·60	11	14
2. Sangamner	1,68,327	2,18,797	1,90,203	9,449	1,11,243	8·49	11	14
3. Kopergaon	1,07,252	2,62,619	2,27,610	35,085	85,788	40·89	12	14
4. Shrirampur	82,181	2,47,551	2,08,059	27,881	65,537	42·54	10	14
5. Newasa	1,29,204	1,50,393	1,50,393	5,994	1,14,012	5·25	11	14
6. Rahuri	1,01,685	1,59,343	1,59,343	10,825	66,554	16·26	13	14
7. Shegaon	1,08,713	1,28,841	1,28,841	5,329	94,582	5·63	8	14
8. Pathardi	1,19,947	1,38,590	1,38,590	5,219	93,217	5·38	7	14
9. Parner	1,89,797	1,54,890	1,54,890	7,421	1,34,048	5·56	11	14
10. Ahmednagar ..	1,50,272	3,03,606	1,55,201	8,737	1,10,435	7·91	10	14
11. Shrigonda	1,60,481	1,46,581	1,46,581	13,085	1,18,289	11·08	8	14
12. Karjat	1,49,157	1,23,612	1,23,612	10,180	1,04,234	9·76	9	14
13. Jamkhed	87,623	86,592	86,592	6,462	73,915	8·74	9	14

TABLE No. I—*contd.*

Talukas falling under broad drought zone

Name of Taluka	Total geographical area (Hectares)	Total population	Total Rural population	Net irrigated area (Hectares)	Net sown area (Hectares)	Percentage of net irrigated area to net sown area	No. of years in which No. of deficient weeks exceeded 11	Total No. of years for which data is considered
1	2	3	4	5	6	7	8	9
District : Sangli—								
1. Vita (Khanapur) ..	132,509	186,332	167,606	5,806	106,683	5·44	7	14
2. Tasgaon ..	111,156	250,679	229,096	11,672	82,843	14·09	8	14
3. Kavathe-Mahankal ..	70,676	87,190	87,190	2,988	47,728	6·26	N.A.	N.A. ....
4. Jath	224,696	171,729	171,729	8,645	150,983	5·73	8	15
5. Miraj	92,616	408,804	207,207	10,899	77,093	14·14	6	13
6. Atpadi	87,175	74,580	74,580	6,648	59,925	11·09	N.A.	N.A. ....
District : Satara—								
1. Koregaon	92,269	164,455	133,790	4,536	71,169	6·37	5	14
2. Khandala	54,352	71,829	69,538	3,775	35,369	10·67	11	12
3. Khatav	136,464	177,501	177,501	8,540	111,398	7·67	7	14
4. Man	150,643	120,758	108,091	8,363	109,627	7·63	9	14
5. Phaltan	117,763	186,627	159,853	30,752	87,809	35·02	10	15
6. Karhad	104,216	311,026	260,836	9,634	79,124	12·18	9	14

TABLE No. I—*contd.*

Talukas falling under broad drought zone

Name of Taluka	Total geographical area (Hectares)	Total population	Total Rural population	Net irrigated area (Hectares)	Net sown areas (Hectares)	Percentage of net irrigated area to net sown area	No. of years in which No. of deficient weeks exceeded 11	Total No. of years for which data is considered
1	2	3	4	5	6	7	8	9
District : Kolhapur—								
1. Hatkangale	60,938	316,652	217,996	4,713	45,319	10·40	7	14
2. Shirol	50,793	198,544	166,799	7,659	41,578	18·42	8	13
District : Aurangabad—								
1. Vaijapur	159,403	163,295	146,635	11,390	142,414	8·00	10	14
2. Gangapur	130,846	139,011	130,140	6,813	116,834	5·83	7	14
3. Paithan	142,812	163,344	148,818	13,339	122,947	10·85	9	15
4. Kannad	155,547	161,088	150,690	6,730	106,029	6·35	6	14
5. Khuldabad	51,846	56,699	50,580	4,307	39,259	10·97	8	14
6. Aurangabad	161,056	323,185	162,932	14,377	1,07,628	13·36	7	14
7. Ambad	224,476	235,772	226,550	6,293	199,245	3·16	6	14

District : Bhir—									
1. Ashti	1,47,057	1,36,232	1,30,373	18,208	1,00,943	[illegible]	18·04	7	14
2. Patoda	1,30,759	1,20,638	1,20,638	10,075	96,614	86531	10·42	7	10
3. Bhir	1,51,617	2,06,173	1,56,208	8,788	1,08,388	99600	8·17	7	10
4. Georai	1,55,127	1,70,117	1,59,577	4,880	1,31,203	126323	3·72	7	13
5. Manjlegoan	1,60,892	1,78,523	1,64,924	4,531	1,24,654	120123	3·63	8	14
6. Kaij	1,86,592	2,10,434	1,99,890	5,152	1,37,460	132308	3·74	N.A.	N.A
District : Osmanabad–									
1. Bhum ..	88,710	91,344	83,508	7,363	67,741	60376	10·88	N.A.	N.A.
2. Parenda ..	1,05,526	1,07,933	99,135	7,842	87,675	79833	8·94	8	14
3. Kallam ..	1,22,748	1,60,535	1,50,319	12,860	94,679	81819	13·58	8	14
4. Osmanabad ..	1,19,448	1,82,741	1,55,462	9,630	92,638	83008	10·39	6	12
5. Tuljapur ..	1,52,378	1,56,924	1,37,184	11,349	91,746	80397	12·36	7	14
	585810	699477	625608	49066	434479	325057			
District : Buldhana—									
1. Malkapur ..	1,68,902	2,68,235	2,12,500	4,139	1,30,577	126438	3·17	6	14
2. Khamgaon ..	1,84,349	2,38,160	1,58,475	2,857	1,26,421	123564	2·26	8	14

TABLE No. II

List of talukas identified as drought prone by the Fact Finding, Committee (1960), The Second Irrigation Commission (1972) and by Our Committee (Revenue and Forests Department).

Serial No.	District	List of Talukas Identified as chronically scarcity affected as per Fact Finding's Committee 1960 report and Government subsequent decision	List of talukas Identified as drought affected by Irrigation Commission	List of talukas identified by our Committee (1973) of Maharashtra Government
1	2	3	4	5
I	Aurangabad	1. Vaijapur (whole) C 2. Gangapur (whole) C	1. Vaijapur 2. Gangapur	1. Vaijapur. 2. Gangapur. 3. Kannad. 4. Paithan. 5. Khuldabad. 6. Aurangabad. 7. Ambad (Wadi-godre and Ambad circles). 6
II	Bhir	1. Bhir (Bhir and Pimpalner) C 2. Ashti (whole) C 3. Patoda (whole) C 4. Manjlegaon (whole) C 5. Georai (whole)	1. Bhir 2. Ashti 3. Patoda 4. Georai	1. Bhir. 2. Ashti. 3. Patoda. 4. Georai. 5. Manjlegaon (Nitrud and Talkhed circles). 6. Kaij (Excluding Digulamba circle) 4
III	Osmanabad	1. Bhoom (whole) C 2. Parenda (Part Paranda and Ancla Circle). 3. Ahmedpur (Part) C 4. Kallam (Part) 5. Osmanabad (Part) C	1. Bhoom 2. Paranda. 3. Kallam 4. Osmanabad	1. Bhoom. 2. Paranda. 3. Osmanabad. (Excluding Thair circle). 4. Tuljapur. 5. Kallam (Kallam and Moha circles).
IV	Poona	1. Shirur A 2. Dhond A 3. Indapur (North Part) B 4. Baramati (Part) B 5. Purandhar (part) B 6. Haveli (17 villages on eastern border) B	1. Shirur 2. Dhond 3. Indapur 4. Purandar 5. Haveli	1. Shirur 2. Dhond 3. Baramati 4. Indapur. 5. Purandhar. (1–5: Areas not served by large irrigation canal system.) 6. Khed (Khed and Chakan circles), 7. Ambegaon (Manchar circle). 8. Junnar (Narayangaon circle).

V	Ahmednagar	1. Shrigonda (whole)	A	1. Shrigonda	1. Akola (Akola and Kotul Circles)
		2. Karjat (Rashin Circle)	A	2. Karjat	2. Pathardi.
		2. (I) Karjat (remaining part)	B		3. Parner.
		3. Parner (whole)	B	3. Parner	4. Ahmednagar
		4. Ahmednagar (whole)	B	4. Ahmednagar	5. Jamkhed.
		5. Sangamner (whole)	C	5. Sangamner	6. Shegaon.
		6. Pathardi (whole)	C	6. Pathardi	7. Sangamner.
		7. Jamkhed (whole)	C	7. Jamkhed	8. Shrigonda
					9. Kopergaon
					10. Shrirampur
					11. Newasa
					12. Rahuri
					13. Karjat. } Areas not served by large irrigation canal system.
VI	Sholapur	1. Karmala (whole)	A	1. Karmala	1. Karmala.
		2. Sangola (whole)	A	2. Sangola	2. Mohol.
		3. Madha (whole)	B	3. Madha	3. Madha.
		4. Pandharpur (whole)	B	4. Pandharpur	4. Pandharpur
		5. Malsiras (Southern Part)	B		5. Malshiras
		6. Mohol (whole)	C		6. Sangola. } Areas not served by large irrigation canal system.
		7. Mangalwedha (whole)	C	5. Mohol	7. Mangalvedha.
		8. Akkalkot (whole)	C	6. Mangalwedha	8. Akkalkot.
		9. North Sholapur (whole)	C	7. Akkalkot	9. North Sholapur.
		10. South Sholapur (whole)	C	8. North Sholapur	10. South Sholapur.
		11. Barshi (18 villages in North East).	C	9. South Sholapur	11. Barshi.
				10. Barshi	
VII	Satara	1. Khandala (Lonand Circle)	B	1. Khandala }	1. Man.
		2. Man (whole)	B	2. Man }	2. Khatav.
		3. Khatav (Part Pusewadi and Vaduj Circle).	C	3. Khatav }	3. Khandala
					4. Phaltan } Areas not served by large irrigation canal system.
		4 Phaltan (Southern Part) ..	C		5. Koregaon.
VIII	Sangli	1. Jath (whole) ..	B	1. Jath	1. Jath.
		2. Khanapur (Part at Padi Revenue Circle). 16 villages from Kharsundi Circle.	B	2. Khanapur	2. Khanapur (Khanapur and Vita Circles).
					3. Atpadi.
					4. Kavathe Mahankal.
					5. Tasgaon (Savalaj and Visapur Circles).
					6. Miraj (Malgaon Circle).

TABLE No. II—*contd.*

Serial No.	District	List of Talukas Identified as chronically scarcity affected as per Fact Finding Committee 1960 report and Government subsequent decision.	List of talukas Identified as drought affected by Irrigation Commission.	List of talukas identified by our Committee. (1973) (Revenue and Forests Department of Maharashtra Government)
1	2	3	4	5
IX	Nasik	1. Dindori (11 Villages) .. C 2. Nasik (8 Villages) .. C 3. Igatpuri (4 Villages) .. C 4. Baglan (12 Villages) .. C 5. Kalwan (15 Villages) .. C 6. Nandgaon (15 Villages) .. B (16 Villages). C 7. Chandor (6 Villages) .. B (81 Villages) C 8. Sinnar (38 Villages) .. A (8 Villages) B (3 Villages) C 9. Yeola (8 Villages) .. A (40 Villages) B 10. Malegaon (7 Villages) .. A (34 Villages) .. A (41 Villages) .. C 11. Niphad (21 Villages) .. A (21 Villages) .. B (45 Villages) .. C	1. Baglan .. .. 2. Kalwan .. .. 3. Nandgaon .. .. 4. Chando .. .. 5. Sinnar .. .. .. 6. Niphad .. .. .. 7. Malegaon .. .. 8. Yeola	1. Chandor 2. Nandgaon 3. Kalwan. 4. Baglan 5. Dindori (Wani and Dinodri circles). 6. Sinnar. 7. Yeola. 8. Malegaon 9. Niphad (4 to 9: Areas not served by irrigation canal system.)
X	Jalgaon	....	....	1. Chalisgaon. 2. Bhadgaon. 3. Parola. 4. Erandol (1 to 4: Areas not falling in the command of large irrigation canal system.) 5. Edlabad 6. Amalner (Amalner and Shirsala Circles). 7. Pachora (Nagardeola Circle.)

H 4485—6a

XI	Dhulia	..	..	....	....	1. Sakri. 2. Sindkheda 3. Nandurbar (Excluding Dhanora Circle). 4. Dhulia.
XII	Buldhana	..	..	....	....	1. Malkapur (Motala Circle). 2. Khamgaon (Khamgaon Circle).

TABLE No. III

Large Irrigation Canal system serving the Drought Prone areas
(As at the end of 1972)

Name of the canal System.	Irrigable command in hectares	Villages are benefitted from the following Drought affected Talukas.
1	2	3
1. Godavari Canals ..	6,000	Niphad, Yeola, Sinnar, Kopargaon.
2. Gangapur Canals ..	17,000	Niphad, Kopargaon.
3. Palkhed Canals ..	7,150	Dindori Niphad.
4. Upper Girna Canals and Mosam Canals together.	3,440 *2,752	Baglan, Malegaon,
5. Pravara Canals ..	24,068	Sangamner, Shriampur, Rahuri, Newasa.
6. Mula Canals ..	64,347	Rahuri, Newasa, (To end of 1972).
7. Mutha Canals ..	31,162	Dhond, Baramati.
8. Nira Canals ..	1,35,810	Purandar, Baramati, Indapur, Khandala, Phaltan, Malshiras, Sangola, Pandharpur.
9. Lower Girna Canals ..	57,115	Chalisgaon, Bhadgaon, Parola, Erandol, Amalner.
10. Ghod Canals ..	25,300	Sirur, Shrigonda and Karjat.

Note.—A large irrigation canal system is considered as the one having a gross physical command of over 10,000 Hectares.

CHAPTER VI

RELIEF MEASURES DURING SCARCITY

6.1. Famine has been described in Encyclopedia of social sciences as "a state of extreme hunger suffered by the population of a region as a result of the failure of accustomed food supply". Modern development in trade, industries and transport have helped in ameliorating the conditions created during famine as it is now possible to reach foodgrains even from abroad to the farthest corner in the country. The problem created by the droughts in the recent years is not so much the shortage of food as principally the anticipated short-fall in agricutural production and reduction in the purchasing power of the rural population living on meagre standard of living mainly caused due to un-employment as a result of discontinuance of agricultural activities which form the main-stay of the rural economy. In the years of severe droughts the reduction in purchasing power is accompanied by shortage of drinking water and fodder which are essential for the very existence. This change in nature of scarcity conditions caused by droughts has to be considered while framing relief policy.

6.2. The dimension of relief policy for developing economy are much wider. The relief policy of the erstwhile colonial administration was torn between two opposing ends of human consideration of saving every life and securing maximum economy in the expenditure. A developing economy with a domocratic structure has a larger responsibility and a drought brings in its wake the dislocation of planned investment pattern, discruption of normal socio-economic life as a result of shortage in agricultural produce. At macro level it creates sectoral as well as regional imbalances and at micro level it means the diversion of administrative personnel towards the implementation of relief works in sacrifice of the intended task for the said personnel in the process of planning. These dimensions of the problems have to be borne in mind while laying down the objectives of relief policy and its implementation.

6.3. *Objectives of relief policy.*

6.3.1. The major object of the relief policy is to mitigate immediate distress and to prevent loss of human and cattle life. Since scarcity in recent years is characterised by the reduction in purchasing power, the mitigation of scarcity primarily takes the form of restoration of purchasing power by providing employment to able bodied persons and gratuitous relief to disabled persons. The views of J. S. Mill and Turgot on British Poor Law provided the basic frame work for relief policy in the event of distress in the past. Turgot laid down the general principles that the best and most useful kind of alms consisted of providing means to earn them. J. S. Mill also held the same view while inunciating the principles of "how to give greatest amount of needful help with the smallest encouragement to undue reliance upon it". Though the basic approach behind the policy of relief through works remains unchanged even now, the reliance on economic deterrents, of low wage rates exaction of more work, providing works involving hard labour as relief works and not providing employment nearer home, in granting relief had to be replaced by a more positive policy of providing work to all those who are in need of it as far as possible near their homes.

6.3.2. The second object of relief works is to harness the man-power released by the conditions of the drought to the improvement of the affected tract which will help in its conversion into drought resistent area by emphasing productive works as against un-productive works. Another allied objective is to rehabilitate the agriculturist before the advent of the next monsoon so that he can carry out normal agricultural operations next season.

6.3.3. One of the views expressed before our Committee is that the objective of the entire planned effort should be full employment. Such a consideration is beyond the scope of this Committee. The Committee feels that some employment should be provided to all those who ask for it. This is already being sought to be achieved through employment guarantee scheme in our State. However the said scheme is suspended during the period of scarcity in the affected areas. This dichotomy between employment guarantee scheme and scarcity should be removed. The Planning Commission has already accepted in principle the employment guarantee scheme in the Fourth Plan. In the Fifth Plan approach paper also, greater emphasis is being placed on the schemes of employment guarantee. The expenditure on the scheme in excess of normal caused due to droughts can be shared by the Government of India and State Government in the agreed proportions. There are several advantages of the change in favour of such policy. Firstly, the Government will not have to follow separate relief policy. The scarcity conditions can be ascertained from labour attendance on the employment guarantee scheme and it may be possible to delink declaration of scarcity with annewari. The implementation of the scheme as part of regular plan effort keeps the machinery for implementation in readiness. One of the important fears of full scale implementation of employment guarantee scheme is that it may attract labour from agricultural operations causing thereby adverse repercussions on the agricultural production. This can be counterbalanced by suitable administrative safeguards in the scheme and adoption of appropriate wage rate policy. The Committee, recommends that dovetailing of scarcity relief with employment guarantee scheme may be considered by the Government.

6.3.4. In the light of these objectives, the Committee has reviewed the relief measures undertaken, in three parts.—(1) Relief Policy; (2) Organisation and administration of relief works; and (3) Review of relief measures adopted in the recent past.

6.4. I.—*Relief Policy.*

6.4.1. The procedure of embodying the relief policy in a "Code" is being followed since long. The Famine Commission (1880) in its report indicated a model famine code and the State Governments were asked to frame their own Famine Codes. In the Bombay Province, the Famine Code was framed in 1885. It remained in force with suitable modification until the draft scarcity mannual replaced it in 1954.

6.4.2. Three significant changes were brought about by scarcity mannual. The Famine Code made a distinction between "famine" and "scarcity". Firstly it made distinction between scarcity works and famine relief works. While the former consisted of local fund and municipal works and expansion of public works and village works, the latter consisted of large works employing more than 3000 workers each. When the distress is not so severe as to necessitate the opening of famine relief works i.e. large scale works but some relief was required in the form of local fund or municipal works, expansion of public works or village works, the existence of scarcity was declared. When distress was acute and work had to be provided to a large number of people and gratuitous relief given on an extensive scale, the existence of famine was declared. The difference between "Famine" and "Scarcity" was considered that of degree. This distinction was abolished.

6.4.3. The second significant change was the provision relating to opening of test scarcity works. The famine relief code did not provide for the opening of test scarcity works for judging the existence of scarcity or famine. The decision to start relief work was based on the assessment of the situation in the districts after considering various factors. The scarcity mannual provided for opening of test scarcity works to judge the existence of scarcity.

6.4.4. Thirdly, as a corollary to the abolition of the distinction between scarcity relief works and famine works, the distinction between the payment of wages on scarcity works and famine relief works was abolished. In Famine Relief Code, different provisions were made in respect of payment of wages to the persons engaged on scarcity works and those employed on famine relief works. The payment of wages to a worker on both types of works was made by results. However the minimum wage was prescribed for workers employed on the scarcity work but no minimum wage was prescribed in respect of those employed on famine works.

6.4.5. In recent years of distress, fresh instructions have been issued by Government from time to time modifying the instructions contained in the Mannual. Therefore it is necessary to revise the scarcity mannual modifying the instructions contained therein accordingly. For understanding the relief policy, our Committee has relied mostly on this Mannual and the very recent publication of Maharashtra Government "टंचाई संहिता" in Marathi incorporating the revised instructions.

6.4.6. The following aspects of relief policy are examined below :—

(*i*) Planning of scarcity works ;

(*ii*) Opening of test scarcity works ;

(*iii*) Declaration of scarcity works ;

(*iv*) Policy regarding location of works ;

(*v*) Priorities in selection of works ;

(*vi*) Procedure in selection of works ;

(*vii*) Policy regarding drinking water ;

(*viii*) Policy for livestock ;

(*ix*) Wage policy ;

(*x*) Other aspects of relief.

6.4.7. (i) *Planning of scarcity works.*—Droughts and floods cannot be predicted with accuracy at present. It would have been advantageous if the technique of weather forecasting had been perfected to anticipate well in advance, the threat of drought and plan the measures adequately. But in the present circumstances to minimise the time lag in the manifestation of scarcity conditions and starting of relief works it is absolutely necessary to have a plan of relief measures much in advance. The Government has also recognised necessity for such a plan. The instructions require the preparation of a plan for scarcity works well in advance. The size of the plan should be such as to provide work for at least 10 per cent of the affected population for six months. There are also instructions to include the works which are productive and those which are situated near the affected villages.

Scarcity during last three years viz. 1970-71 to 1972-73 was unprecedented and beyond human anticipation. It also revealed the inadequacy of planning for scarcity works. The productive works such as percolation tanks, minor irrigation schemes, had to be deferred because the works were not surveyed and their feasibility was not ascertained. Consequently, the works which were less productive had to be undertaken in place of productive works. We appreciate the difficulty in reconciling the considerations of providing work to all who are in need of it as far as possible within the radius of 5 kilometres of affected population and giving preference to productive works. We are of the opinion that the former consideration should generally prevail over the latter. But this however, does not mean that the latter consideration should be sacrificed because of inadequate advance planning of possible productive works.

We, therefore, recommend that the employment plan should have a large perspective. A contingency plan for relief should be prepared assuming that the employment will have to be provided for 25 per cent. of the affected population. It should be adequate to include works which can be undertaken for three consecutive years of scarcity.

The guidelines for the plan are indicated below :—

(*a*) Such contingency plan should be dovetailed with the normal state plan.

(*b*) It should estimate likely labour attendance in the event of scarcity in terms of man-days.

(*c*) The plan should give preference to scarcity works which are productive. It should indicate the order in which works are to be undertaken so as to avoid the delay in the selection of works.

(*d*) Feasibility surveys of all the works to be undertaken should be carried out and plans and estimates kept ready so that no time is lost in starting the works after scarcity conditions become manifest.

(*e*) The plan should specify the possible sites for location of cattle camps in the district. It should also plan for the location of labour camps in the district.

(*f*) Requirement of tools and equipment should be indicated.

The unit of planning should be a block. It is necessary to associate local representatives in the process of planning. We have recommended in subsequent chapter the format of an organisation necessary to discharge the function of preparing contingency plan and implementing it in times of distress. For preparing such a contingency plan, planning should be initiated from block level. The block plans thus prepared will be dovetailed in the district plan. State contingency plan will be prepared after considering the district plans. The contingency plan at all levels should be dovetailed with the normal State plans. The copies of the plans should be available with all the executive and supervising officers. The plan should be revised every year and brought up-to-date by deleting the works already completed and adding new works.

6.4.8. (*ii*) *Opening of test scarcity works.*—The vagaries of rainfall are unpredictable and administrative machinery has to be alert in watching the situation so that the works are started without delay. According to the existing instructions in areas where the annewari of crops is likely to go below 6 annas and there is demand for works established by the rush of labour on normal works, test scarcity works are started by the Collector. We considered whether it is possible to lay some objective test other than assessment of the situation on above considerations. We are of the opinion that it is possible to specify the objective tests in terms of occurrence of dry spells in the drought prone areas where light to medium soils are predominant. Continuous dry spell (50 per cent. less than normal rainfall) for four weeks or more is an indication of the threat of drought situation, and the crops are likely to be affected. The weekly normal rainfall in each taluka can be ascertained from I.M.D. who has already prepared the normal pattern of distribution of rainfall built upon five days graphs (pentad graph) which indicate normal expectation of rainfall in a particular region. The Collectors should generally think of starting test scarcity works in drought prone areas when such situation has arisen unless special circumstances warrant for commencement of test scarcity works earlier. On similar lines, it should be possible for the Agriculture Department to specify tolerance limit of dry spells for areas which do not fall within the drought prone areas.

6.4.9. (*iii*) *Declaration of scarcity.*—According to the present procedure, test scarcity works are continued if the labour attendance on these works exceeds 50 for more than six weeks. The Collector then submits to the Government the proposal for declaration of scarcity taking into account the following factors :—

(1) Annewari of crops for the current year and annewari of crops for previous two years ;

(2) Current prices and stocks of foodgrains and fodder ;

(3) State of trade ;

(4) Trends in wages on agricultural and non-agricultural works ;

(5) Opportunities of employment ;

(6) Mortality statistics ;

(7) Unusual movement of labour ;

(8) State of crime ;

(9) Any other facts which indicate signs of distress such as malnutrition among children.

It is obvious from the factors mentioned above, that the formal declaration of scarcity has to await the finalisation of annewari. In fact, relief works on large scale are started prior to the declaration of annewari and scarcity. But the formality of such declaration is deferred till the declaration of annewari.

It has been suggested that declaration of scarcity may be delinked with the declaration of annewari. Two main reasons are advanced in favour of such suggestion. Firstly, it will avoid the delay in the declaration of scarcity conditions. Where the crops are not sown, the annewari can be declared early, but where the crops are sown and they are likely to fail, the declaration of annewari cannot be made early till the harvesting season starts. Secondly, it is contended that when scarcity works are started, the annewari is likely to be biased on account of continuance of scarcity works.

There is no ban on starting scarcity works prior to the formal declaration of scarcity. Gratuitous relief can also be distributed prior to the declaration of scarcity. Therefore, the formality of declaration does not make any difference in the relief. The Government and co-operative dues are suspended after formal declaration of annewari. Since the declaration of scarcity and suspension of Government dues is necessitated by failure of crops, its delinking with annewari which is the only method of assessing the condition of crop is not considered desirable. If annewari is biased by the existence of scarcity conditions the procedure for declaration of annewari requires re-consideration. We have already recommended in Chapter IV use of models which highlight the effect of timeliness of rainfall on the crop conditions. Such models should be built up for all major crops in the distinct agro-climatic zone by Agriculture Department and used for ascertaining the scarcity conditions.

6.4.10. *Policy regarding location of works.*—There has been controversy since long as regards the policy of locating the works at central places as against the dispersal of works in affected villages. A deliberate shift in favour of village works as against the centralised works was visible even before independence. Prior to the recommendations by Famine Commission (1898), considerable emphasis was being laid on the distance test. Lord Lytton is reported to have outlined the advantages of central works in the following words, " the advantages of large works over petty local works is two fold. Firstly, the obligation to do a full day's work and go at some distance keeps from seeking relief by those who can support themselves otherwise and secondly, money expended on large works bequeaths permanent benefit to the country ". The Famine Commission of 1880 did not favour the central works but there was decisive shift in favour of a small works when the Irrigation Commission, 1903 recommended small irrigation works. The village works are economical, more useful, less prone to cholera and epidemic diseases, more easy to control, less open to objection of interference with local markets, and neglect of agricultural holdings. Opening of village works is one of the useful policy of the Government. The only snag in these works is their attractiveness and this may detract the labour from normal plan works. The Government policy in recent years has been to prevent shifts by introducing suitable disincentives such as reduction in wages on scarcity works and ban on starting works within apecified distance of normal works. The Committee, therefore, feels that the accepted list of works which can be provided near the home of the affected population may be extended by adding all types of useful works. We have indicated some types of small works which can be undertaken while discussing priorities in the selection of works. If there is recurrence of scarcity in consecutive years, progressively severe in character the large works will have to be opened at central places if the list of accepted works is exhausted or if works are found inadequate to provide employment to all those who ask for it.

6.4.11. *Priorities in the relief works.*—The emphasis on production works as one of the significant aspects of the relief policy was outlined even before Independence. The Famine Commission of 1880 laid down that work selected should be of permanent utility and capable of a employing considerable number of persons (a large portion of which would be unskilled labourers) for a considerable period of time. In practice, however, prior to Independence the emphasis continued to be on the disagreeable works in order to keep the labour attendance to the minimum and thus effect economy in expenditure on relief works.

A clear-cut order of priority was laid down for the first time in 1952 as follows :—

(*i*) Irrigation works (tanks, bunds, drainage, channels);

(*ii*) Soil conservation;

(*iii*) Unfinished road works from previous scarcity which are important from the point of view of rural communication; and

(*iv*) New road works which are important from the point of view of rural communications.

It was further emphasised that these projects should be such that they could be completed during the period of scarcity or in the case of roads brought up to a safe and useful stage.

The said priority had to undergo change because new works such as nalla bunding and percolation tanks were not conceived at that time. Revised priority, prescribed by Government, is at present as follows :—

(i) Soil conservation and excavation of canals;

(*ii*) Major, medium, minor irrigation schemes and community wells;

(*iii*) Percolation tanks;

(*iv*) Desilting of tanks, canals and wells and digging field channels;

(*v*) Unskilled work in respect of lift irrigation schemes;

(*vi*) Incomplete works started in the period of previous years of scarcity;

(*vii*) Metal breaking;

(*viii*) Road works.

The guidelines for the selection of works and giving priority prescribed by Government are three fold :

(*i*) The works should be productive;
(*ii*) The works should help in making the area scarcity resistent;
(*iii*) The works should be capable of employing large number of workers.

In selection of works during the period of scarcity, the over-riding consideration is their effectiveness in relieving the distress by providing employment to a large number. Therefore the work has to satisfy certain essential characteristics, before it can qualify for being taken up as scarcity work. Firstly the work should be labour intensive. Secondly, the work should be capable of being completed during the period of scarcity. In the alternative, if the entire work cannot be completed during the period of scarcity it should be capable of being divided into suitable stages so that one part of the work could at least be brought to a safe stage during the period of scarcity.

Amongst the types of works which satisfy above consideration priority has to be given to the productive works. The productive works can be further divided into three broad categories. The first category consists of works which are essential for the survival of human and cattle population such as works which create the assured sources of drinking water supply. Second category of works is those which have direct bearing on agricultural production. Third category of works consists of those which benefit the rural economy as a whole by creating infra-structure even, though they have no direct bearing on agricultural production. It cannot be disputed that the works which are essential for the survival of human and cattle population should have the highest priority followed by works which have direct bearing on the agricultural production. The works creating the infra-structure for the rural economy should have relatively low priority. We are of the opinion that the works which have direct bearing on agricultural production can further be distinguished on the basis of works whose benefits are direct and can be ascertained and those whose benefits are indirect and cannot be easily measured. Another consideration which should weigh in selection of works is the benefit which such works will extend to less privileged class of farmers i.e. small farmers. In selection of sites for community wells etc. therefore this consideration should be kept in mind.

The Committee feels that these principles, subject to considerations laid down in above paras, be followed in laying down the order of priorities in selection of relief works during the period of scarcity :—

(1) The works which are essential for the survival of human and cattle population.

(2) The works which have direct bearing on agricultural production and whose benefits can be ascertained.

(3) The works falling in the category (2) above but whose benefits are indirect and cannot be easily measured.

(4) In selecting the sites of work for the categories (1), (2) and (3) it should be seen that maximum benefit is derived by small and less privileged class of farmers.

(5) The works which are beneficial to the rural economy as a whole but do not have direct bearing on agricultural production.

In the light of these principles, we recommend the priorities adopted in the selection of works as follows :—

(1) Community wells for drinking water.

(2) Works of medium and major irrigation projects, and minor irrigation schemes.

(3) Percolation tanks and nalla bunding.

(4) Land development works for soil and water conservation.

(5) Desilting of tanks, canals and wells.

(6) Unskilled works in lift irrigation schemes.

(7) New road works including improvement of road works.

(8) Metal breaking.

In addition to these works we are of the opinion that there are many other suitable works relating to afforestation and works which help in increasing recharge of ground water that the Government should consider for inclusion in the accepted list of works and give them suitable prorities in the light of principles mentioned above.

We realise that in certain circumstances such as the probable sub-mergence of area or where the works falling under the above categories have been exhausted, there may be no other alternative except providing the work to the affected population in some other areas at a longer distance.

6.4.12. *Procedure in selection of works.*—The procedure in selection of works comprises of consulting taluka level and district level committees. The selection takes place after interaction of forces and counter-forces at taluka and district level. Though the collector has final word in selection of works, the local pressures which exert on the collector cannot be denied.

We have already suggested contingency plans for the districts which will specify the order in which the works should be undertaken. We feel that this will facilitate the selection of works in more objective manner as the order is fixed during normal times when there is time to examine the merits and demerits of the scheme elaborately. Though it may not be possible to adhere rigidly to the contigency plan, the instances of departure should be kept to the minimum.

6.4.13. *Drinking water.*—The measures for relieving drinking water scarcity are as follows :—

(*a*) Deepening and desilting of existing wells.

(*b*) Construction of community wells.

(*c*) Supply of drinking water through bullock carts and tankers.

Even under normal condition, many villages in the state lack protected water supply and in most of the villages the wells get dried up as the summer advances. Digging of new wells will not be of much use unless there is guaranteed source of supply of water underneath. Therefore, the reliance has to be placed on the supply of water through tankers and bullocks carts. These arrangements are made in the village where there is no source of water within the distance of 3 kilometres. Recently this distance test has been revised to include villages where there is no source of water within the radius of 1.5 km.

We have dealt in details the long term measures that should be taken up for resolving the problem of supply of drinking water in scarcity areas in a later chapter.

6.4.14. *Policy of Livestock.*—The scarcity conditions affect the fodder supply and if cattle population is to survive, suitable fodder policy has to be followed in this direction. Following measures to relieve fodder scarcity are suggested :—

(1) Restriction on the movement of fodder.

(2) Opening forest kurans for needy cattle.

(3) Encouraging production of fodder by giving water free of charge and supplementing normal fodder by supply of cheap concentrates.

(4) Opening of cattle camps.

(5) Grant of tagai loan.

(6) Procurement and distribution of fodder through co-operatives.

Restriction on the movement of fodder will depend on the conditions of fodder supply in each district. In the initial stages, when the fodder scarcity is not acute, twin policy of granting fodder tagai to the cultivator and distribution of fodder through co-operatives at reasonable rates should be followed. But in the later stages, when the fodder supply in the open market is reduced considerably, cattle camps will have to be opened.

In the cattle camps, the policy of admitting only useful cattle should be followed. When the fodder shortage is acute, the emphasis should be on saving useful animals rather than all animals. There is tendency on the part of the cultivator to keep useful cattle with him and send useless cattle to the camps so long as there is some fodder available. Therefore, the scruplous selection of cattle will only guarantee the objective of saving useful cattle. Necessary veterinery aid also should be provided to the cattle. The cattle camps if operated in the artificial insemination centres will become an instrument of improving the breed of the cattle.

It has been suggested that the Government should enter into the purchase and sale of fodder. The Committee is of the view that the administrative machinery of the Government is so much strained during the scarcity that it may not be able to bear this additional task. The established co-operative machinery can perform this function more effectively through the government aid.

Another suggestion has been to reserve a percentage of sugarcane apart from the bagass of the sugarcane for feeding the cattle, as the price of fodder is higher than that of sugarcane. The suggestion further requires some sort of imposition of levy on the sugarcane growers for the purpose. The Committee does not agree with the suggestion on two grounds. Firstly, such diversion of sugarcane may have wider consequences on the prices of sugar which is already in short supply. Secondly, the imposition of levy and its procurement is not practicable. We do not agree with the suggestion for imposing the levy on sugarcane for using it as fodder because considerable quantity of water has already been utilised for growing sugarcane. We have in a later chapter suggested that the irrigation from canal water should limited only for eight months. In addition as soon as the position of water in the storage is known, during the period of scarcity, no water should be released for new plantation of sugarcane and available water should be diverted for growth of fodder crops and drinking.

6.4.15. *Wage Policy.*

6.4.15.1. *History.*—It is necessary to trace the evolution of wage policy on relief works. Famine Codes laid down that the wage to labour on relief works should be the lowest amount sufficient to maintain health under given circumstances. In return a fair amount of work was to be exacted from the workers. In view of the deterioration of the health and stamina of labourers that the reduced diet during famines was bound to produce, the task was fixed at 75 per cent of a day's work in normal times. A shortfall in the daily work from the fixed task was punished but precaution was taken that the wage actually paid did not fall below a certain minimum level of subsistance. The element of fines in the system however evoked public criticism.

The Famine Commission of 1898 favoured the adoption in future of the Bihar system known as the Blackwood system which prescribed payment of workers by results with a maximum limit on daily earnings. But it recommended the retention of the position relating to minimum wage. The Commission of 1901 recommended the abolition of the minimum wage for the able bodied in all future schemes of relief, the adoption of a system of payment by results and reduction of scale of wage from 20 Chataks to 18 Chataks of cereals a day to able bodied persons. The Commission called this system the New Code System. The government accepted its recommendations.

The major scarcity year after independence was 1952-53. At the commencement of scarcity, the workers were paid daily wages on task basis. The maximum and minimum of the wages were fixed. Although the workers were eligible for minimum wage under any circumstances the habitual shirkers were liable to be removed from the muster roll. A family was assumed to consist of two earning members and three dependents. The wage was fixed at level which was sufficient to enable the family to maintain themselves. Minimum wage encouraged the worker to put nominal task, during the day and the cost of the work done with scarcity labour exceeded its value. Small difference in the minimum and the daily wage did not offer a sufficient incentive to the ordinary worker to turn out a full days work. The Government therefore, decided to discontinue the minimum wage for able bodied workers and decided to pay wages strictly, according to results by adopting piece rate system. The piece rate on scarcity works was fixed at 2/3rd of the normal scheduled rates. The earnings on the work were permitted subject to a maximum of Re. 1. The maximum limit was fixed in order to prevent the worker from over exerting himself and because of the financial implications. The maximum limit also served in preventing professional labour from getting undue advantage. Weak and old persons were formed in separate gangs and were paid a minimum wage.

Scarcity mannual of 1952 adopted the said practice and laid down the grain wage scale as follows :—

	Workers.	
A	Gangers and special gangs	25 per cent more than earned by Class B.
B	Digger	... 18 Chhataks.
C	Carrier	... 14 Chhataks.
D	Children between ages of 12 and 14 years.	12 Chhataks.
	Dependants.	
E	Adults	... 12 Chhataks.

F	Non-working children over 12 but under 14 years. ...	8 Chhataks.
G	Non-working children over 7 but under 12 years. ...	6 Chhataks.
H	Non-working children under 7 and in arms. ...	4 Chhataks.

The basis for conversion of grain wage to cash wage was to be equivalent of the retail price of the cheaper grains in common use. The final wage-rates included the cost of fuel also. The level of maximum wage was fixed in such manner that a family consisting of two earning members and three dependents was able to earn sufficient to maintain themselves. The payment was made in gangs. The muster roll of workers was kept and the measurements were taken. The instruction in the manual prescribed the payment at $\frac{2}{3}$rd of normal departmental rates. The minimum wage was fixed to weak and infirm worker and the rest day allowance was linked with the said minimum wage. The maximum limit laid down on the earnings of the workers were as follows :—

Category of workers	Descriptions	Maximum Limits
B	Adults employed for digging ...	Rs. 1·25.
C	Adults employed for carrying and the equivalent work. ...	Rs. 0·94.
D	Children below seven years ...	Rs. 0·62.

Later the Government raised the maximum limit on wage to Rs. 1·50 in case of 'B' worker, Rs. 1·25 in case of 'C' worker and Rs. 0·75 in case of 'D worker in 1962. Subsequently the rate of wage underwent many changes and according to the instructions in 1971, the maximum has been raised to Rs. 2·50 for male worker and Rs. 2·00 for female worker and Rs. 1·25 for children. The minimum wage for weak and infirm worker is Rs. 0·75 for male and female workers and 50 paise for a child. Recently the maximum limit has been raised to Rs. 3 and the distinction between the maximum wage for male and female worker has been abolished.

We have examined the wage policy from following aspects :—

(*a*) Wage rates appropriate for scarcity relief work.

(*b*) Method of payment of wages.

(*c*) Rains policy.

6.4.15.2. (*a*) *Wage Rates appropriate for scarcity relief works.*—As is well known, in times of drought, employment which is normally available to the people living in scarcity affected areas disappears and consequently the income of rural families gets reduced. The economic distress that follows due to these causes and due to the reduction in agricultural production, necessitates starting of relief works. In order to overcome the effects of scarcity, Government has to provide employment to a large number of people. This is done not as a result of a serious pre-planned programme, but because of the social obligation of the government to ensure that any widespread distress is not allowed to occur. While starting scarcity works and continuing them, the government has to ensure that labour is not diverted from agricultural operations when it is possible to carry them out. At the same time the wage-rates given on relief works have to be at least sufficient to allow the average worker in affected areas to survive.

There are three possible approaches for determining the appropriate wage-rates which should prevail on relief works.

The first is that the wage-rates should be such that an average family of five persons consisting of one adult male, one adult female and three children should obtain enough money to satisfy their normal needs. It was mentioned to the Committee that it has been found in the surveys of consumption expenditure that expenditure on cereals accounts for about 50 per cent of the total consumer expenditure of an average family, if cereals are purchased at market rates. A view has, therefore, been expressed before the Committee that since three Kgs. of cereals per day are required per family, the effective wage-rates should be obtained by calculating the value of 6 Kgs. of cereals at market prices. Since it is accepted that in an average family there are two workers and three dependents, the wage-rates on this basis would work out to about Rs. 5 per worker per day at present prices.

Another method of working out a reasonable wage-rate is to link wage-rates paid on relief works to the rates given to the agricultural labourers in the areas in which the relief works are in progress. From the available statistics, it is known that for the year 1971-72, the agricultural labourers' wage-rates on an average in the State were Rs. 2·25 per day for male and Rs. 1·75 per day per female. It is, however, important to remember that these average rates of wages for agricultural labourers vary widely from district to district as well as from one operation to another. This can be seen from the fact that during the year 1971-72 the wage-rates for agricultural labourers varied from less than Rs. 2·00 to as high as Rs. 6.

The third method for determining the wage-rates is to link them with the wage rates paid on the normal public works. It is possible to think of wage-rates which would result in the same amount of money for the same type of work and outturn even when the work is taken as a part of scarity relief. However, since the normal works of government departments are executed through professional workers, the output per non-professional worker is bound to be less.

The Committee considered all the aspects of the three methods of fixing wage-rates mentioned above and came to the conclusion that third method of linking the wage-rates on scarcity works with those prevailing on the public works should be accepted. The Committee arrived at this conclusion for the reasons discussed in following paragraphs.

The Committee rejected the suggestion of paying wage-rates on the basis of need since it felt that the question of determination of wage-rates on this basis is a larger one which is outside its purview. After all, if a need-based wage on scarcity works is to be paid it should also be given for agricultural labourers for their work. Most of the workers working on scarcity works are agricultural labourers and small cultivators whose normal income in any case during the year was nowhere near the income that they would have got if they were being paid a wage-rate at the level envisaged in the suggestion. Finally, the scarcity works are carried out as relief measure and with the limited resources of the state government, it would be impossible for the government to pay such a large number of workers need based wage without undergoing a severe strain on its resources.

As regards the wage-rates corresponding to the agricultural labourers there are certain practical difficulties in applying the principle on a uniform basis throughout the state. The agricultural wages differ from district to district and also from one type of work to another and from one season to another season according to demand. It is, therefore, difficult to determine reasonable wage-rates which could be applied uniformly on the basis of average agricultural wage-rates. The Committee, therefore rejected this suggestion also, but, however, felt that the average of agricultural wage-rates should be kept in mind in determining the effective daily wage-rates which should be given for work done in scarcity relief.

The Committee considers that the linking of the level of wage on scarcity work with the rates prevailing on public works is the appropriate method of fixing the wages on scarcity works. The schedule of rates for public works is fixed by government every year and thus takes into account the changes in prices and general wage-rates prevailing in the state. A large number of normal works are carried out at these rates. Apparently, therefore, the rates are acceptable to the worker and what is more important, have been found to be suitable in practice since they are applied to all public works that are undertaken by the government. They, therefore, represent a reasonable measure of the quantum of wages on the basis of work done.

The wages are being paid at present on the scarcity works at 90 per cent of the scheduled rates of wages. Two reasons are cited in favour of such policy. Firstly, the reduction in wage-rates prevents the diversion of labour from normal plan works to scarcity relief works which are situated near the home and are therefore preferred to normal plan works. Secondly, the scheduled rate of wages fixed on public works include an element of contractor's profit in the rate structure at the rate of 10 per cent. When the works are carried out departmentally, as is being done at present, the justification of including this element in the rate structure does not exist. We agree that continuation of this policy is essential for achieving twin objectives of preventing shifts of labour from normal plan works and of eliminating the element of contractor's profit in the wage structure on scarcity relief works.

The earnings of the workers at present are subject to a maximum limit. The intention in fixing the maximum limit on the earnings of the workers are two-fold. Firstly in the absence of such maximum limit the worker on relief works is likely to over work himself in order to maximise his earnings with adverse consequences on his health. Secondly maximum limit is fixed to prevent the professional workers from earning more as the task fixed for the worker on scarcity relief works is comparatively low. The maximum limit is essential to prevent the diversion of labour from normal plan works. It is also necessary to ensure that the people who would otherwise be employed in agriculture are not attracted to relief works thereby affecting the agricultural production. We, therefore recommend that the policy of fixing a maximum limit on the earning of the workers employed on scarcity relief works should be continued. The maximum earnings may be fixed keeping in mind the normal output of an average worker engaged on scarcity works.

The Committee is of the view that the wage rate thus fixed adequately takes into consideration the changes in the prices of commodities as the schedule of rate of wages is periodically revised. The Committee feels that the relief to the affected population will be more effective if the quantum of food-grains supplied to them through fair price shops is substantially increased to meet the major part of their monthly requirements of foodgrains rather than effecting frequent increases in wage-rates at every change in the level of prices of the foodgrains. It is also necessary to ensure that the increased quantum is supplied to the workers every week and he has not to rely on the supply of commodities at exhorbitant prices from the local market.

Another aspect connected with the wage is the supply of tools required by the labourer such as hammers, crowbars etc. According to the existing instructions, tools are to be supplied by the Government. There are complaints that tools are not supplied to the workers and the labour is required to buy its own tool. This entails additional burden on the worker. We recommend that the worker should be suitably compensated in such eventuality.

6.4.15.3. (*b*) *Methods of payment of wages.*—Two common methods payment of wages are daily wage rates and payment by results through piece rate. In former method the worker is primarily compensated for the time he spends on work without directly relating the payment to the outturn of the work. The tasks are prescribed and the worker is punished by dismissal on his failure persistent or occasional to fulfil the prescribed task. In the piece rate system the payment is directly related to the outturn. The rate of wage is expressed in terms of work such as Re. 1 per cubic meter of excavation. The daily rate system has the advantage of simplicity of operation as no detailed assessment of the outturn and the calculations of wage in terms of the outturn are involved. The worker paid on the daily wages knows his earnings and can plan his budget more effectively. One of the significant disadvantages of this system is its inability to provide an incentive for turning out adequate work. The unit cost of the work also rises if the worker fails to turn-out the prescribed quantum of work. The only disincentive is fear of his dismissal. Attempts are made to introduce the disincentive by inducting the system of fines for short fall in the work but such a system results in demoralisation of the worker. On the contrary the piece rate system by relating the payment to the outturn controls the costs and provides incentive by rewarding the efforts in the form of higher payment.

There is a significant distinction between the scarcity work and normal public work. The object of the scarcity work is to provide relief to the affected population by providing employment. The very purpose of granting relief is defeated if the worker is dismissed for his failure to perform the task. During the period of scarcity, the scarce resources of the state are diverted for relief works. It therefore becomes imperative to ensure that tangible results are achieved with the minimum costs. The history of wage policy reviewed in the earlier paragraphs indicates how the system of minimum daily wage payment had to be replaced by the method of payment on the basis of the results. We are, therefore, strongly in favour of continuing the piece rate system of payment on the scarcity works.

For a long time, the wages were paid on the gang basis to the workers. Because of the large scale abuse of the system and resulting public criticism, the payment of wages is no longer made to the gangmen. The measurements of work are taken by the work-in-charge and the muster roll is certified. Payment is made to individual worker. The bills are prepared by the executing agency, the payment is made by the revenue staff in most of the districts.

We have observed that the delay in the weekly payment of wages is not avoided in practice. We strongly feel that the delay in payment can be avoided if the staff is properly stregnthened and proper supervision is exercised.

We strongly feel that the delay in payment can be avoided by shortening the procedure in the payment by reducing stages in the payment of wages. A system of provisional payment on the basis of knowledge of work done should be introduced in the State in order to mitigate the distress caused by delay in payment.

6.4.15.4. (c) *Rains Policy.*—The main object of the policy for rains should be to secure the re-establishment of agriculture. Therefore the scarcity works have to be closed down thereby diverting the labourer from the scarcity works to normal agricultural operations by adopting a suitable wage policy. The wages are reduced by 25 per cent. on the works on the onset of the monsoon so that the agricultural labourers are induced to go back for the normal agricultural operations. According to the instructions prescribed in the Manual, the wages are to be reduced by 15th July in kharif areas and 15th September in rabi areas. In 1958, some relaxation in this policy was allowed if the rainfall continued to be precarious in the affected areas. In 1971-72 and 1972-73, the policy had to be modified entirely and the wage rates were not reduced even after September 1971. Adverse effect of this policy on agricultural wages was not evident more so because of continued scarcity conditions. In general the policy of adopting suitable disincentives for diverting the labour to agriculture has to be adopted unless special circumstances warrant.

6.4.16. *Other aspects of relief.*—There are other aspects of relief also such as the medical relief, prevention of epidemics, proper care of children during the period of distress, concession to students whose parents are affected by scarcity conditions by way of concession in fees, hostel charges inclusive of food which require attention.

Another aspect of relief policy which requires serious attention is the steps necessary for assisting the agriculturist in undertaking successful cultivation in the following year of scarcity. This implies the assistance in preparing the land for cultivation, where bullock power is not available, supply of seeds, and other inputs and credit.

6.5. *Organisation and administration of relief works.*—The revenue department at the state level and the collector at the district level is the spearhead, of the organisation of relief works, and brunt of management of works is borne by executing agencies. Though the Famine Commission (1880) had recommended that the organisation of relief works should be the responsibility of the agriculture department, the Famine Codes did no incorporate this recommendation. The revenue administration bore the brunt of relief administration even before Independence. The collector has to play a triple role in the relief administration. He is the sanctioning authority and supervisory officer. He is also responsible for channelising the information to the government regarding the conditions prevailing in the district.

The works are executed through an executing agency both in the State and local sectors. The agencies in the State sector are Building and Communications Department, Agril. Department (Soil Conservation Department) and Irrigation and Power Department and in the local sector, the Zilla Parishad is the main executing agency. The Collector sanctions the work in consultation with district and taluka committees. The revenue staff performs the role of supervising character.

6.5.1. The Advisory Committees are formed to help the Collector in sanctioning, supervising and co-ordinating the relief works. The main functions of such Committees are listed below :—

(1) to advise the officers in framing the relief schemes and selecting relief works ;

(2) to supervise the works with regard to the payment of wages, timely measurement of works, etc.

(3) to secure voluntary donations in cash and kind ;

(4) to supervise the distribution of gratutious relief.

The composition of the Committee consits of local representatives viz. M. L. As., Presidents, Z. P., Chairman, Panchayat Samitis, political leaders, social workers and officials.

We have discussed in greater details the type of organisation that we envisage for implementing scarcity works in a later Chapter. We do recognize the important role that can be played by voluntary organisations in looking after scarcity affected people.

6.5.2. *Allotment of funds for scarcity works.*—The funds for the execution of scarcity works are allotted by the revenue department from the budget head of 64-Famine Relief. The allotment is placed at the disposal of the collector who in turn allots the funds to the executive agencies. The plans and estimates of the works are required to be prepared before the sanction of works, but in practice it has not been possible for the Collectors to sanction the relief works after the preparation of plans and estimates. The government has also taken congnizance of this difficulty and the collectors have been empowered to sanction the work pending preparation of plans and estimates. The collector after sanctioning the work places *ad hoc* allotment on the basis of rough estimate with the executing agencies. Though the workwise allotment of funds is required to be made, it has not been possible for the collectors to make such workwise allotment as the number of works sanctioned is quite large, and the entire amount covering the cost of works is not placed with him by the government. Therefore, the amounts in lump sum are placed with executive agencies and the distribution of the lump sum amount workwise is left to these agencies.

There are 3 stages before the funds are allotted to the works (*a*) Submission of the proposal for funds by the collector (*b*) Sanction of funds by government and (*c*) Allotment of funds to the executing agencies. Since the funds covering the entire cost of works in progress are not placed with the collector, the process of asking for funds, sanctioning it and alloting it to the executing agencies is repeated every month or fortnight. Any delay in the allotment of funds results in the delay in payment of wages. However, there are provisions in the Treasury Manual to draw the funds in the absence of specific allotment on a certificate given by drawing officer that the funds will be made available through proper budgetary provision.

6.5.3. *Administration and execution of works.*—The scarcity works were administered either departmentally or through contractor in the past. The contractors have been eliminated in the execution of works in the current year of scarcity. There were several complaints against the works executed by the contractors. Firstly, they used to refuse to employ the affected labour. Secondly, the actual payment to the woker was not made by him in accordance with the rates prescribed. The arrangement for drinking water and medical aid were not satisfactory. Because of several complaints, in the current year of scarcity, there is a ban on the execution of works through contractors. We consider this ban as desirable step in effective implementation of scarcity works. All the works are executed departmentally in the current year of scarcity. The executing agency is responsible for the execution of work.

6.5.4. *Execution of works.*—The Committee during its tour and discussions has observed certain operational difficulties in the execution of scarcity works which it would like to record.

6.5.4.1. *Soil conservation works.*—The wage rates on the soil conservation works were much lower than the rates of wages on other works. On account of this discrepancy in wage rates, the labour attendance on this works was less. The main reason advanced for the lower wage is that part of the cost of work is recovered from the beneficiary. The effectiveness of the scarcity works is considerably reduced if the works become competitive. The government, it seems has accepted this principle recently and introduced a measure of uniformity in wage rates and also increased the wage rate on soil conservation works by 11 per cent. We are of the view that the wage rates on the scarcity works *inter se* need to be fixed in such a manner that they do not become competitive. We agree that a fair trial should be given for recent increase in the rate of wage on soil conservation works. Since the alternative to soil conservation work is to start less productive works the cost of which at higher wage rates is to be borne by the government, there is some justification for the demand that the cost on account of the increased wage rate may not be passed on to the beneficiary.

6.5.4.2. *Irrigation schemes.*—It was observed that in most of the districts the minor irrigation schemes in spite of the high priority given to them could not be undertaken because the schemes were not ready in advance. This was mainly due to lack of staff and general unpreparedness for the contingency of the order.

6.5.4.3. *Percolation tanks.*—The percolation tanks play great role in increasing the water table in the wells down-stream. But the works on large scale could not be undertaken mainly because of two reasons. Firstly, the schemes were not ready with advance surveyes and the surveys and preparation of plans and estimates was a time consuming process. Secondly, many sites did not fit in the yardstick of the expenditure prescribed. The yardstick was revised recently from Rs. 33,000 per M. C. Ft. to Rs. 40,000 per M. C. Ft. Even then many works could not be taken up as the expenditure was higher than the yardstick prescribed. We recommend that two additional factors should be considered while fixing the yardstick. Firstly, the fact in addition to well irrigation, such works help in relieving the drinking water problems in the normal year needs to be taken into consideration whenever the alternative to percolation tanks is only less productive works, he higher expenditure on this productive work is justified.

Recently the government has removed the criterion of yardstick for percolation tank.

6.5.4.4. *Inadequacy of staff.*—There was general complaint regarding shortage of technical staff. The government has followed progressive policy by recruiting temporary additional staff and re-employing retired persons. Even then the shortage of staff which is the main handicap in taking up of additional works and for prompt payment of wage, still persists. We suggest that suitable training schemes can train non-qualified personnel to undertake some of the task such as measurement effectively. Measurements of simple earth work is not such a complicated work and engineer need not waste his time on such simple work, when works on large scale are undertaken departmentally. A technical assistance below the level of overseers is normally required. There are 4 agricultural universities in the State. Qualified local agricultural graduates are in large number available in the affected areas. These agricultural graduates are properly trained for survey work and measurement. They can be effectively used as technical asistants on these scarcity works.

6.5.4.5. *Inadequacy of tools and equipments.*—The tools and equipments were inadequate. Even small tools like hammers and crowbars were in short supply, the quality of tools was also inferior. The government has delegated powers of local purchase to the collectors. Even then the shortage of tools could not be alleviated. The small scale industries corporation should take a larger responsibility for making these tools available. There has been a general shortage of road rollers. Particularly, this difficulty was faced on the percolation tanks. The difficulty has partly been overcome by substitution of bullock roller for the road roller also. The experiment of attaching a 5 tonne roller on the versatile Bolgar tractor has been quite useful.

6.6. *Review of scarcity relief measures:*

6.6.1. The Committee attempted to survey the relief measures undertaken in the affected areas during the conditions of scarcity to assess their effectiveness in relieving of distress as well as to investigate the potentiality of these measures for the permanent rehabilitation of these areas. In surveying the relief measures the Committee intended to restrict itself to the period commencing from 1960, i.e., after the submission of the report of the Fact Finding Committee (1960). We tried to collect the information directly from the collectors in order to asses the districtwise impact of scarcity relief measures. But within the short time left at our disposal, it was not possible to reconcile the information received from the districts. Therefore, we relied on the available information. Since 1952-53 the practice of publishing annual report on scarcity was started. It appears that the practice has been discontinued. The last annual report on scarcity was published in 1961-62. We strongly recommend that this practice should be revived, as in the absence of such a report, no evaluation of the relief work is possible. Further we suggest that such reports should be laid before the legislature.

In the following paragraphs, we have attempted to review the relief measures from the available information in four major years of scarcity since 1960.

6.6.2. (i) *Number of villages affected.*—Table No. 1 attached to this Chapter indicates the number of villages in each district in which the scarcity conditions were declared since 1960. It is evident that scarcity conditions prevailed almost every year in some parts of the state. The statewise picture of the number of villages affected during last 10 years, is as follows :—

Year				No. of villages affected
1960-61	...	...	...	208
1961-62	...	...	...	4,960
1962-63	...	...	...	784
1963-64	...	...	...	1,275
1964-65	...	...	...	1,144
1965-66	...	...	...	16,155
1966-67	...	...	...	7;040
1967-68	...	...	...	4,083
1968-69	...	...	...	962
1969-70	...	...	...	2,026
1970-71	...	...	...	22,992
1971-72	...	...	...	14,698
1972-73	...	...	...	24,797

(Approximate).

Scarcity was wide spread in 1965-66, 1970-71, 1971-72 and 1972-73. In 1970-71 part of the state was affected by the scarcity conditions due to excessive rains (particularly parts of Nagpur Division). Drought was the main cause of scarcity during last twelve years. Other causes of scarcity were excessive rains, cold wave and also infection by pests.

6.6.3. (ii) *Population of the affected areas.*—The population affected in major years of scarcity is shown below :—

Year			Population
1965-66	...	...	1·30 crores.
1970-71	...	...	1·88 crores.
1971-72	...	...	1·12 crores.
1972-73	...	...	2·00 crores.

The magnitude of the problem of scarcity is evident from the fact that population of the affected areas during the years of scarcity varied between 28 per cent. to 40 per cent. of total population of the State.

6.6.4. (iii) *Agricultural production.*—During the years of scarcity, the extent of damage caused by the scarcity conditions can also be assessed from the agricultural production index during this period. The following table illustrates the behaviour of agricultural production index for 1964-65 to 1971-72 :—

AGRICULTURAL PRODUCTION INDEX

Base year 1956-57 = 100

Year			Index
1964-65	...	...	113·19
1965-66	...	...	82·23
1966-67	...	...	95·15
1967-68	...	...	109·32
1968-69	...	...	114·02
1969-70	...	...	110·71
1970-71	...	...	94·72
1971-72	...	...	88·30

(*Source* :—Maharashtra An Economic Review, 1972-73).

The agricultural production index was lowest during 1965-66, the index for 1972-73 is not yet known but the fall in production is expected to be of the order of about 50 per cent.

6.6.5. (iv) *Expenditure on relief measures.*—The following table gives the expenditure on relief measures for the major years of scarcity :—

Year		Total expenditure		Expenditure per capita of population affected
		Rs.		Rs.
1965-66	...	11·77 crores	...	9·00
1970-71	...	2·23 crores	...	1·50
1971-72	...	41·51 crores	...	32·00
1972-73	...	75·46 crores	...	37·50

(upto 31st March 1973)

During these four years of scarcity, the Government has spent about Rs. 131 crores, and per capita expenditure has also been increasing during recent year. It is the highest in 1972-73. A comparison of per capita expenditure with per capita development expenditure in the State reveals the magnitude of the problem of scarcity as compared with the regular development expenditure. The following table gives the per capita development expenditure in 1970-71, 1971-72 and 1972-73, for the States a whole :—

Year			Per capita development expenditure
			Rs.
1970-71	...	...	78·43
1971-72	...	...	92·88
1972-73 (budget)	...	...	95·91

(*Source* :—Budget in brief)

Per capita expenditure on scarcity works almost amounted to more than 1/3rd of per capita development expenditure in 1971-72 and 1972-73.

6.6.6. (v) *Scope of scarcity works.*—The scarcity works are undertaken in the affected areas much prior to the formal declaration of scarcity. Though the scope of scarcity works is to relieve the effects of scarcity conditions, the existence of large scale unemployment in the rural areas and the desire to increase the pace of development may at times become responsible for attracting more relief works in the areas where scarcity conditions may not be severe. It is necessary to avoid the latter considerations from prevailing in determining the expenditure on relief works so that the expenditure is channelised to the areas according to the intensity and severity of scarcity conditions.

6.6.7. (vi) *Labour attendance.*—The labour attendance figures for some of the peak fortnights, are given below:—

1972-73 Fortnight ending on		Daily labour attendance in lakhs	1971-72 Fortnight ending on		Daily labour attendance in lakhs
15th August 1972	..	7·17	15th August 1971	..	12·36
1st September 1972	..	10·48	1st September 1971	..	13·34
15th September 1972	..	11·50	15th September 1971	..	14·60
1st October 1972	..	11·82	1st October 1971	..	11·60
15th October 1972	..	13·37	15th October 1971	..	11·02
31st October 1972	..	15·38	31st October 1971	..	8·39
15th November 1972	..	16·82	15th November 1971	..	6·57
1st December 1972	..	17·79	1st December 1971	..	4·21
15th December 1972	..	18·39	15th December 1971	..	4·21
31st December 1972	..	20·17	31st December 1971	..	2·82
15th January 1973	..	22·58	15th January 1972	..	2·34
31st January 1973	..	24·40	31st January 1972	..	1·79
15th February 1973	..	26·48	15th February 1972	..	1·71
1st March 1973	..	29·01	1st March 1972	..	1·73
31st March 1973	..	35·04	31st March 1972	..	1·25

It can be observed that the labour attendance in 1971-72 declined since October. On the other hand the contrary trend is revealed by the labour attendance in the year 1972-73. The main reason is that, later rains in 1971-72, improved the prospects of a rabi crop while in 1972-73, the prospects of rabi crop did not improve in the absence of late rains. It has been general experience that the scarcity conditions are more severe when the rabi crop fails.

In 1965-66 maximum labour attendance in the peak period of May and July 1966 was 5·51 lakhs. A comparison of maximum labour attendance to the population affected is given in the table below :—

Year 1		Population affected 2		Maximum labour attendances 3		Percentage of 3 to 2 4
1965-66	..	1·30 crores	..	5·50 lakhs	..	4 per cent
1971-72	..	1·88 crores		14·60 lakhs		7 per cent.
1972-73	..	2·00 crores		35·04 lakhs		17 per cent.

During the current year of scarcity, employment has beeen provided to larger proportion of the population than in the previous years of scarcity. The same increasing trend is prevalent in the number of works sanctioned. In 1965-66 in the peak period of scarcity, 5,631 works were in progress while in the current year of scarcity, 44,241 works are in progress. This increase in the labour attendance in the current year of scarcity is attributable to the fact that it was 3rd year of scarcity in succession. It may also be observed that the population affected in 1972-73 was only 38 per cent. more than the population affected in 1965-66, but the expenditure on relief works is 6 times more.

The coverage of relief measures in recent years was more than in 1965-66. It is difficult to comment upon the adequacy of relief measures as the concept of adequacy is a relative concept particularly so in the era of rising aspiration but the trend in the coverage in the relief measures in recent years indicates the magnitude of problem that has to be tackled in the event of scarcity. It also speaks for the necessity of having sufficiently flexible financial and administrative arrangements to meet the challenge of such contingencies.

6.6.8. (vii) *Supply of tools and equipment.*—The supply of tools and equipment to the workers is one of the important problems posed by the scarcity. In 1965-66, the tools and plants worth Rs. 6·18 lakhs were purchased. Building and Communication Department also released the reserve tools.

Severity and intensity of scarcity conditions necessitated starting of large number of works in the affected areas during last three years of scarcity. Wide powers were delegated to the Executive Engineer and Collector. The tools and plants supplied during the current year of scarcity are as follows as on 1st March 1973 :—

Ghamellas	...	...	2·15 lakhs.
Phawrahas	...	...	1·09 lakhs.
Pickaxes	...	...	0·43 lakhs.
Hammers	...	...	3·04 lakhs.
Crow-bars	...	...	0·37 lakhs.
Sutkis	...	...	0·05 lakhs.

The labour attendance on the scarcity works is about 35 lakhs on 31st March 1973. About 7 lakhs additional tools had to be purchased for giving to the labourers. The scarcity manual provides for keeping sufficient reserve stock of tools and equipment by the executive department. The estimates of reserve stock require revision in the light of current year's requirements. Another problem connected with the supply of tools and equipment is system of their issue. It has been observed that the workers at times do not return the tools and equipment. It is difficult to take security from the workers for such small tools costing few rupees. We feel that the assistance of local non-official agency may be taken in evolving suitable system of issue of tools.

6.6.9. (vii) *Physical achievements.*—The physical achievements of the scarcity works during the last three years are indicated in Table No. II.

It will be observed that large number of works started during the scarcity period will remain incomplete or will be brought only to the safe stage during the period of scarcity. The completion of works will require sufficient provision in the future years for spill-over works, otherwise, the very purpose of undertaking drought resistent works will be defeated. If funds are not available for spill-over works for long time, the expenditure incurred in the scarcity may become infructuous. In selection of works, it is necessary to strike balance between the immediate need for scarcity works and availability of funds for spill-over works in future.

6.6.10. (viii) *Gratuitous relief.*—The policy of distributing gratuitous relief to disabled and infirm persons had been in existence since long. The rates of gratuitous relief in various years of scarcity are indicated below :—

Year	Rate of gratuitous relief			
	Adult	Person between age group 12 to 13 years	Child between 7 to 12 years	Child below 7 years
1966-1971	50 paise	35 paise	25 paise	18 paise.
1971-72	....	45 paise	35 paise	25 paise.
Since October 1972	Re. 1.	65 paise	45 paise	35 paise.

In 1965-66, the expenditure on gratuitous relief was Rs. 1·85 lakhs and it constituted only 1 per cent. of the total expenditure on relief works. In 1971-72 the gratuitous relief was distributed to 3,704 persons amounting to Rs. 7·84 lakhs, constituting 0·2 per cent. of the total expenditure on the scarcity works. In the current year of scarcity, the expenditure on gratuitous relief is Rs. 61 lakhs and constitutes slightly less than 1 per cent. of the total relief expenditure. The number of persons receiving gratuitous relief in various districts in the current year of scarcity, is 66,581 as on 1st March 1973.

6.6.11. (ix) *Drinking Water.*—The measures to relieve drinking water scarcity in 1965-66 mainly consisted of supply of drinking water through bullock-carts, supply of boring and blasting machines to the Zilla Parishads to enable them to sink new wells or to deepen existing wells in order to augment drinking water supply. About 7,000 oil engines were also supplied to the Zilla Parishads for irrigation and drinking water. The total expenditure on drinking water supply was to the tune of Rs. 3·45 lakhs.

In 1970-71, the late rains in August and September relieved the scarcity of drinking water and no extensive measures for relieving the said situation had to be undertaken.

In the current year of scarcity, drinking water scarcity is being experienced in large number of villages.

One of significant measure undertaken to relieve the drinking water scarcity is the programme of deepening and boring of wells, for augmenting the water supply. The programme for deepening and boring is taken up in 2,472 villages, by 1st March 1973. The community wells have been taken up in 4,917 villages, out of these wells 409 had succeeded by 1st March 1973. 578 villages are being supplied water through 723 tankers and large number of bullock-carts as on 1st March 1973.

For the purposes of deep drilling and blasting of wells, the existing rig machines and other boring units are in use in 9 severely affected districts of Ahmednagar, Poona, Sangli, Satara, Sholapur, Aurangabad, Bhir, Osmanabad and Nasik.

The measures for relieving drinking water scarcity through digging new wells can only be successful if there is an assured source of ground water underneath. We have indicated in a later chapter, the measures that are required to be undertaken as long term solution to the problem of drinking water supply.

6.6.12. (x) *Fodder.*—In 1965-66, the fodder scarcity was not so acute but as a measure of precaution export of fodder of certain varieties was banned under the Defence of India Rules. These included bhusa, gavar, kadba, grass and oil-cakes. The stocks in the fodder banks were reserved for scarcity areas but were latter allowed to be sold freely after the end of May 1966, when the demand decreased. Fodder tagai was also granted to the agriculturist and the expenditure in this connection amounted to Rs. 4·41 lakhs.

In 1970-71, district ban on export of fodder was imposed but was removed after the later rains in August and September relieved the fodder situation. Fodder tagai was however distributed to the agriculturists. The situation was relieved by late rains in August and September and the necessity of opening cattle camps was not felt.

In the current year of scarcity, the fodder shortage is severe as it is third year of scarcity in succession. The measures such as grant of tagai were inadequate to relieve the shortage. To save as much cattle as possible opening of cattle camps, cattle feeding centres became inevitable. The position of cattle camps as on 1st March 1973 is shown below :—

District	No. of cattle camps cattle feeding centres opened	Capacity	Cattle admitted
Ahmednagar	4	16,000	4,085
Poona	9	10,000	2,700
Sangli	7	9,000	47
Sholapur	7	4,737	4,293
Satara	17	7,100	760
Aurangabad	....	....	....
Bhir	....	....	....
Osmanabad	....	....	....
Nasik	24	12,150	4,525

Cattle from Aurangabad, Bhir and Osmanabad districts are taken care of in the cattle camps, in Vidarbha districts, particularly in Buldhana, Amravati and Yeotmal districts.

Besides cattle camps following measures have been undertaken :—

(i) Procuring of fodder from other states through co-operatives.

(ii) Cultivation of fodder on the lands in charge of universities and State Farming Co-operation.

The fodder tagai has been distributed extensively in the districts as follows as on 1st March 1973 :—

District	Amount in lakhs (Rs.)
Ahmednagar	14·20
Poona	11·75
Satara	13·03
Sangli	20·79
Sholapur	24·35
Aurangabad	11·85
Bhir	42·72
Osmanabad	31·23
Nasik	27·95

The exact figures of cattle population that will require the assistance are not available. In the absence of authentic data relating to shortfall in fodder stocks including carry over of stocks from earlier years, it is difficult to comment on adequacy of measures.

6.6.13. (*xi*) *Distribution of Sukhadi.*—Owing to the prevelance of scarcity conditions the rural population becomes emaciated. Non-availability of sufficient grains in open market and fair price shops further deteriorates the situation. In order to supplement the normal food requirements, with nutritional food and build up resistance in this population, the programme of distribution of " Sukhadi " was undertaken.

6.6.14. (*xii*) *Medical Relief.*—Scarcity Mannual provides for provision of medical relief and other arrangements for the labourers working on scarcity works. However no necessity for such special measures was so acutely felt in the past scarcities of 1965-66 and 1970-71 and 1971-72. But during the current year of scarcity we understand that instructions have been issued to the Deputy Directors of Health Services in-charge of circles to depute medical officers and sanitary inspectors to the scarcity work sites for rendering medical aid and for carrying out immunisation against infectious diseases like small-pox, cholera and tetanus. Instructions were also given for disinfection of water supplies.

As the magnitude of relief increased and the number of relief works multiplied it was not possible for normal health staff to cope up with the medical needs of the labourers on each and every work site. It was therefore necessary to mobilize the services of doctors and interns of the medical college in the State to supplement the medical relief.

The Maharashtra Scarcity Relief Committee also took steps to strengthen the government efforts and due to its initiative a number of such medical teams have been working in the 9 acutely affected districts. A team normally consists of 2 senior doctors and 10 interns. It generally operates from its headquarters to the scarcity works located within 32 to 40 kms. The work of the team consists of physical examination, diagnosis, distribution of medicines and vitamines supplies. A single team normally covers about 350 to 500 persons per day.

To co-ordinate the various agencies and execute the programme of medical aid affectively a Directorate of Medical Relief has been created. The medical aid at present is being rendered in the form of mobile medical service and this is being achieved through co-operation of various agencies which have provided vans and drugs. Pharmaceutical industries have helped by supplying drugs worth one crore rupees. Other essential drugs are being bought from grants placed at the disposal of the Directorate.

All these steps have been fairly successful to ensure mass immunisation of the rural population from epedemics.

TABLE No.

Number of Scarcity

Serial No.	District	No. of villages (1961 census)	1960-61	1961-62	1962-63	1963-64	1964-65
1	2	3	4	5	6	7	8
1	Thana ..	.. 1,629	....	....	....	....	....
2	Kolaba ..	.. 1,957	18	9	12	10	13
3	Ratnagiri ..	.. 1,520	....	....	....	....	....
4	Nasik ..	.. 1,659	98	99	10	76	49
5	Dhulia ..	.. 1,381	7	125	37	24	3
6	Jalgoan ..	.. 1,478	....	15	....	2	....
7	Ahmednagar	.. 1,323	....	492	214	317	....
8	Poona ..	.. 1,516	....	....	2	100	40
9	Satara ..	.. 1,174	....	153	....	....	....
10	Sangli ..	.. 530	....	15	....	12	23
11	Sholapur	.. 952	*....	180	....	....	....
12	Kolhapur ..	.. 1,093	....	....	....	....	....
13	Aurangabad	.. 1,976	....	....	....	....	129
14	Parbhani	.. 1,577	....	....	....	....	....
15	Bhir ..	.. 1,043	84	123	....	....	....
16	Nanded ..	.. 1,386	....	....	....	72	....
17	Osmanabad	.. 1,411	....	....	....	....	....
18	Buldhana ..	.. 1,371	....	321	....	63	145
19	Akola ..	.. 1,713	....	780	....	479	348
20	Amravati ..	.. 1,968	....	....	....	....	....
21	Yeotmal ..	.. 1,924	....	230	....	110	388
22	Wardha ..	.. 1,373	....	1,266	153	....	....
23	Nagpur ..	.. 1,897	....	1,087	241	....	....
24	Bhandara ..	.. 1,648	1	65	115	10	6
25	Chandrapur	.. 3,368	....	....	....	....	....
		38,867	208	4,960	784	1,275	1,144

*There are no kharif villages

Source :—Maharashtra An

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Affected Villages

1965-66	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73 Kharif villages
9	10	11	12	13	14	15	16
....	....	....	....	....	....	3	1,497
45	4	102	39	184	38	219	969
....	....	....	....	....	....	....	475
716	214	38	25	258	211	701	1,366
877	616	191	70	59	443	576	832
1,323	563	172	15	24	1,414	843	802
653	204	214	249	42	666	990	459
1,236	109	184	334	393	386	382	1,124
959	....	....	....	....	279	160	797
387	....	16	119	....	182	121	483
469	....	....	....	....	952	453	*
236	....	....	5	....	....	....	912
1,205	184	77	105	....	1,976	1,971	1,057
227	....	....	....	....	1,577	1,099	940
79	136	108	....	....	1,021	1,534	530
84	....	....	....	....	1,386	575	1,161
312	149	292	....	....	1,376	1,423	1,010
1,291	108	200	....	151	1,363	907	1,250
1,537	1,039	231	....	144	1,713	116	1,315
253	478	299	....	400	1,837	574	1,442
483	881	302	....	....	1,783	78	1,799
833	606	679	....	173	1,360	....	1,263
711	915	885	....	181	1,829	1,434	1,228
1,135	458	66	1	17	....	25	722
1,100	376	27	....	....	1,200	471	1,364
16,151	7,040	4,083	962	2,026	22,992	14,695	24,797

in sholapur district.

Economic Review 1972-73.

TABLE No.

Important Scarcity works during 1970-71

Serial No.	District	Irrigation and Percolation Tanks Canal Works etc. During 1970-71, 1971-72, No. of works taken	No. of works completed	During 1972-73 (upto 31st December 1972) No. of works taken	No. of works completed
1	2	3	4	5	6
1	Thana	....	....	....	....
2	Kolaba	7	3	1	3
3	Ratnagiri	....	....	....	....
4	Nasik	31	2	18	2
5	Dhulia	39	3	23	2
6	Jalgaon	56	1	16	....
7	Ahmednagar	204	15	112	15
8	Poona	115	40	41	23
9	Satara	60	10	29	8
10	Sangli	204	2	196	2
11	Sholapur	55	2	52	....
12	Kolhapur	....	....	....	....
13	Aurangabad	59	16	....	....
14	Parbhani	41	10	2	1
15	Bhir	123	20	76	17
16	Nanded	120	36	35	5
17	Osmanabad	59	26	48	26
18	Buldhana	37	4	22	3
19	Akola	125	104	15	13
20	Amravati	100	92	9	1
21	Yeotmal	120	19	61	13
22	Wardha	22	....	3	....
23	Nagpur	51	24	19	7
24	Bhandara	....	....	....	....
25	Chandrapur	64	19	40	12
		1,692	448	819	146

(*Source :* Maharashtra An

II

to. 1972-73 (up to December 1972)

Soil Conservation Works		Road Works			
During 1970-71, 1971-72	During 1972-73 upto 31st December 1972	During 1970-71, 1971-72		During 1972-73 upto 31st December 1972	
Areas covered (in hectares) 7	Areas covered (in hectares) 8	Total road length completed (in Kms.) 9	Road length brought to a safe stage (in Kms.) 10	Total road length completed (in Kms.) 11	Road length brought to a safe stage (in Kms.) 12
....	....	....	....	....	....
168	138	21	22	13	22
....	....	....	....	....	....
11,383	....	1,669	1,669	254	254
13,992	6,134	1,473	1,110	265	265
50,909	21,733	3,423	2,052	339	112
36,344	11,844	5,015	3,078	2,160	1,296
17,730	9,648	2,439	2,439	557	557
14,320	7,577	60	....	60	....
17,725	11,577	1,340	906	924	630
51,522	22,715	2,812	3,352	1,612	1,432
2,464	....	78	27	....	....
1,42,221	64,035	3,488	2,940	664	640
57,544	18,226	3,790	2,936	594	30
1,35,448	1,05,434	2,358	1,835	424	264
59,962	38,957	3,862	2,919	168	....
1,58,230	67,930	2,933	2,481	1,207	768
60,465	32,300	2,887	2,005	818	268
21,538	379	2,253	2,232	52	226
20,330	5,630	2,395	1,657	135	....
10,893	293	3,187	2,176	880	392
7,505	905	1,664	1,206	1,202	....
23,025	13,876	1,564	641	56	28
....	....	....	....	....	....
3,400	271	1,215	526	935	486
4,17,818	4,39,631	50,971	38,971	12,633	7,670

Economic Review, 1972-73.

CHAPTER VII

LONG TERM STRATEGY

7.1. We have earlier distinguished between economically backward areas and the drought prone areas. The drought prone area may possess all the characteristics of the economically backward area alongwith its drought prone character. But it is the insecurity in agrarian condition resulting from the scanty and uncertain rainfall which distinguishes it from the economically backward areas. Unless steps are taken to overcome this insecurity first by making adequate and dependable supply of water available to these areas, hardly any developmental measures can succeed in these areas. This insecurity is responsible for the deterioration in the economic conditions of the population in that area. At times under the severe conditions of drought even the very human existence is brought in danger. While the planning for economically backward areas aims at raising the level of income; in the drought prone areas, by force of circumstances its primary aim has to be the stabilisation of income and ensuring the supply of basic necessities of human and cattle life such as drinking water and fodder. Apart from the problems of increasing the rate of investment and making a correct choice of technology to fructify the investment, the main problem of the drought prone area is to make the investment itself more secure in the face of uncertain precipitation and to adopt a technology which can counteract the vagaries of rainfall.

7.2. Generally, the drought prone areas tend to be also economically backward areas because of fluctuation in the level of incomes caused by uncertain and scanty rainfall. Hence all the measures essential for the improvement of economically backward areas are required to be taken in addition to the improvement in the dependability and availability of the supplies of the water. It is an accepted fact that the developmental measures tend to get attracted to the areas where infra-structure for development exists in preference to the areas where it is necessary to create such infra-structure as a precondition for economic development. The regional imbalances are created polarising prosperity and poverty. The gap between economically developed area and economically backward area is likely to be further widened, if the area happens to be drought prone area, unless deliberate attempt is made to develop the drought prone areas in a co-ordinated manner.

7.3. The policies adopted by the government for mitigating the distress caused by famine may be considered in the historical perspective. Till the end of the nineteenth century, the government conceived famine as something of nature of fatality which the government could not prevent : all it could do was to mitigate suffering and relieve distress when famine came. The measures to alleviate the distress of famine therefore took the form of maintaining essential supplies of food, granting relief to agricultural labourers by starting large relief works and granting relief to cultivator class by remission or suspension of land revenue. Even in the administration of the relief policy, the influence of laissez faire policy advocated by Adam Smith and J. S. Mill was evident and the government interference was kept to the minimum. No. attempt was made to control the distribution of food or to reorient the agrarian structure by settling the rights of various classes of cultivators such as tenants and share-croppers whose living conditions worsened during the famines. The emphasis on measures in relieving the distress rather than preventing it was also evidenced by the preference given to railway works *vis-a-vis* the irrigation works. Even though the Famine Commission of 1880 emphasised the importance of both railways and irrigation works in mitigating the distress of famine and unequivocally expressed in favour of giving higher priority to the latter, the public works policy of the government favoured railways as protective measure against the famine. The Secretary of State is reported to have pressed for railway works before the Select Committee of the House of Commons in 1884 rather than pressing the demand for the appointment of an Irrigation Commission.

7.4. However the suffering caused by two famines at the end of the century, the heavy cost on relief and the change in the political climate in the country forced the government, to revise its options in favour of more positive policy. The appointment of an Irrigation Commission in 1901 was evidence in this direction. The Commission prepared a 20 year plan of irrigation, costing Rs. 44 crores. Though it dispelled the mistaken beliefs of protecting the entire country against famine by extending the irrigation, it placed larger emphasis on protective character of irrigation works. The government also considered and introduced legislation for giving protection to the various agricultural classes engaged in the production by introduction of Tenancy Law regulating the rent and security of the tenure. The introduction of co-operative credit was an attempt in the direction of safeguarding the interest of cultivator class from the clutches of the money-lenders. Though the sympathies definitely shifted in favour of the agricultural classes and there was a modification in the laissez faire approach, the policies adopted by the government only tinkered with the problems posed by the famine.

7.5. The realisation that the ultimate solution to the problems of poverty and famine lay in the economic development in the country, did not come in the government thinking till the dawn of Independence. After independence and formulation of Five Year Plans a definite attempt was made to accelerate the process of economic development. The first Five Year Plan laid emphasis on agriculture. The development of agriculture also occupied significant place in subsequent plans. It was considered that the process of economic growth itself would eventually abolish the scarcity. The recurrence of scarcity conditions after Independence particularly the large scale scarcity conditions in 1952-53 in the former Bombay State again revived the thinking for the need for a different programme for chronically scarcity affected areas. Accordingly, a Fact Finding Committee was set up in 1958 under the Chairmanship of Shri N. S. Pardasani to examine the economic conditions in all the areas in the Bombay State with a view to assess the effects of recurrent famine and scarcity conditions and collecting full data regarding the visitation of famine and scarcity conditions and other relevant information to enable the government to assess the situation. The task of naming the areas which could be treated as precarious areas was also entrusted to the Fact Finding Committee. The Committee was also required to suggest preventive and ameliorative measures to deal with similar threats.

7.6. The Fact Finding Committee (1960) emphasised the necessity for preventive measures in the following words. "The policy of adopting scarcity measures when scarcity is already in sight has to be substituted by strategy of development based on appraisal of the basic deficiencies in the economy of the area. As the problem is deep rooted, a phased programme which aims at removing underlying causes has to be implemented until the area is made reasonably free from the spectre of scarcity". The Committee further outlined the objective of the development effort in the scarcity areas in the following words : "The development measures for scarcity areas should therefore aim at security of employment and income to the people in these areas. This would generally be obtained by enabling the people in these areas to have at least one assured crop in the year and at maximising its yield by developing the land and water resources of the areas".[1] The Committee further recognised the inadequacy of normal plan schemes to alleviate the conditions in the scarcity areas in the following words : "The objectives embodied in our plans like increasing per capita incomes making the country self-sufficient in food and rapid industrialisation can, in many cases, be achieved quickly or at less cost by a more rapid development of areas which already have some advantages or facilities for development. Unless, therefore, certain basic conditions are deliberately provided, in the scarcity areas in a co-ordinated manner and on a priority basis, the future development of these areas will continue to remain handicapped and the gap between these areas and others would only widen".[1] After outling the essence of the problem of development of these areas, the Committee examined policies then existing in relation to irrigation, soil conservation, animal husbandry, fodder supply, drinking water and development of industries with a view to suggest relative priorities in the programmes for making the areas scarcity resistent. In the concluding portion of the chapter on "Approach to the development of the areas", the Committee observed that the conditions in which development measures are called for are determined by physical resources of each region. The Committee placed larger emphasis on the development programme of these areas but observed : "It is therefore, necessary in framing long term programme for scarcity areas except those which are served by major irrigation to include all measures which are feasible and to arrange them in the order of priority for the purpose of the implementation, the size of the programme being determined by the general aim of making these areas free from recurrence of scarcity condition".[2] The Committee also examined in details the programmes for development of the area in each sector and also alternative programmes within the sector.

7.7. There are no major minerals in the drought prone areas. The natural resources, therefore, consist of land, water and manpower. The development of drought prone areas, therefore, has to depend mainly on the interplay of these three natural resources. Fuller utilisation of these resources can alone bring the development of these areas on par with the other areas.

7.8. Hence the above approach to the development of drought prone areas highlights two important considerations of giving emphasis on the preventive measures and creating conditions which can assure one crop at least during a year. In view of scanty precipitation received by these areas, there are evident limitations for the development of agriculture in these areas. The eradication of drought which is a meteorological phenomenon is not within the reach of human effort at the existing level of scientific knowledge. Irrigation projects also depend upon the rainfall in the catchment areas for the supply of water. Fortunately

[1] Report of Fact Finding Committee, 1960, Chapter V, page 17.

[2] *Ibid.* Chapter V.

the catchment areas of the major irrigation projects which serve the drought prone areas in our State are situated in the high rainfall zone and are not affected by vagaries of rainfall in the drought prone areas. But there are evident limitations to the area which can be served by major irrigation projects. The works for increasing the recharge of ground water have also to depend upon annual precipitation for adequately recharging the ground water. Soil conservation measures can also not be a substitute for adequate precipitation. If precipitation is not adequate, soil conservation measures by themselves will not ensure the crop. When total precipitation itself is inadequate, the measures are unable to retrieve the drought situation. The capacity of agriculture, therefore, to sustain the population in drought prone areas is limited as compared to the capacity of agriculture in other areas and cannot be substantially increased. Under these conditions the measures limited to assure one crop may not make large impact on the living standard of rural population in these areas. There is, therefore, imperative need to design measures which will diversify the economy of these areas by augmenting the employment opportunities in the non-agricultural sector. This can be brought about only if it is realised, that every piece of land need not be meant for cultivation in perpetuity even when it is of advantage to leave it to other persuits. The nucleus of this thinking is found in the report of the Second Irrigation Commission, 1972 which says, "the concept of food deficit areas with the modern development of transport and communication can become irrelevant. It is not necessary for every area to produce food............ Some areas of scanty rainfall, such as Jaissalmir region of Rajasthan or Banni areas of Gujarath must of necessity be diverted to sheep breeding and cattle rearing".[1] Even this approach does not go further than emphasising the development of animal husbandry.

7.9. It has been suggested to the Committee that some lands in these areas could be deliberately withdrawn from agriculture and diverted to non-agricultural sectors. The process of industrialisation suggested corresponds to the process of industrialisation adopted for developing industrially backward areas by inducing industrialisation through concentration on building infra-structure around selected growth points. Creation of infra-structure for industrialisation of this area should be given higher priority bacause of the precarious agrarian condition in these areas.

7.10. The normal sequence through which a region experiences economic development are acknowledged to be as follow :—

(1) Stage of self-sufficient subsistence economy.

(2) Growth through specialisation in production of primary activities and inter-regional trade which can be expected to accompany improvements in transport.

(3) Introduction of secondary industries such as processing of farm and forest products.

(4) Shift to diversified economy with built in internal linkages and rising income and

(5) Advanced stage of economic development.

Report of Irrigation Commission 1972. Letter to Irrigation Minister by Chairman of Irrigation Commission, page XIII, paragraph 6.

7.11. As is evident from the description of stages, the shift from one stage to another implies sectoral shifts within the region. Though the stages describe the process of economic development more or less with precision, they are mainly of historical significance, as it is difficult to identify the stage of growth of a particular region at a particular point of time. The economic picture of the drought prone areas is somewhat blurred in the context of this theoretical framework. Even to-day, the developmental duelism of highly diversified economy in one part and subsistence economy in another is reflected in some of the drought prone districts. In most of the drought prone districts, inter-regional trade has been taking place all these years. Agriculture has also been commercialised to some extent. So also the mechanised processing of farm products is being carried out. But there is stagnation of economy of this region at this level. Two main reasons can be attributed for such economic stagnation. Firstly, the uncertainty in agrarian condition has failed to generate internal process of capital formation. Secondly, the infra-structure necessary for development of non-agricultural activities has not been adequately developed to attract external capital for initiating non-agricultural or industrial development. In short, lack of investible funds and investment opportunities is the main reason for this stagnation.

7.12. The objective of planned effort in this areas should have a perspective larger than the measures designed to assure "one crop" and will have to be directed towards the stabilisation of income levels and ensuring the growth of these areas along with other areas. The planned effort will have to be directed mainly towards:—

(*i*) Provision of drinking water and fodder which are basis necessities of human and cattle life.

(*ii*) Development of all sources of irrigation to the maximum extent.

(*iii*) In the areas which cannot be adequately served by irrigation projects:—

(*a*) Development of agriculture through appropriate dry farming methods where the land capability shows that agriculture can be developed successfully;

(*b*) Afforestation programmes;

(*c*) Diversification of economy by augumenting employment opportunities in the non-agricultural sector by—

(*i*) Development of animal husbandry and dairy farming.

(*ii*) Development of industries.

7.13. The drought prone areas in our State suffer from severe shortage of drinking water in the years of drought. It is the basic necessity of human and cattle life which cannot be ignored and assigned a low priority in any programme of development. The inadequacy of simple measures of digging wells for alleviating this shortage lends severity to the problem of drought prone areas. We have outlined in a later Chapter the necessity of storage schemes for relieving the drinking water shortage in these areas. It is the declared objective of the 15 point programme framed by the government for the removal of poverty to meet the needs of drinking water of every village by a definite date. It cannot be denied that it is necessary to consider the entire drought prone areas on priority basis for this programme.

7.14. Since sizeable population is to depend upon agriculture in these areas, the efforts to make agriculture a viable occupation have to be continued by providing irrigation wherever possible, increasing the productivity of land through soil and water conservation measures; and adopting crops suitable to the soil-climate complex in these areas. Afforestation measures are desirable for ecological effects which they produce in giving vegetative cover to the soil and thus increasing the moisture retentive capacity. We have outlined details of the approach required in each sector in later Chapters.

7.15. There are large stretches of land in the drought prone areas with shallow soils where nothing except grass can be grown even though vain attempts are made to grow crops in these areas. It is necessary to adopt the approach of land use according to its capability. One of the important effects of such shift in the land use will be the fillip which it will give to the development of dairy, cattle breeding, and sheep rearing industries. The ready market for products of such type of activity already exists in the drought prone areas themselves in the big cities and urban areas of these districts. If the infra-structure needed for the development of these activities is created by providing adequate number of artificial insemination centres, key villages centres and prophylatic measures, this activity itself will be able to reduce the burden on agriculture to a considerable extent. Besides, it will satisfy the needs of even drought free areas in respect of meat and milk. Sheep rearing can also facilitate the development of wool industry in these areas. Apart from the creation of necessary infra-structure for the development of this activity it is necessary to ensure marketing facilities for finished products of these activities, through the creation of marketing organisation. We have outlined the approach towards the development of these activities in the later part of this report.

7.16. The basic question relating to diversification of economy of these areas relates to the creation of capital absorbing capacity for attracting the productive investment in these sectors. As in the economically backward areas, the development of a catalytic agent in the form of an urban-industrial infra-structure is the immediate task which has to be undertaken in the near future on priority basis. The drought prone areas deserve priority in this programme over other industrially backward areas as it may be possible to develop agriculture in the latter areas whereas there are limitations for the agricultural development in the drought prone area. The improvement of the communication infra-structure. particularly railway lines will be pace setter in this direction.

7.17. This takes us to the problem of spatial distribution of non-agricultural economic activity within the region. In under-developed countries, the task of regional planning is related with the aspects of development, growth and imbalance. The major problem which the spatial planning has to tackle is the removal of functional and locational imbalances to prevent further deterioration of economic activities. One of the ways suggested for reducing the friction between highly industrialised centre and the underdeveloped farm economies is to create intermediate centres. In an industrially backward drought prone district one may not come acrross the highly developed urban centres. In such areas perhaps, the development of major urban centre itself may propel the industrialisation. The system of development centres is to be arranged in a coherent manner without overburdening few centres and leaving the others under-utilised. In the selection of the growth centres in the drought prone areas the emphasis should be on the availability of infra-structure for industrialisation rather than on the agricultural surplus alone which the region generates on account of availability of irrigation.

7.18. In outlining the necessity of spatial planning in the drought prone areas for accelerating their transition from precarious agrarian economy to predominantly industrialised region, we realise that the wholesale conversion of these areas into industrialised areas may not be possible. It is only in the areas where the deposits of economic minerals are available on a vast scale that such transition usually takes place. According to geological experts, there is no possibility of finding major minerals in these areas. The objective, therefore has to be to prevent the increase in the population depending on agriculture or if possible to reduce the existing population depending on agriculture by creating larger employment opportunities in appropriate non-agricultural sectors. This will result in stabilising the income levels in these areas. For the purpose of ascertaining the possibility of such shifts in occupational distribution, it is necessary to delienate industrial potential and indicate the type of infra-structure needed for fuller utilisation of this potential. The selection of growth centres, extension of concessional finance and the development of urban-industrial infra-structure shall be the core of planning in this direction. It is not possible for our Committee within the limited time at its disposal to delienate industrial potential, build up suitable model for spatial distribution of economic activity and suggest the pattern of industrial investment in each of the drought prone districts. Master plans for development of these areas will have to be prepared for this purpose on the basis of techno-economic surveys. These plans should indicate in an integrated manner the programme in various developmental sectors. We have indicated the guidelines for selection of growth centres, choice of investments and package of incentives needed for accelerating the development in a later Chapter.

7.19. The drought prone areas should be considered as a separate unit of planning. The plan period may correspond with the normal plan period. A considerable detailed exercise in preparing the perspective plan will be necessary to demarcate the areas where according to the land capability use it is possible to make agriculture a viable occupation either through extension of dry farming methods or extension of assured sources of irrigation or areas where the development of subsidiary occupations such as cattle breeding, dairy farming, etc. will be successful. The plan will have to delienate the industrial potential in the area which can reduce or at least minimise the dependence on agriculture. The size of plan, its phasing over a period of years, priorities among the sectors and within the sector will have to be detailed. Since drought is a recurrent feature of these areas, we are of the opinion that a contingency plan indicating an alternative pattern of activities to be adopted in the drought years for relieving immediate distress will have always to be kept ready.

CHAPTER VIII

IRRIGATION

8.1.1. Inadequacy of water being the principal result of a drought situation, ways and means for improving the availability of water to the maximum possible extent has to be the key note of the development of the drought prone areas. This can be achieved in the following ways :—

(*i*) Conservation of all water precipitating on the water deficient areas.

(*ii*) Storing the water during the periods of intense rainfall and using it in the subsequent lean periods.

(*iii*) Transferring the water from the high rainfall tracts to the low rainfall tracts.

(*iv*) Adopting a conjunctive use of surface water and ground water together.

8.1.2. We have discussed at length the water conservation techniques required for the agricultural fields in a separate chapter on Agriculture in this report. The remaining three measures fall under the broad category of 'Irrigation'. Because of the scanty water resources of these areas, the techniques of Irrigation and measures for the development of water resources deserve to be studied thoroughly.

Earlier Commissions and Committees of Inquiry.

8.2.1. That Irrigation can only bring solace to the drought affected tracts has been long recognised by several commissions and committees of inquiry appointed in the past, the more important amongst them being—

(*i*) The Second Famine Commission, 1896-98.

(*ii*) The First Irrigation Commission, 1901-03.

(*iii*) Irrigation Inquiry Committee, 1938.

(*iv*) Surveys by the Gokhale Institute of Politics and Economics, 1940.

(*v*) Fact Finding Committee, 1960.

(*vi*) Maharashtra Irrigation Commission, 1962.

(*vii*) Second Irrigation Commission, 1972.

8.2.2. The earliest protective irrigation works such as the Mutha canals with Storage at Khadakwasla, Krishna canals with weir at Khodshi and Nira left bank canal with an old small storage at Bhatgar and diversion ex Vir were taken up as back as in 1870 and were even completed before the close of the century.

8.3.1. The Second Famine Commission set up by the Government of India after the famines of 1896-97 had recommended that among the measures that may be adopted for giving India direct protection from drought, the first place must unquestionably be assigned to works of irrigation. The Government of India also endorsed this view and appointed the First Irrigation Commission of 1901-1903. The famines of 1876-78 and 1896-98 had already highlighted the need to extend 'irrigation as a protective measure' against future famines. The First Irrigation Commission ascertained 'the utility of irrigation under local conditions of agriculture whether in generally increasing the produce of the land or in securing it from the effects of failure of rainfall', and laid down 'a set of criteria for judging the feasibility of proposals for irrigation work subject of course to the all important reservation that there should be no limit to the expenditure where human lives and safety were involved'. The Commission took into consideration such factors as the estimated total cost of famine relief works in a tract for the preceding 25 years, the population of the tract and the per capita area which should be protected by irrigation. After weighing these factors, it concluded that Government should be prepared to face an expenditure equal to three times the future annual cost of famine relief and remissions of revenue for the sake of preventing famine altogether. According to the Commission, protective works could be sanctioned, without hesitation when the capital cost was not likely to exceed thirty times the net revenue or whenever a net return of three per cent on the actual outlay could be anticipated.

8.3.2. The more important public works recommended by that Commission in the present areas of Maharashtra were the following :—

(1) Chankapur storage on river Girna,

(2) Maladevi storage on river Pravara,

(3) Storage works on the river Gunjavani to feed the Nira Right Bank Canal,

(4) Catchment areas of all rivers originating in the Western Ghats to be investigated for locating as many storage reservoirs as possible to provide irrigation to scarcity tracts.

Chankapur tank on Girna river was accordingly completed in 1911. Godavari canal and Pravara canals (with storages at Darna and Bhandardara respectively) were completed in 1916 and 1938. The work of the Nira Right Bank Canal with a supporting storage at Bhatgar was commenced in 1924 and completed in 1938. The earlier concern for irrigation works appears to have gradually slackened despite the fact that the constitutional reforms of 1919 had authorised the Provincial Government to raise loans for protective works if they could not be financed from current revenues or from the Famine Insurance Fund.

8.4. *Beale's Report.*

8.4.1. Realising the need for enhancing the irrigation facilities for the drought prone areas in Maharashtra, Mr. H. F. Beale, Superintending Engineer had been directed by the Government of Bombay in 1902 to make a hydrographical and hydrological survey of a certain portion of the Bombay Presidency in which an unfailing supply of water could be counted on and where also this water could be used for the irrigation of lands liable to a very fluctuating rainfall and to occasional droughts. After making an extensive study of all the areas of the state which are prone to drought, Beale submitted his memorable "Report on Protective Irrigation in Deccan" in 1910. In the mean while, protective Irrigation projects with storages on the river Darna near Aswali and on Pravara at Bhandardara in the Up Ghat catchments were taken up. Later, on the basis of the surveys made by Mr. Beale, a storage project in the Nira valley at Bhatgar was taken up. All these projects executed have given not only effective protection but also prosperity to four tracts with a total area of over 1·5 lakh hectares from the chronic scarcity districts of Nasik, Ahmednagar, Poona, Satara and Sholapur. In all these schemes the heavy precipitation in Sahyadri ranges is stored and transferred for utilisation in the area receiving scanty rainfall. These schemes have shown how irrigation completely changes the economic condition of the tract which was once facing famine.

8.4.2. Out of the projects Beale had suggested as protective works, the following have been subsequently taken up after independence and are completed or are nearing completion by now :—

(1) Gangapur on Godavari benefiting Nasik District and irrigating 23,257 hectares.

(2) Vir storage on Nira benefitting 26,710 additional hectares in the Nira valley.

(3) Khadakwasla project (Stage I) covering 31,162 hectares of acute scarcity area from the Dhond Taluka of Poona district.

(4) Girna Project with storage at Panzan—for an irrigation potential of 57,115 hectares.

(5) Mula project in Ahmednagar district benefitting 64,347 hectares of a very acute famine area.

In addition, a small scheme on Ghod river has also been completed benefitting 25,300 hectares from famine tract. These six schemes now provide protection to an additional area of over 2·0 lakh hectares in the drought areas of Maharashtra. The rest of the projects surveyed and suggested initially by Mr. Beale have since been included with suitable refinements and modifications in the Master Plan for the development of the Godavari and Krishna basin published in the year 1969 by the Irrigation and Power Department. When these are completed, protection will be available to an additonal area of 10,96,600 hectares. Some of these projects are under execution at various stages *vide* Appendix No. I.

8.5. *Irrigation Inquiry Committee, 1938.*

8.5.1. The importance of major irrigation with laid out canal systems as an effective-protective measure for scarcity areas got another formal recognition by the report of the Bombay Irrigation Inquiry Committee presided over by Late Shri M. Visvesvaraya (in 1938), which said that a canal system of the Deccan primarily designed to protect the country against famine has succeeded in doing so in the areas served by the canal. The very great fall in the expenditure on famine relief since opening of the canals can very reasonably be attributed to their existence and to the protection which they have afforded to those parts of the country against famine.

8.6. *Survey by Gokhale Institute of Politics and Economics : 1940.*

8.6.1. In the report on the survey of the direct and indirect benefits of the Godavari and Pravara canals, Prof. D. R. Gadgil, Director of Gokhale Institute of Politics and Economics in 1942 brought out the greater social benefits of such irrigation works in the drought areas in comparison with the other areas with favourable rainfall in the following words. "The measure of success of irrigation work has also to be judged in relation to the opportunities created for employment of capital and labour resources. The actual benefit will thus depend on the degree to which labour and capital resources were previously under employed or employed in a manner distinctly less remunerative than those available after public investment. In economy like that of the Bombay Deccan, where under-employment of the labour, livestock and other resources is notoriously chronic the effects of such investment must act in a specially beneficial manner much more so than they would in a richer tract with less part time idle labour".

8.7. *Fact Finding Committee of 1960.*

8.7.1. The problems of the scarcity areas were gone into afresh by the "Fact Finding Committee for Survey of Scarcity areas in Bombay State" in 1960. The Committee suggested that the development measures for scarcity area should be taken as an integral part of the 'Plans' and implemented in accordance with a phased programme, because irrigation works in particular require time in survey, preparation and execution. The Committee recommended that provision of the irrigation facilities would generally be the most important measure in any development programme of the area. Well Irrigation being a costly mode of irrigation, particularly in view of the fact that certain wells are found incapable of striking water, should be resorted to only where the flow or more economical modes of providing irrigation are not available.

8.7.2. The Fact Finding Committee of 1960 also recommended that in the scarcity areas, for tracts with shallow and medium soils, where contour bunding and dry farming methods are practised, irrigation water may be provided by a small water dose in the scarcity areas to enable cultivators to bring their crops to maturity with a very light irrigation. About 20% of the area in the irrigation command (extended) was recommended to be reserved for such a treatment.

8.7.3. Further, as the ground water resources in irrigation commands get invariably enriched, the Fact Finding Committee (1960) felt that it should be possible to exploit underground water resources for extension of irrigation in the command of the canal in the scarcity area. The Committee therefore recommended that major irrigation schemes combined with wells and lift irrigation should be provided so as to cover as large an area as possible. Later the Irrigation Commission of the Government of India also endorsed this view and stressed the need for taking ground water resources into account while preparing river basin plans particularly where ground water supply is expected to improve with the advent of canal irrigation.

8.7.4. The Fact Finding Committee of 1960 had suggested high priority to the major and medium schemes that would benefit the scarcity areas. The Committee had then clearly observed that scarcity areas have been exposed to repeated failures of crops for a long time; their economy to-day is precarious and it is necessary to make up for lost time by starting major irrigation works for these areas as early as possible. The present position of the schemes suggested by the Fact Finding Committee of 1960 is as shown in the Appendix No. II enclosed.

8.7.5. As pointed out earlier in our Chapter on criterion and identification of drought affected areas, the Fact Finding Committee of 1960 has not identified a large part of the affected areas, because of their sole reliance on data of Annewari and declaration of scarcity. We have since identified on the basis of rainfall all the drought prone areas. We find that number of irrigation works have been taken up in the areas now identified by us as drought prone but not identified as scarcity affected by the Fact Finding Committee in 1960. In addition four medium projects not mentioned by the Fact Finding Committee in their report of 1960 have been taken up in the areas identified by them as scarcity affected. A list of such works having a total irrigation potential of over 2 lakh hectares is given in Appendix No. III enclosed.

8.8. *Maharashtra Irrigation Commission of 1962.*

8.8.1. All the problems of irrigation in the State as a whole received a careful and comprehensive consideration at the hands of the Maharashtra State Irrigation

Commission which submitted its report in the year 1962. The Commission recommended, amongst other things, that—

(1) the water resources of the State both the surface and underground should be fully exploited within the shortest possible period and that this be done by 1980;

(2) the total water resources both surface and underground are enough only for about 30 per cent. of the cultivated area. It is therefore necessary to disperse the benefits of the irrigation over as large an area of the State as physically possible;

(3) the meagre water resources must be stretched as far as possible;

(4) the water rate structure should be so designed as to recover in the shape of water rates recurring costs including interest charges to the full extent;

(5) with a view to achieve maximum utilisation of the available water resources, water of lower dependability, up to 50 per cent. should be harnessed in those basins where the available yield of 75 per cent. dependability is inadequate;

(6) wherever possible flow irrigation should be combined with lift irrigation;

(7) in the areas not within the command of irrigation projects, underground water resources should be exploited to the full. An underground water resources investigation survey should be initiated forthwith and carried out throughout the State.

These recommendations have been accepted by the Government of Maharashtra in 1964 *vide* extract of Government orders at Appendix No. IV.

8.8.2. With particular reference to the scarcity areas, the Commission observed that until about 1930, preference was being given to the traditionally known scarcity areas in the matter of location of irrigation projects. This was on the lines of Mr. Beale's report. "Most of the existing irrigation works were laid out to serve extensive portions of the scarcity areas but development was allowed to take place according to local response and the need, from a purely technical point of view, of utilising irrigation water as near the upper reaches of the canals as possible, to save transit losses. The contemporary experience is that farmers located in the irrigated areas, particularly where perennial cash crops can be grown become much more prosperous than even those in areas of assured rainfall. The result has been that development of irrigation has been lopsided, in so far as these pockets of all round prosperity have been confined to narrowly circumscribed areas. In short, the social aspects of distribution of benefits of irrigation water have not been given sufficient weightage". The Commission, therefore, recommended that in each river basin irrigation should be spread over as large an area as possible permitting the development of pockets of prosperity all along the river course from the reservoir to the State's borders.

8.8.3. In order that areas along the canals, but out of their command, should also be eligible to the benefit of irrigation, they recommended that 'cultivators should be allowed to pump water from the canals by paying normal rates of irrigation'. They also recommended that 'other forms of irrigation such as wells, should be concentrated in areas which will not be reached by schemes providing flow irrigation'. To achieve equitable distribution of the irrigated area the Commission recommended that fresh applications for irrigation water should also be accommodated by reducing a sanctioned area of existing irrigators to the extent necessary.

8.8.4. With a view to enable an assessment to be made of the benefit of the irrigation, the Commission proposed that socio-economic survey of area proposed to be brought under irrigation should be carried out before construction of a project and also subsequently. For continuous review of the implementation of the irrigation policy, the Commission suggested that Maharashtra State Irrigation Board should undertake this task. An examination of the irrigation policy should be undertaken every 10 to 15 years by the appointment of special commission of inquiry.

8.9. *Second Irrigation Commission of Government of India (1972).*

8.9.1. Recently Second Irrigation Commission was appointed by the Government of India in 1969 stating that " the drought condition in the last four years in several parts of the country and that continued food shortage have brought into sharp focus the importance of providing greater irrigation facilities. In this context the maximum exploitation of both surface and ground water resources within the next four to five plan periods needs greater emphasis and attention ". The Commission's terms of reference, amongst other aspects, requested from the Commission—

(*i*) A report on the contribution made by irrigation to increasing the productivity of land, and providing insurance against the vagaries of rainfall.

(*ii*) An examination in detail of the irrigation facilities available in chronically drought affected and food deficit areas, and suggesting essential and minimum irrigation works to be taken up promptly in such areas.

8.9.2. The Commission recently submitted its report in March 1972 and observed that meaningful irrigation policy of India must have national objectives of a socialistic pattern of society. The Commission, therefore, felt that it would not be in consonance with such a pattern to concentrate our irrigation effort in areas with the most favourable climatic, soil and topographical conditions, even though such an effort would cost less and would certainly give a substantial increase in production, if this meant postponing irrigation indefinitely in less favoured areas, where the agricultural population, is carrying on a precarious form of subsistence agriculture.

8.9.3. Accordingly, the Commission has supported adoption of liberal policy in respect of irrigation works in the drought areas and has recommended that the benefit cost ratio in respect of major and medium works in those areas may be relaxed upto unity. The Commission noted that the Maharashtra Government already allows the relaxation in B.C. ratio in respect of Irrigation schemes costing less than Rs. 3 crores. To achieve the implementation of such works, the Commission also stated that it is necessary to provide special loans at a concessional rates to the States to facilitate the construction of irrigation works in the drought areas.

8.9.4. The Irrigation Commission analysed the possible goals of an irrigation policy under three heads—

(*i*) Maximum production per unit of area,

(*ii*) Maximum production per unit of water,

(*iii*) Maximum area served.

and recommended that generally ' the aim of our canal system should be maximum production per unit of water rather than maximisation of areas served as latter would involve wasteful use of water which is very scarce through larger wastages in the canal system apart from the heavy capital invested'. [But the main ingredients of suitable irrigation policy for the drought areas in particular was indicated by the Commission as below—

(1) For the Chronic Drought areas

(a) first priority to be given to the provision of drinking water;

(b) the next priority may be given to the industries in view of their small requirements and income generating potential;

(c) after meeting domestic and industrial requirements, the balance of water to be used in growing such crops, grass or trees or for animal husbandry, to maximise the income per unit of water.

(2) For Drought areas.

The main policy for drought areas should be the conjunctive use of water from rainfall, surface and groundwater sources, and the introduction of a crop pattern which would provide optimum protection from drought and at the same time ensure a reasonable and reliable income per hectare. Irrigation works in the area should aim at giving '*protective' irrigation to as wide an area as possible* if necessary, by introducing the principle of localisation.

8.9.5. With regard to the size of projects, the Irrigation Commission has observed that "the surest way of providing assured irrigation in a big way is to harness the flow of rivers with big storages. They have large catchments and any variation in rainfall or seasonal fluctutions in downpour would not affect these reservoirs to the same extent as it does in the case of small tanks. During the droughts in 1965 and 1966 the failure of such small tanks was widespread".

8.9.6. It is true that large number of projects are held up on account on inter-State river disputes. The Irrigation Commission therefore feels that the projects which are supposed to give a coverage to the drought zone should be taken up immediately on priority to those projects which do not afford protection to a drought zone, by using the water releases already earmarked for the land in non-drought zone.

OUR RECOMMENDATIONS

8.10. *Storages in Sahayadri*

8.10.1. Fortunately, the drought prone areas of our State are located on the downstream of a heavy rainfall zone of the Sahyadri ranges receiving normal precipitation of 2000 mm. on an average. Counting only the areas above the 1000 mm. of precipitation, this area of 7058 sq. km. receives in all 325 T.M.C. of water of which at least 250 T.M.C. can be considered as a net water surplus of normal precipitation years available for transfer to the drought prone areas on the downstream. This water surplus of the high rainfall tract alone can mitigate the distress of a large tract of over 20 lakh hectares at 30 per cent intensity of irrigation in the gross command and with appropriate crop pattern i.e. about 20 per cent of drought area by assured protection. This is a substantial contribution on the background of the fact that the net irrigation potential in the entire State was estimated at only 30 per cent of the culturable area by the Maharashtra Irrigation Commission in 1962.

8.10.2. Good dam sites are also available close down the slopes of Sahyadri. There the cost of major storage hardly exceeds Rs. 8000/Mcft even in the present days. Because of the narrowness of the valley and less water spread, the submergence of cultivable land is less. Evaporation losses from the reservoir surface are also low; in contrast to the large submergence and evaporation losses caused by the reservoirs in the plains. Foundations are also generally good. Very successful and economic irrigation storages can therefore be built up in this tract rapidly.

8.10.3. Such projects as mentioned in Appendix No. V stand already included in the master plan of the Godavari and Krishna basins. Some of them are already under construction. All these need to be pursued with the utmost priority to provide assured protection to a large tract of chronic scarcity which can get a satisfactory protection from some of these schemes and hence their special importance. The Fact Finding Committee (1960) had already stressed the importance of most of these schemes.

8.11. *Planning for 50 per cent. dependable yields.*

8.11.1. At present the irrigation projects are arbitrarily being designed to utilise 75 per cent dependable flow. This amounts to non-utilisation of, at least, as high as 30 per cent of the water resource available in nature at the prospective reservoir sites *vide* Appendix VI. There is hardly any justification for leaving the valuable resource of water so largely unutilised in the drought areas. Our aim will have to be to maximise the utilisation of the water resource available in nature. With the present arbitrary choice of 75 per cent dependable yield, water in every 3 out of 4 years is being allowed to spill over into the river. In the irrigated tract, this approach gives a total water availability for irrigation over a period of years as high as 92 per cent of the irrigation potential in the aggregate. Even if we use 50 per cent dependable flows at the reservoir site the total water availability in the irrigation tract remains as high as 83 per cent *vide* Appendix VII enclosed, which is quite good for prosperous agriculture. The agricultural economy which is highly dependent on the vagaries of rainfall, having a variability coefficient of the annual rainfall as high as 30 per cent and of the monthly rainfall in monsoon months as high as 100 per cent, can get very well stabilised with an average availability of water as high as 83 per cent for the agriculture. When reservoirs are planned for 50 per cent dependable flows at the dam site, about 20 per cent of the water resource available in nature at the dam site will still be left unutilised *vide* Appendix VIII. The planned utilisation then gets enhanced by 30 per cent over the one planned for 75 per cent dependable yield. This will then be a major step in harnessing the nature's resources for protection to extensive drought areas.

8.11.2. The present arbitrary level of high dependability being insisted upon by the C. W. & P. C. has put an artificial and severe limitation on the total area that could be protected by irrigation. Considering the paramount importance of irrigation in the economic development of the drought area in the State, it is necessary that for the projects for which irrigation command is physically available, the storages should be planned for 50 per cent dependability. For example, in the case of Kukadi and Upper Godavari Projects which benefit the scarcity areas of Ahmednagar and Nasik districts respectively, the economic studies of utilising the flows of lower dependability of 50 per cent for Kukadi and 60 per cent for Upper Godavari, enclosed with this report as Appendices IX and X show that the B. C. ratios of these two projects remain as high as 1·75 and 1·85 even when planned for 50 per cent and 60 per cent. dependable yields, respectively at the reservoir sites. These two projects are at present under construction. The Committee strongly recommends that their planning should be immediately reviewed to maximise their irrigation potential on the lines suggested above. On similar lines, the planning of the following other projects which are yet to be taken up for construction or are under construction needs to be reconsidered immediately to maximise irrigation by extension of canals further into the drought areas.

District		Name of Project	Talukas to be protected by extending the Irrigation.
1. Poona	...	Chaskaman	Sirur.
2. Sholapur	...	Bhima at Ujjani	Mangalwedha and Sholapur.
3. Sholapur	...	Sina at Kolegaon	Madha and Mohol.
4. Satara	...	Krishna at Dhom	Koregaon.
		Krishna at Arphal	Khanapur and Tasgaon.
5. Ahmednagar	...	Sina at Nimgaon	Karjat and Karmala.
6. Nasik	...	Karwa	Niphad.

8.11.3. It is also necessary that the extension and remodelling of the existing canal systems is considered seriously to extend the protective irrigation to a large drought tract. Such extensions and remodelling are called for on the following canals along with the taking up of additional storages in the catchments to tap the balance potential between the 75 per cent and 50 per cent recurrence yields such as at Morewadi on Mula.

District		Canal	Benefitted drought talukas
1. Nasik	...	Godavari Left Bank.	Vaijapur, Gangapur and Paithan.
2. Ahmednagar	...	Mula Right Bank.	Shevgaon and Pathardi.
3. Nasik	...	Girna Right Bank (Fed from Chankapur storage).	Malegaon.
4. Ahmednagar	...	Ghod Left Bank.	Karjat and Karmala.
5. Sholapur	...	Nira Right Bank.	Pandharpur and Sangola.

8.11.4. It is necessary that in all future projects benefitting drought areas, reservoirs should hereafter be planned for harnessing 50 per cent. dependable yields such as at Natambi on Nira and Chaskaman on Bhima.

18.12 *Monsoon surpluses for recharge of water table.*

8.12.1. Even after utilising 50 per cent. dependable flows, the natural flows in the river after the reservoirs are full, in the monsoon of good years i.e. once in

2 years, cannot be utilised and will spill into the rivers. The extra flow of the river can be utilised in good years for charging the underground water table at the eastern tips of the canals—which lie in the drought tracts. Trenches along the murumy open lands can be taken as scarcity works and fed by the surplus waters from the canals in the good years. As a typical case, the study of the flood hydrograph of Mula river at Baregaon Nandur dam site indicates that normally a flow over 600 cusces will be available for a period of one month after the filling of the reservoir in monsoon. Mula right bank canal has a spare capacity of about 700 cusecs and hence it should be possible to divert the spill across the dam through the Mula right bank canal for recharging the groundwater in the tail areas of the project. About 1,500 Mcft. can be utilised for the purpose.

8.13. *Small Tanks.*

8.13.1. Major and medium projects with storages in Sahyadri as planned today, though best suited to serve the purpose of eliminating scarcity permanently from the drought prone areas, cannot cover all the tract and can extend protection to only 20 per cent of the area in the drought zone. Moreover, apart from the principle aim of assured protection against drought, supplementary measures for general rise in the economic standard of this drought area are also required to be taken by making the maximum possible use of the available water in this tract through smaller and dispersed storages all over the tract. Rain precipitation is unfortunately not uniform and 90 per cent of it takes place under the rain storms conditions in a short period of 10 days causing flooding of the nallas and rivers temporarily. Unless this water is arranged to be stored and channelised to the fields, it goes waste to sea and hence the need for development of storage tanks, small or big, at all the possible sites throughout the drought area.

8.13.2. It is true that recent advances in agriculture have opened up the possibility for increase in production particularly with the use of high yielding seeds, fertilisers and pesticides. But this increase is feasible only under irrigation facilities in the drought areas. The farming practices can no doubt obtain better yields, but results achieved can at best be a fraction of those possible in irrigated areas. As can be seen from the table No. 2 mentioned later at paragraph 8.20.2., the yields of rabi jowar, wheat, groundnut, grams, pulses and chillies increase three folds under irrigated conditions. It is, therefore, necessary to cover as large areas from the drought zone as physically possible by irrigation facilities to make adequate water available for agriculture, at least, in the years of good rainfall.

8.13.3. Three types of small storages dispersed through the drought tract can be envisaged; minor irrigation tanks, percolation tanks and village tanks or gaon-talavs, utilising smaller and smaller catchments progressively. This philosophy can be successfully extended right upto the smallest type of catchment in the agricultural farms in the form of 'farm ponds', the details of which are discussed separately in the chapter on Agriculture. Small storages dispersed over the drought areas, distribute the benefit of irrigation as contrary to the concentration of benefits in the tracts of the canal system of the major projects and thereby help strengthening of the economy of the area.

8.13.4. The Grow More Food Enquiry Committee recommended in 1952, that priority should be given to new minor irrigation schemes and to the repairing of existing works. Minor flow irrigation schemes were recommended for a still higher priority. Minor irrigation works have been given more and more importance since then in the overall national policy on irrigation. The Third Plan laid greater stress on various aspects of the minor irrigation programme and got a further fillip in the Fourth Plan. As a result of these measures, the areas irrigated by wells during this period have shown a distinct increase. Accordingly, in Maharashtra also, the annual spending on minor irrigation has been considerably stepped up in recent years and is now 4 times more than what it was at the end of the Third Plan.

8.13.5. In the context of drought prone areas, however, the Fact Finding Committee (1960) suggested that minor irrigation works may be considered as desirable only in areas where the rainfall is assured. 'In areas where the rainfall is not assured such works serve no useful purpose because catchment areas of the minor irrigation tanks lie in the same tract as the area proposed to be irrigated under it. In the year of scarcity when the demand is maximum, supply available in the tank is negligible.' That Committee, therefore, opined that minor irrigation tanks are not very effective in providing relief and protection to the scarcity areas. The cost of water stored in a small tank is also very high. [The present costs (in 1972) of major, medium and minor projects are Rs. 7,500, Rs. 19,000 and Rs. 20,000, respectively per Mcft. of water stored]. Because of such a large difference in the unit costs of major and minor schemes, major projects were considered by that Committee as the cheapest and the most reliable of all the possible irrigation works and were looked upon as the most appropriate protective measures for the famine areas. That Committee, therefore, recommended that major irrigation works must receive the highest priority. Though we generally agree with that view, we feel that the special importance of minor irrigation works in respect of dispersal of benefits and early benefits within 2 to 3 years or so of investment, particularly in areas which cannot get benefits from major and medium projects, should not be lost sight of. Almost the entire cost of the work gets covered by the extra produce within a short span of 5 to 6 years. Investments on these works, therefore, are not a drag on the national economy. Hence, construction of minor irrigation tanks should be taken up to the extent suitable economic sites for storage exist.

8.13.6. It has been the experience that silting of the small tanks in the drought areas is very fast. Because of lack of vegetation cover in the drought prone areas, erosion of the soil from the catchment of the minor tanks is very fast resulting into heavy silting up of the tank beds. The afforestation in the catchment of the medium size and small size irrigation tanks in the drought zone is, therefore, an urgent necessity ; otherwise, the assets created from the construction of medium or small tanks will be lost to the society in a short time.

8.13.7. The Second Irrigation Commission (1972) has already laid stress on the classification of the areas according to the land capability and have suggested that lands with more than 10 per cent slope should be earmarked for forest or pasture and that with less than 10 per cent slope should only be reserved for food and agriculture. The catchment areas generally have slopes more than 10 per cent because of the rolling nature of the land in Maharashtra and hence most of them need extensive afforestation measures if reservoirs have to be useful for longer years. This Committee, therefore, recommeds that small irrigation works should be taken up in the drought prone areas as an integrated programme along with afforestation works in their catchments. Catchments of the major projects are large, but that is not the case with the minor schemes. It should not be difficult to cover these small catchments with adequate afforestation work simultaneously with the construction of the tank and the canals.

8.13.8. *Water harvesting.*—It is of the utmost importance that whatever little precipitation is received in the small catchments should be effectively utilised. For this, it is necessary that the lands are so treated as to increase the run-off of rainfall, say by building contour ditches to collect hillside flows by growing crop in strips which facilitates collecting of the run-off from the strips to the drainage channels. Culturable lands in the catchments need the above type of treatment to augment the availability of water for the minor irrigation tanks which otherwise suffer very badly even with a small deficit in rainfall. It is very necessary that in drought areas, there has to be an integrated approach to soil conservation, water conservation and water harvesting measures. Bunding works in the catchment of minor irrigation tanks should be so designed that surplus water is properly channelised to the natural drainage system. Otherwise the utility of the tank which is very susceptible to rainfall run-off characteristics will greatly diminish.

8.14. *Percolation Tanks.*

8.14.1. Percolation tanks are constructed for very small catchments upto 10 to 12 sq. km. where Minor Irrigation Tanks or bandhara or any other direct irrigation schemes are not technically and economically feasible. These schemes are mainly for improving the ground water supplies to wells for drinking water or for irrigation. The success of the percolation tanks is not directly measurable. The Fact Finding Committee (1960) had requested the State Bureau of Economics and Statistics to carry out a survey of the then existing percolation tanks to assess their usefulness. However, as the data was then incomplete, no conclusion could be drawn from the note on survey done by the Bureau. A detailed survey is now being planned by the Director of Irrigation Research and Development. The real picture about the benefit cost ratio of the percolation tanks will be known only when the results of such a survey are available.

8.14.2. Sites for percolation tanks are to be so selected in the upper reaches of the stream as to store water and pass it on to the subsoil mainly through water bearing strata intercepted in the tank bed. The benefit derived by the such percolation tanks cannot be measured because the actual quantum of water stored in percolation tanks and the actual quantum which re-appears into the wells downstream cannot be correlated with any degree of accuracy. Water from the irrigation tanks is utilised directly for irrigation of crops without involving any additional cost of lifting machinery. Irrigation tank no matter how small it is, was therefore, considered by the Fact Finding Committee (1960) to be more preferable to a percolation tank.

8.14.3. The Second Irrigation Commission of 1972, however, held a different view and expressed in favour of the percolation tank as below. "During our visit to the worst drought affected areas of Maharashtra, we saw the beneficial effects of percolation tanks on wells within their zone of recharge. In Gujarat, appreciable benefits are reaped from the construction of check dams on streams and rivulets. Although percolation tanks and check dams do not provide direct irrigation, their contribution in firming up and augmenting supplies in nearby wells, and thus facilitating irrigation has now been established. Both the Maharashtra and the Gujarat Government place great reliance on these works in their minor irrigation programmes. We recommend that in areas where ground water level is low and irrigation from wells is precarious, specified attention should be given to the construction of percolation tanks, check dams, etc."

8.14.4. We find that the percolation tanks can be successful under certain favourable situation of topography and geology. We have discussed at length separately the role of the percolation tanks in recharging of the ground water in our chapter on Groundwater. We noticed a large number of successful percolation schemes in Poona and Satara districts, where the percolation tanks have helped the improvement of ground water condition. Even if the water does not percolate efficiently, the tank provides a worthwhile storage of water for the community and the cattle around. The very presence of water in a drought area is conducive to general well—being. We, therefore, do not see any objection to the taking up of a large number of such works as scarcity works; on the other hand they should be preferred on account of their nearness to the affected villages and their large employment potential. Even in the normal times they would provide a worthwhile employment potential under employment guarantee schemes.

8.14.5. The scope of bandharas is limited to streams which have sustained flows in fair weather. Because of large scale disafforestation of the catchments, rivers now dry up early and sufficient flows cannot be diverted to the irrigation in fair weather. Hence as long as the forests are not restored in the catchments, the bandhara schemes cannot be depended upon.

8.15. *Lifts from Canals.*

8.15.1. Out of the total precipitation by way of rainfall, only a part appears as a surface run-off which is stored in the lake for purpose of irrigation, water supply, industrial uses etc. In the areas of scanty rainfall of say less than 500 mm. the percentage of runoff to the rainfall is hardly 10 per cent to 13 per cent., while in the area of moderate rainfall of 750 mm. the percentage run-off is 23 per cent i.e. more than 2 times. Thus it can be said that in the areas of scanty rainfall the run-off is much poorer as compared to the areas of moderate rainfall. Where the mean annual rainfall is less than 500 mm. protection to agriculture by minor irrigation tanks cannot be depended upon, because whatever little run-off is received is mostly lost by way of evaporation and absorption. The Committee, therefore, recommends that for all such areas supplies of water from the lakes situated in the high rainfall zones should be considered as the principle source of irrigation and lifts on canals or rivers made perennial by releases from such sources should be liberally allowed in this tract. The additional water available from the 50 per cent dependable yields can very profitably be used for developments of such arid tracts along the canals and the rivers into which the water from Sahyadri storages is released.

8.15.2. It is to be remembered that all the drought areas in the State are not favourably situated with respect to the available water resources. Large areas of Parner in Ahmednagar district and Purandhar in Poona district are situated at such high elevation that no water can possibly reach there either by flow or even with a reasonable lift of 50 m. Such areas are shown by shaded portion in

Appendix No. XI to this Chapter. It is necessary to consider a different approach to the development of these areas as reliable protection by a regular canal system cannot be afforded to these areas. What best can be done is to develop some isolated spots through percolation tanks and small tanks; but because both these have a poor reliability as protection against drought the entire economic pattern of the society in these areas will have to be re-oriented basically from agriculture to non-agricultural activities.

ECONOMICAL USE OF WATER

8.16. *New Methods of Irrigation.*

8.16.1. Irrigation in the scarcity areas will have to be so practised as to conserve water and maximise its use by avoiding losses. It is apprehended that as much as 30 to 40 per cent. of water is lost in conveyance system upto the outlet in the distributary. The loss in the water courses and the fields is estimated to be equal to half the water utilised for irrigation. Some idea about the estimated losses under the different arrangements for irrigation can be had from the Appendix No. XII enclosed. This loss of water in the irrigation field can be avoided if either sprinkler or drip type irrigation is resorted to.

8.16.2. In the sprinkler type irrigation, water is pumped with adequate pressure into the pipe line which is either perforated or is fitted with special nozzles to direct the spray to the root of the plants. Initial investment is estimated to be of the order of Rs. 1,750 per hectare at 1972 rates. Such type of irrigation is, however, generally limited to coarse, sandy or gravelly soils where percolation losses from surface irrigation are high and frequent waterings are required due to poor water holding capacity of the soils. Moreover, under heat of the Sun and winds, losses by evaporation tend to be high. The scope for development of this type of irrigation appears to be limited.

8.16.3. In the drip type irrigation, water is conveyed along the furrows in 12 to 16 mm. diameter tubings fed from larger feeder lines by gravity and the water is allowed to drip slowly through the nozzles or orifices, at zero pressure. This eliminates the loss due to evaporation and provides a steadier wetting of the soils. This system appears to be worth giving a trial in our drought areas. The Irrigation Department and the Agriculture Department should initiate field research and experiments on this system so as to identify the areas, the conditions and the crops for which it can be best suited and then popularise it amongst the farmers.

8.17. *Evaporation in Hot Weather.*

8.17.1. Another method of conserving water is to utilise it fast from the reservoirs, avoiding long time exposure of the reservoir to the Sun and the winds. Evaporation from the reservoirs is very high, almost 50 per cent. of the annual loss, in the months of the hot weather as can be seen from Table No. 1 below.

TABLE No. 1.

Evaporation losses in mm.

District	Monsoon	Rabi	Hot Water	Total
1. Aurangabad	596	774	1,326	2,696
2. Ahmednagar	559	563	1,017	2,139
3. Sholapur	762	836	1,283	2,881
4. Poona	464	452	811	1,727

(*Source.*—Paper by P. K. Raman and V. Satkopan in IMD Science Notes Vol. VI No. 61, titled (Evaporation in India calculated from other meterological factors).

8.17.2. We should be able to avoid this loss if the reservoir water can be utilised earlier. In Kukadi project alone, loss by evaporation is of the order of 1150 Mcft. in the period of hot weather. This is equivalent to a loss of about Rs. 1 crore in terms of investment for equivalent storage or Rs. 25 lakhs annually by way of additional crop production lost. The Committee, therefore, strongly recommends that in the drought zone of Maharashtra, irrigation from reservoirs should be restricted to kharif and rabi seasons only and the irrigation programme be so planned as to deplete the reservoir fully by the end of February. Water that would have been lost in the hot weather by evaporation can then be utilised for irrigating more hectares of lands in the earlier months. It is time that irrigation on existing canals from Godavari, Pravara and Nira is also re-planned on this basis and irrigation benefits extended to additional lands by extension of canals or by additional lifts from canals and reservoirs progressively.

8.18. *Conjunctive Use of Ground Water.*

8.18.1. In the irrigated tract, out of the water applied to the land, at least, 10 per cent contributes to the ground water. Thus in the typical case of the Kukadi project, where gross utilisation is 42 TMC., it is expected that at least 4 TMC. will contribute to the ground water. Even 30 per cent of it is exploited, about 1.3 TMC. should be available for the irrigation in hot weather months from the wells. Even if all of it is used for sugarcane alone, which needs maximum water, a minimum of 2,700 hectares (i.e. 6,600 acres) of cane can be sustained on it during the hot weather period of 120 days. Reservation of water in the reservoir for sugarcane crop in the hot weather is neither beneficial nor necessary in view of the supplies available from ground water and should be avoided hereafter in the drought zone at least. Such an approach should maximise the utilisation of our water resources in the drought areas. Second Irrigation Commission (1972) has also recommended the limiting of the sugarcane crop to areas where irrigation needs during the dry weather season can be met from ground water sources and where suitable blocks can be localised for sugarcane cultivation.

WATER FROM DRAINAGE

8.18.2. On the existing canals in Deccan, part of water supplied for irrigation re-appears in the valleys in the command areas as drainage water. Schemes for collection and disposal of such water in the natural drains have been undertaken. This water can be utilised for irrigation in the lower reaches of the distributary or minor. This results in saving of water to be supplied to each distributary and thus additional area can be brought under irrigation. Experience on the drainage schemes indicates that the amount of water appearing in the drains is at least 10 per cent of the water supplied which is appreciable and should, therefore, be fully exploited.

8.19. *Irrigation Command.*

8.19.1. The Committee noticed that irrigation is being planned for 70 to 75 per cent of the command area i.e. even upto 90 per cent of the culturable area, and we consider this to be far too high. The irrigation projects in the scarcity area are to be looked upon more as protective irrigation schemes and should aim at covering as large tracts as possible so that in the case of failure of monsoon the canal system can extend protection to a large number of fields. The actual intensity of irrigation in the developed irrigation tracts along the Godavari, Pravara and Nira has been less than 40 per cent of the culturable area and the canal tracts have been prosperous and drought resistant with this much intensity. We, therefore, recommend that the canal system in the drought areas should be planned for substantially reduced intensity of irrigation say 50 per cent of the culturable area (i.e. about 30 per cent of the command area). It is true that this needs an extended system of canals with larger initial investment. But the drought from these extended areas will stand permanently eliminated. Thus, for example, in the case of Kukadi project, 66,000 additional hectares of gross command area from the worst drought affected talukas of Shrigonda and Karjat can be extended protection by irrigation with an investment of Rs. 8·0 crores if this revised intensity is adopted. This extra investment required is quite small compared to the heavy expenditure on the relief during the drought years in these talukas.

8.19.2. The Irrigation Commission (1972) has also expressed that in the areas where the total water resources are limited, irrigation should not be concentrated in a small area but should be extensively spread over in a larger tract to maximise the economic benefits per unit of water and extend the benefit of irrigation to as large a number of people as possible. The Maharashtra State Irrigation Commission also held a similar view as mentioned in paragraph 8.8.2. above.

8.20. *Crops in Irrigation Tracts.*

8.20.1. In the low rainfall area, there is scarcity not only of surface water but also of ground water. These areas should, therefore, be utilised, as far as possible, for only such irrigated crops as require less water and give reasonable yields with fewer waterings and withstand longer dry spells. The estimated water requirements for the different crops are given in Appendix No. XIII. These water requirements are tentative. Unfortunately no systematic research data on the optimum requirements of the crops in the field is still available. The Agricultural Universities can do a lot in this direction in the near future. It can however be clearly seen that mug and bajri require very little water, jowar and wheat require 525 mm. oil seeds 750 mm. groundnut, potatoes and L. S. cotton—around 1000 mm. whereas the popular cash crop of sugarcane requires more than 3000 mm.

8.20.2. Further, the yields of jowar, wheat, grams, groundnut are found to increase substantially under irrigated conditions. From the experience in the Deccan, the average yield per hectare under irrigated and non-irrigated conditions are indicated below as an illustration (*vide* Table No. 2). For yields of unirrigated crops, the standard yield per hectare of a typical district like Ahmednagar are taken, while for irrigated crops the same are taken from the data for B.C. ratios supplied by the Agriculture Department to the Irrigation and Power Department.

TABLE No. II

Serial No.	Crop		Average yield in quintals per hectare	
			Irrigated	Unirrigated
1	2		3	4
1.	Paddy			
	(*a*) Drilled ...	...	17	6·57
	(*b*) Transplanted	...	30	...
2.	Bajari			
	(*a*) Local ...	...	...	3·01
	(*b*) Hybrid ...	...	7	...
3.	Jowar			
	(*a*) Kharif ...	...	10	7·15
	(*b*) Rabi ...	...	17	4·35
	(*c*) Hybrid ...	...	30	...
4.	Wheat			
	(*a*) Local • ...	...	14	4·64
	(*b*) High yielding	...	20	...
5.	Maize			
	(*a*) Local ...	...	19	10·09
	(*b*) Hybrid ...	...	37	...
6.	Kharif Pulses	...	11·6	4·26
7.	Gram ...	...	12·5	7·00
8.	Groundnut			
	(*a*) Kharif ...	...	14	4·76
	(*b*) Hot weather	...	19	...
9.	Chillies ...	...	16	6·73
10.	Cotton			
	(*a*) Local ...	...	...	0·92
	(*b*) Long staple	...	20	...
11.	Tobacco (Chewing)	...	5	4·0

8.20.3. It has however to be remembered that even after harnessing all the available resources of water only a part of the culturable area can at best be brought under irrigation in the drought areas. Hence, in order to make the optimum use of the available water only the most beneficial crops will have to be grown. Based on the water requirements and the known yields, an estimation of the possible benefits of various crops per unit of water has been worked out at the 1972 price level and given in the Appendix No. XIII.

8.20.4. From that table it can be seen that in terms of yields in quintals, the maximum return per unit of water is from potatoes and onions amongst the food crops and is about four times that of the common cereals. Vegetables and maize follow next. Amongst the common cereals, maximum yield is given by hybrid rabi jowar and is 50 per cent more than that of wheat. Paddy gives a yield only half of that of jowar.

8.20.5. Per unit of land, however, net return in terms of commercial value is maximum for banana followed by potato, onion and sugarcane and hence the individual cultivator's aspiration to grow these crops. Of these, banana and sugarcane require very large quantities of water.

8.20.6. Net return per unit of water, which indicates the productively per unit of resource, is however maximum in the case of potato, onion and chillies. Only half the return from the above items can be realised from long staple cotton, groundnut, vegetables, hybrid, jowar and banana. Maize, wheat, pulses and sunflower have a marginally better return than these. It is interesting to note that paddy and sugarcane give the lowest return per unit of water used.

8.20.7. From the data supplied by the National Sample Survey to the 2nd Irrigation Commission (1972), the latter observed that cotton shows the maximum increase in the yield under the irrigated condition. In view of the inherent low output of the variety grown in the rain fed areas, it would be unrealistic to expect dramatic results. The Irrigation Commission has, therefore, recommended extension of cotton more and more in the irrigated areas. Requirement of water for growing cotton is relatively small in comparison with the cash benefit it brings. The Commission has strongly recommended adoption of cotton as a principal cash crop in the irrigation command. The important advantage is that it is a seasonal crop and rarely fails in the absence of rain but that is not a case with sugarcane which requires commitment for assured supply throughout the year. The Commission has particularly pointed out that significant results in increasing the yields of pulses and cotton can be achieved under irrigation in the State of Maharashtra.

8.20.8. The crop pattern in the irrigation tracts has to be guided by the productivity values along with the 'need based' priorities of the society. Further, in view of the policy of 'maximisation of area served' as recommended by the Irrigation Commission (1972) for the drought areas *vide* para 8.9.4 above, crops with lesser requirement of water and better productivity should be generally preferred; food and fodder requirement getting a general priority over others. We are strongly of the view that in determining the cropping pattern to be followed in the areas covered by an irrigation system emphasis should be laid on crops which give maximum output per unit of water used subject to the considerations mentioned above. Selection of appropriate crops on this basis may differ from area to area and we recommend that a suitable cropping pattern for each irrigation system should systematically be evolved.

8.20.9. The experiments conducted by IARI have shown that increase in the yields from initial few waterings is spectacular but there is limited addition in the yield at the subsequent waterings. In the area where water is severely limited as in arid areas, a larger area can be served and more farmers benefitted, if the number of irrigations is limited. It is true that such an irrigation system would require larger channels to serve a larger area at each watering, but in view of the better coverage and insurance against scarcity condition under such arrangement this Committee strongly recommends adoption of such a practice on the irrigation canals in the drought areas.

8.21. *Land Development.*

8.21.1. The water which is made available should be 'properly' made available to the crops. For the proper and economic use of water, land development and correct water management practices should be introduced in all the fields. Land development consists of—

(*i*) construction of water courses with suitable drops and distribution arrangements,

(*ii*) construction of graded bunds to prevent soil erosion and removal of excess rain and irrigation water,

(*iii*) construction of field drains for removal of excess water to keep the root zone clear from water logging.

(*iv*) proper land shaping and land grading necessary for spread of water all over the area.

Judicious use of irrigation water is one of the important aspects to be taken care of, especially in chronic scarcity areas. Proper utilisation of water will be possible only through such land development measures. It is experienced that in chronic scarcity districts, manual labour and bullock drawn kenies are available in large numbers. They can be very conveniently used. It is necessary that the work of land development in the commands of all the irrigation tanks is taken up as part of the project work to make the full use of water. This will need an investment of about Rs. 700 per hectare, in addition to the one of Rs. 4,000 to Rs. 5,000 per hectare on the irrigation system, reservoir and canals together. It is worthwhile spending this supplementary amount to realise the full benefits of the large investment in the irrigation system.

8 22. *Irrigation Rates.*

8.22.1. Irrigation schemes should not normally impose a burden on the general revenues. However, in drought prone areas some concessions for recovering the capital cost of irrigation scheme are necessary. In such areas in times of drought, expenditure on relief measures are substantial and a large portion of such expenditure would be saved in case protective irrigation is provided to these areas. The recovery of a reasonable proportion of the capital cost in such areas should be effected through various taxation measures including betterment levy. However, in view of the initial poor financial capacity of the cultivators in the drought zones, this Committee feels that the betterment levy should not be charged for a longer period, say five years, after commencement of irrigation, and its collection should be spread over a longer number of years.

8.22.2. In respect of rates, the 2nd Irrigation Commission (1972) has recommended that they should be related to the gross income from the crops and should range between 5 to 12 per cent thereof, the upper limit being applicable to the cash crops. This is in line with the recommendations of the Maharashtra Irrigation Commission which recommended the irrigation rates at 6 to 12 per cent of the income from the crops. Further the Second Irrigation Commission has also recommended that lower rate may be fixed where the supply is inadequate and uncertain. It is time that the rates are accordingly reviewed and refixed early. The prevalent rates are far low in comparison with the guiding principles mentioned above.

8.22.3. Further for the successful operation of the irrigation schemes on which short sighted farmers do not utilise the available water, it is very strongly recommended that a consolidated assessment on lands which can derive irrigation benefit in normal years, as suggested by the Fact Finding Committee of 1960, should be introduced as early as possible.

8.22.4. Percolation tanks are of use to the cultivators in the surrounding area. It will therefore be reasonable to expect some return of these gains by the farmers to the State Exchequer. Conceding the fact that generally such works are undertaken to ameliorate widespread suffering and to provide protection against recurring failure of crops, it must be remembered that the society bears a heavy burden by way of relaxing the normal economic yardsticks for undertaking more expensive works in such areas. This Committee, therefore, feels that the areas likely to be benefitted should be notified and the beneficiaries should be charged on the basis of the area irrigated by the wells on the downstream. The expert Committee on percolation tanks appointed by the Government of Maharashtra in 1967 had already suggested a minimum rate of Rs. 5 per acre of seasonals from the wells situated in the command of the percolation tanks to cover at least the annual maintenance costs. The Committee on Panchayat Raj in its report in 1971 has already recommended levying of water rates on the beneficiaries as a source of revenue for the Zilla Parishad.

8.23. *Plans for the Future.*

8.23.1. The Irrigation and Power Department has already formulated master plans for the utilisation of water resources of Bhima, Tapi, Krishna and Godavari basins. Similarly, master plans of each district are also being formulated covering minor irrigation schemes in the State sector in operation, under construction and proposed in each district. On completion of all these schemes as planned the total area that is likely to come under irrigation in the drought affected areas of the Maharashtra State will be approximately 14·5 lakh hectares *vide* Appendix No. XIV. The total estimated cost of all these schemes as per the present estimates is Rs. 539 crores and the expenditure incurred upto the end of March 1972 is Rs. 131 crores at the book values. Thus, an additional amount of Rs. 408 crores will be required for completion of all these schemes as planned at present. If these schemes are now replanned for using 50 per cent recurrence yields and for extensive canal systems as recommended by us, an additional investment of the order of Rs. 280 crores will be required—providing at least 4 lakh hectares of additional irrigation. Districtwise figures of total estimated cost, expenditure incurred upto the end of March 1972 and the additional expenditure required for the schemes on the basis of the Irrigation and Power Department's present planning is given in Appendix No. XV. The additional acreage to be added by irrigation in the coming years will be 9·00 lakh hectares according to plans already prepared and 4 lakh hectares in addition by utilising 50 per cent recurrence yields.

8.23.2. A systematic approach to the implementation of all the schemes envisaged in the master plans will be necessary to avoid any lopsided development and to achieve a speedy economic recovery of these distressed areas. The Major/Medium projects which cater to the needs of the acute scarcity areas where the average annual rainfall is less than 500 mm. and the droughts are more intense and frequent, will have to be taken up with the first priority. Amongst the rest catering to the needs of areas of lesser severity, the priority may be given to projects which give a better B.C. ratio.

8.23.3. As already stated in para. 8.9.5, the major irrigation projects which are less affected by the vagaries of monsoon are the best means to protect the scarcity areas from droughts. Moreover the B.C. ratio in their case is much higher even after allowing for the accumulated interest through the years of construction. Hence, while allocating funds major portion of the same ought to be allocated to the major irrigation projects of the drought areas. At the same time, the needs of the other areas which cannot be covered by the major canal system has to be kept in view. The smaller projects fructify early, and return the investment on them within a short span of 5 years, though in years of drought they cannot afford sufficient protection. A balanced approach therefore needs to be adopted so that while speeding up with the major projects requiring heavier investments, disperal of benefits to the rest of the tracts is also achieved.

8.24. *Funds.*

8.24.1. Following the great famines in 1876-78, special fund of Rs. 15 million known as famine relief and insurance funds was set apart every year from 1882, half of it for the development of railways and irrigation if it was not spent on famine relief. The Nira Left Bank canal and Mhaswad tank in Maharashtra were constructed through these funds. The progress on the works aimed at the protection to the drought zone should not be allowed to suffer on account of the variations in the budget provisions from year to year. Instead of spending large amounts on relief measures when faced with scarcity, it is desirable that a certain minimum amount is set aside every year for the development of the drought prone areas— particularly for building up of the irrigation assets therein, so that the projects once taken up can be assured of their funds year to year upto completion within the shortest possible time. In view of the recurring nature of scarcity conditions in the drought areas identified by this Committee, we feel that a standing arrangement on these lines is necessary.

8.25. *Water Resources Organisation.*

8.25.1. Hydrometeorological data are basic to the formulation of any irrigation scheme. In river basins where hydrometeorological stations are inadequate, data for project formulation is also inadequate, particularly when the project is located in the low rainfall area. It is, therefore, necessary that without loss of time, adequate number of hydrometeorological stations are installed in all the river systems in the drought zone and in the Ghat catchments feeding the drought zone. At present there is an organisation under the Irrigation and Power Department for preparation of the individual projects but a technical organisation for assessment of the water resources as a whole is not built up on a permanent footing. To achieve full utilisation of the water resources, for the benefit of the drought areas in particular, our Committee strongly recommends the establishment of a permanent organisation for the assessment of the water resources on a continuing basis. This organisation should be in charge of all the raingauge stations in the State and should analyse the rainfall data collected in liasion with the IMD. It should also gauge the flows in the rivers and reservoirs and build up reliable rainfall—run-off correlations. This organisation should in addition keep track of all the developments of water resources—for irrigation or for drinking water and point out the overstretching of the resources or under utilisations, as the case may be. In the absence of such an organisation there is no coherent organisation to guide the individual enterpreneur also—endeavouring for lift irrigation schemes. It is, therefore, necessary that such an organisation is established early.

H 4485—10

APPENDIX I

(Ref. Paragraph 8.4.2.)

Statement giving the details of schemes benefitting drought prone areas, originally surveyed by Mr. Beale and now included in the master plans of Krishna and Godavari Basins with necessary modifications

Serial No.	Name of scheme	Storage sites	Gross utilisation T.M.C.	Irrigation potential (Th. Hectares)	Talukas benefitted	Present position (in March 1973)
1	2	3	4	5	6	7
1	Upper Godavari	Karanjwan, Ozarkhed and Palkhed.	15·7	44·9	Dindori, Niphad, Yeola, Kopargaon.	Under construction.
2	Karwa	Pimpalgaon Dukra ..	3·2	9·7	Sinnar and Niphad ..	Under investigation.
3	Kukadi	Dimbhe, Manikdoh, Vadaj and Yedgaon.	38·9	120·6	Junnar, Ambegaon, Sirur, Parner, Shrigonda.	Canals and storage at Yedgaon under construction.
4	Chaskaman	Bibi on Bhima	10·0	29·1	Khed, Sirur ..	Canals taken up as scarcity work.
5	Khadakwasla Stage II ..	Warasgaon on Mose a tributary of Mutha.	33·1	20·6	Indapur ..	Canals under construction. Warasgaon dam work being resumed.
6	Krishna	Dhom, Kanher and Arphal ..	35·9	22·3* (64·4)	Koregaon, Tasgaon ..	Dhom dam and canals under construction.
7	Nandur Madhmeshwar (Supplementing Godavari canals ex-Nandur Madhmeshwar).	Mukne on Aundh in Darna valley.	4·5 (As per Beale)	14·5 (Approx)	Kopargaon, Vaijapur	Under investigation.
		Total ..	141·3	261·7		

*Portion for drought prone tract

APPENDIX No. II

(Ref. para 8.7.4.)

Details of projects recommended by the Fact Finding Committee 1960

(Refer : Chapter VI, paras. 8 and 9 of the FFC's report in 1960)

Serial No.	Name of the Project	Talukas benefitted	Irrigation potential in Hectares	Estimated cost Rs. in lakhs	Present position
1	2	3	4	5	6
		(A) POONA DIVISION			
		1. *Poona District*			
1	Tank at Nazre on Karha	Baramati	3,116	49·00	Likely to be completed by June 1974.
2	Tank at Burhanpur on Karha	Baramati ..	5,726	80·40	Found infeasible
3	Warasgaon storage on Ambi and extension of Mutha canals	Haveli, Baramati, Indapur ..	48,078	753·00	Canal extension in progress. Warasgaon Dam started recently.
4	Storage on Bhima at Chaskaman ..	Sirur, Dhond, Haveli ..	30,838	628·00	Canal work taken up as a scarcity work in 1972-73.
5	Pargaon Lift on Bhima	Dhond	14,164	222·80	Deleted.
6	Kukadi project with storages at— .. (*a*) Manikdoh on Kukadi (*b*) Wadgaon on Mina (*c*) Mahalunge on Ghod (*d*) Kandli near Pimpalvandi on Kukadi	Sirur of Poona Distrtict. Parner Shrigonda, Karjat of Ahmednagar and Karmala of Sholapur	1.16,189	3,116·00	Stage I project comprising of storages at Dimbhe, Manikdoh and Yedgaon, cleared by Planning Commission. Work on dam at Yedgaon and Kukadi canals is in progress.
7	Storage on Vel	Sirur	1,619	28·00	....
		Total ..	2,19,730	4,877·20	

H 4485—10a

	2. *Ahmednagar District*				
8	Sina at Nimbgaon Gangurde	Karjat	7,689	139·00	Started as a scarcity work in 72-73.
9	Irrigation Tank at Bhalwani	Ahmednagar	445	7·40	In progress, likely to be completed by June 1973.
10	Adhala Mahalungi scheme	Sangamner	2,894	118·00	Under construction.
			11,028	264·40	
	3. *Sholapur District*				
11	Natambi storage on Nira and Mohori storage on Gunjavani.	Malshiras, Sangola, Pandharpur, Mangalwedha.	82,777	2,109·00	Under investigation.
12	Ujjani Lift on Bhima Stage I	Madha, Mohol, Pandharpur, South. Sholapur.	55,120	697·12	Ujjani storage dam and canals are under construction.
13	Ujjani Lift on Bhima Stage II	Madha, Mohol	33,995	548·90	Do.
14	Sina at Kolegaon	Karmala, Madha, Barshi and Paranda of Osmanabad District.	18,211	229·5	Under investigation.
15	Irrigation tank at Akola	Madha	898	9·67	
16	Irrigation tank at Pandhalkarwadi ..	Mangalwedha	712	6·50	Completed.
17	Khatgaon Storage at Harni	South Sholapur	2,347	40·00	Do.
18	Dahitana storage on Bori	Akkalkot, South Sholapur ..	4,047	152·50	Site-shifted and now known as Kurnoor project. Work nearing completion.
			1,98,107	3,793·19	

APPENDIX No. II—*contd.*

Serial No.	Name of the project	Talukas benefitted	Irrigation potential in Hectares	Estimated cost Rs. in lakhs	Present position
1	2	3	4	5	6
		4. *Satara District*			
19	Yeralwadi	Khatav and Khanapur of Sangli District.	5,666	125·00	Started in 1972-73.
		5. *Sangli District*			
20	Rampur	Khanapur ...	17,111	200·00	Deleted.
		Total for Poona Division ...	4,51,642	9,259·79	
		(B) AURANGABAD DIVISION			
		1. *Aurangabad District*			
1	Upper Godavari Part II Stage I (extension of G.L.B.C.)	Vaijapur	85,392	791·16	Under investigation.
		2. *Bhir District*			
2	Jayakwadi project Stage I (Sindphana) ..	Manjalegaon	18,029	371·71	Paithan dam with left bank canal taken up as stage I. R. B. canal work commenced as scarcity work in 1972.
		Total for Aurangabad Division ...	1,03,421	1,162·87	
		Grand Total ...	5,55,063	10,422·66	

APPENDIX No. III

(*Ref.* para. 8. 7. 5)

Details of Projects previously not included in the list of projects recommended by the Fact Finding Committee (1960) but which have since been taken up between the period 1961 to 1972 in the drought prone areas now identified by this committee.

Major and Medium Projects

Serial No.	Name of the project	Talukas benefited	Irrigation potential in Hectares	Estimated cost Rs. lakhs	Present position
1	2	3	4	5	6
		BOMBAY DIVISION			
		1. *Dhulia District*			
1	Malangaon Dam ..	Sakri	2,261	76·21	Completed.
2	Panzra Dam ..	Sakri	9,640	319·00	Likely be completed by June 1974.
3	Kanholi ..	Dhulia ..	2,045	34·41	Completed.
			13,946	429·62	
		2. *Jalgaon District*			
4	Maayad Dam ..	Chalisgaon ..	2,480	224·27	Likely to be completed by June 1974.
5	Bori ..	Parola ..	5,970	297·30	Taken up in 1972-73.
			6,450	521·57	
		3. *Nasik District*			
6	Upper Godavari ..	Dindori Niphad Yeola ..	44,270	1,428·98	Under construction.
7	Chankapur (raising) ..	Malegaon ..	5,961	302·82	Likely to be completed by June 1974.
8	Haranbari ..	Baglan ..	7,215	179·65	Started recently.
9	Daraswadi ..	Chandor ..	844	27·85	Completed.
10	Bhojapur ..	Sinnar Sangamner ..	6,380	173·65	Likely to be completed by June 1974.
11	Kelzar ..	Baglan.. ..	2,480	118·32	Started recently.
12	Alandi ..	Dindori ..	1,787	178·89	Taken as scarcity work in 1972-73
			68,937	2,410·16	

APPENDIX No. III—Contd.

Serial No.	Name of the project	Taluka benefited	Irrigation potential in Hectares	Estimated cost Rs. lakhs	Present position
1	2	3	4	5	6
		POONA DIVISION			
		1. *Ahmednagar District*			
13	Ghatshil ..	Pathardi Gevrai (Bhir Dist) ..	1,497	71·00	Under construction.
		2. *Sholapur District*			
14	Pangaon Hingni ..	Barshi	5,625	167·77	Under construction.
		3. *Satara District*			
15	Krishna ..	Satara, Wai, Jaoli, Koregaon, Karad, Walwa, Tasgaon and Miraj	99,430	2,766·00	Under construction.
		AURANGABAD DIVISION			
		1. *Aurangabad District*			
16	Gadadgad ..	Kannad ..	1,440	47·32	Completed.
17	Kolhi ..	Vaijapur ..	470	23·12	Do.
18	Galhati ..	Ambad ..	4,860	77·91	Do.
19	Sukhana ..	Aurangabad ..	2,500	107·69	Do.
20	Khelna ..	Sillod	3,400	70·64	Do.
			12,670	326·68	
		2. *Osmanabad District*			
21	Khandala ..	Tuljapur ..	1,326	73·69	Likely to be completed by June 1973.
22	Ulup (Bhandardi) ..	Bhoom ..	1,450	51·05	Started in 1972-73.
			2,776	124·74	
		3. *Bhir District*			
23	Kadi ..	Ashti	1,189	43·52	Completed.
		Grand Total ..	2,12,520	6,861·06	

APPENDIX No. IV

(*Ref*: Para. 8. 8. 1)

Recommendations by the Maharashtra State Irrigation Commission (1962) mentioned in para 8. 8. 1 and orders of the State Government on these recommendations.

Serial No.	Recommendation by Maharashtra State Irrigation Commission.	Orders of the Government.
1	The water resources of the State both the surface and underground should be fully exploited within shortest possible period and that this is done by 1980.	(1) Government accepts the ambitious programme of spending Rs. 1,400 crores upto 1980 for utilising all harnessable water resources in the State subject to availability of financial resources.
2	The total water resources both surface and underground are enough only for about 30 percent of the cultivated area. It is therefore necessary to disburse the benefits of the irrigation over as large an area of the state as physically possible.	(2) Because of geological and Geographical features and crop patterns, pockets of prosperity due to irrigation are not amenable to uniform dispersal areawise hence the recommendation is accepted subject to its own limitations.
3	The meagre water resources must be stretched as far as possible.	(3) Acccepted by Government in principle detailed orders about the measures to be taken to follow.
4	The water rate structure should be so designed as to recover in the shape of water rates recurring costs including interest charges to the full extent.	(4) Accepted by Government.
5	With a view to achieving maximum utilisation of the available water resources, water of lower dependability, upto 50 percent should be harnessed in those basins where the available yield of 75 percent dependability is inadequate.	(5) Recommendation accepted in principle only. Each Project will have to be considered on individual merits for adopting percentage dependable yield.
6	Wherever possible flow irrigation should be combined with lift irrigation.	(6) Accepted in principle as it has far reaching and complex repercussions on the Irrigation policy. Government proposed to take up pilot schemes and on the basis of the results of these pilot schemes, universal adoption will be considered. Government accepted construction of wells in the command of canal on planned and permitted basis.
7	In the area not within the command of irrigation projects, underground water resources should be exploited to the full. An underground water resources investigation survey should be initiated forthwith and carried out throughout the State.	(7) Recommendation to carry out pilot survey in the representative area of the state accepted by Government.

APPENDIX No. V

(*Ref* : Para. 8. 10. 3)

Details of Projects included in the master plan of Krishna and Godavari Basins, serving the drought affected areas identified by this committee

Serial No.	Name of the Project	Gross Utilisation (TMC)	Irrigation in Th. Hectares	Scarcity districts benefited	Remarks
1	2	3	4	5	6
	(A) *Major Projects*				
1	Mahaldevi (W) ..	7·2	20·2	Ahmednagar. ..	I
2	Pravara Canals ex Ozar (S) ..	16·5	29·0	Do. ..	C
3	Mula at Baregaon Nandur (W)	28·1	65·6	Do. ..	P
4	Upper Godavari (W) ..	15·7	44·9	Nasik, Ahmednagar, ..	P
5	Gangapur (S) ..	8·0	17·8	Nasik ..	C
6	Godavari Canals ex Nandur-Madhameshwar (S).	30·3	86·2	Nasik, Ahmednagar .. Aurangabad ..	C I
7	Kukadi (S) ..	38·9	120·6	Poona, Ahmednagar ..	P
8	Ghod (W) ..	10·4	25·3	Do. Do. ..	C
9	Khadakwasla (S) ..	33·1	51·8	Poona ..	P
10	Chaskaman (W) ..	10·0	29·1	Poona ..	P
11	Bhima (W) ..	90·7	119·8	Poona, Sholapur ..	P
12	Nira Canals Ex Vir (S) ..	65·2	129·9	Poona, Satara, Sholapur ..	C
13	*Krishna (S) ..	35·9	22·26	Koregaon, Tasgaon, Miraj Talukas.	P
14	Krishna Canals Ex Khodshi (W).	5·7	14·7	Tasgaon and Miraj Talukas.	C
15	Sina at Kolegaon ..	4·3	12·9	Sholapur ..	I
16	Begampur Lift ..	5·3	24·3	Do. ..	F
17	Sina Lift ..	6·0	8·1	Do. ..	F
18	*Jayakwadi Project Stage I ..	80·1	82·98	Paithan, Ambad, Gevari Talukas.	P
19	Shevgaoh Lift from Paithan reservoir.	(0·5)	10·1	Ahmednagar ..	F
	(B) *Medium Projects*				
1	Adhala at Deothan ..	1·5	3·6	Ahmednagar, Nasik ..	P
2	Mahalungi at Bhojapur ..	1·0	3·2	Do. ..	P
3	Pimpalgaon Dukra (S) (Karwa).	3·2	9·7	Nasik ..	I
4	Kadwa River Works ..	0·7	0·9	Do. ..	C
5	Daraswadi ..	0·2	0·5	Do. ..	P

APPENDIX No. V—contd.

Serial No.	Name of the Project	Gross Utilisation (TMC)	Irrigation in Th. Hectares	Scarcity districts benefited	Remarks
1	2	3	4	5	6
6	Dhor ..	0·4	1·5	Ahmednagar ..	I
7	Erdha ..	0·6	2·0	Do. ..	I
8	Nani ..	0·5	1·6	Do. ..	I
9	Visapur ..	1·4	2·1	Do. ..	C
10	Ghod tail tank ..	0·2	1·0	Do. ..	F
11	Sina at Nimgaon ..	1·8	5·5	Do. ..	P
12	Ghatshil ..	0·4	1·2	Do. ..	P
13	Puspavati (W) ..	0.5	1·7	Poona ..	C
14	Barhanpur ..	1·5	5·7	Do. ..	F
15	Nazre ..	0·5	1·7	Do. ..	P
16	Kundli (S) ..	2·5	6·1	Do. ..	F
17	Nher ..	0·5	2·0	Satara ..	C
18	Yeralwadi ..	0·9	4·5	Do. ..	P
19	Wadgaon Nani ..	0·1	0·5	Do. ..	F
20	Wadgaon Mand ..	0·5	2·0	Do. ..	F
21	Agrani at Shindewadi ..	0·3	1·4	Sangli ..	I
22	Shegaon ..	0·4	1·3	Do. ..	I
23	Nimbavade ..	0·3	0·9	Do. ..	I
24	Mhaswad ..	2·2	4·1	Atpadi and Sangola talukas	C
25	Ashti ..	1·0	1·9	Sholapur ..	C
26	Budhial ..	0·9	4·2	Do. ..	C
27	Mangi ..	1·2	3·9	Do. ..	C
28	Ekruk ..	2·0	2·1	Do. ..	C
29	Higani Pangaon ..	1·6	4·9	Do. ..	C
30	Hingani Hatiz ..	0·9	2·9	Do. ..	I
31	Halchincholi ..	0·2	0·6	Do. ..	I
32	Chikalgi ..	0·7	2·4	Do. ..	F
33	Shiralwadi ..	0·1	0·4	Do. ..	D
34	Padwalkarwadi ..	0·3	0·6	Do. ..	C
35	Dheku ..	0·7	2·7	Auiangabad ..	C

APPENDIX No. V—concld.

Serial No.	Name of the Project		Gross utilisation (TMC)	Irrigation in Th. Hectares	Scarcity districts benefited		Remarks
1	2		3	4	5		6
36	Kolhi	..	0·1	0·5	urangabad	..	C
37	Ambadi	...	0·4	1·1	Do.	..	I
38	Sukhana	...	1·0	4·6	Do.	..	C
39	Lahuki	...	0·2	1·0	Do.	..	I
40	Upper Sindphana	...	0·6	3·6	Bhir	..	C
41	Bendsura	..	0·6	3·7	Do.	..	C
42	Seoni	..	0·1	0·5	Do.	..	F
43	Mohesangvi	..	0·2	1·0	Do.	..	C
44	Mehekari	..	0·7	4·0	Do.	..	C
45	Kada	...	0·5	2·8	Do.	..	C
46	Talwar	...	0·2	0·6	Do.	..	C
47	Kamli	..	0·3	0·8	Do.	..	C
48	Rooti	...	0·3	0·8	Do.	..	C
49	Kadi	..	0·3	0·6	Do.	..	P
50	Khairi	..	0·6	2·0	Osmanabad	..	F
51	Khasapur	..	1·3	4·2	Do.	..	C
52	Chandni	..	0·9	3·7	Do.	..	C
53	Ulup	..	0·2	0·6	Do.	..	P
54	Harni	..	0·6	2·9	Do.	..	C

*Benefits of projects marked thus fall in the non-scarcity zone also.

(*i*) Completed projects indicated as C

(*ii*) Projects under construction as P

(*iii*) Projects under investigation as I

(*iv*) Projects proposed for future as F

Storages in Sahyadri have been indicated by subscript (S).

Catchment areas in Sahyadri have been indicated by subscript (W).

APPENDIX VI

Natural water resources not utilised by Planning of project for 75 percent dependable flow.

(Ref. Para 8·11·1)

(*i*) Upper Godavari	.. (Statement VI/1)	40%
(*ii*) Kukadi	.. (Statement VI/2)	29%
	Total ..	69%
	Average	34.5
	Say ..	35.00%

STATEMENT VI/1

UPPER GODAVARI PROJECT

Statement of quantity of water which cannot be utilised if the reservoir is planned for 75 per cent. dependable flow.

Year	Available yield TMC	Utilisation TMC	Surplus TMC
1914 ..	62.2	15.7	46.5
1919 ..	38.3	15.7	22.6
1912 ..	37.2	15.7	21.5
1917 ..	36.9	15.7	21.2
1907 ..	36.4	15.7	20.7
1915 ..	28.6	15.7	12.9
1913 ..	26.2	15.7	10.5
1921 ..	24.1	15.7	8.4
1916 ..	22.9	15.7	7.2
1908 ..	20.2	15.7	4.5
1910 ..	19.7	15.7	4.0
1922 ..	19.1	15.7	3.4
1924 ..	17.1	15.7	1.4
1923 ..	16.5	15.7	0.8
1909 ..	15.7	15.7	..
1911 ..	12.2	12.2	..
1906 ..	11.7	11.7	—
1918 ..	10.5	10.5	..
1925 ..	8.6	8.6	..
1920 ..	7.3	7.3	..
Total ..	471.4	285.8	185.6

∴ % of surplus to available yield

$$\frac{185\cdot6}{471.4} \times 100 = 39.37$$

say 40%

STATEMENT VI/2

KUKADI PROJECT

Statement of quantity of water which cannot be utilised if the reservoir is planned for 75 per cent. dependable flow

Year	Available MCFT	Utilisation MCFT	Surplus MCFT
1913 ..	93,699	42,913	50,786
1914 ..	91,422	42,913	48,509
1916 ..	84,667	42,913	41,754
1912 ..	74,464	42,913	31,551
1910 ..	72,060	42,913	29,147
1907 ..	64,857	42,913	21,944
1908 ..	63,092	42,913	20,179
1924 ..	62,792	42,913	19,879
1909 ..	59,415	42,913	16,502
1919 ..	58,008	42,913	15,095
1915 ..	56,774	42,913	13,861
1917 ..	49,468	42,913	6,555
1923 ..	46,730	42,913	3,817
1921 ..	43,421	42,913	508
1922 ..	42,913	42,913	..
1911 ..	37,550	37,550	..
1925 ..	33,620	33,620	..
1906 ..	30,501	30,501	..
1920 ..	29,255	29,255	..
1918 ..	18,893	18,893	..
Total ..	11,13,601	7,93,514	3,20,087

∴ % Surplus/available

$$= \frac{320087}{1113601} \times 100 = 28\cdot74$$

Say 29·00%

APPENDIX VII

(Ref. para 8.11.1)

Availability of Water for Irrigation with 75 percent 50 percent dependbable yeilds

Kukadi Project—50 % dependability

(50 % dependable yield = 58008 Mcft)

Annual yields less than 50 % dependable

Yield (Mcft.)	% to 50 % dependable yield.
56,774	97·87
49,468	85·28
46,730	80·56
43,421	74·85
42,913	73·98
37,550	64·73
33,620	57·96
30,501	52·58
29,255	50·43
18,893	32·57
	670.81

Weighted average for 20 years = (100×10 +670·81)/20=83·54%

Kukadi Project—75% Dependability

(75 % dependable yeild = 42910 M cft.)

Annual yields less than 75 % dependable

Yield (Mcft.)	% to 75 % dependable
37,550	87·50
33,620	78·34
30,501	71·07
29,255	68·17
18,893	44·02
	349·10

Weighted average for 20 years (100 × 15+ 349·10)/20 = 92·45%

APPENDIX VIII

Natural water resources not utilised by planning of Project for 50 per cent dependable flow
(Ref. : para 8·11·1)

Upper Godavari ..	..	(Statement VIII/1).	28%
Kukadi ..	..	(Statement VIII/2).	13%
		Total ..	41%
		Average	20.5%
		Say	20.00%

STATEMENT No. VIII/1

Upper Godavari Project

Statement of quantity of water which cannot be utilised if the project is planned for 50 per cent dependable flow

Year	Available yield TMC	Utilisation TMC	Surplus TMC
1914 ..	62·2	20·2	42·0
1919 ..	38·3	20·2	18·1
1912 ..	37·2	20·2	17·0
1917 ..	36·9	20·2	16·7
1907 ..	36·4	20·2	16·2
1915 ..	28·6	20·2	8·4
1913 ..	26·2	20·2	6·0
1921 ..	24·1	20·2	3·9
1916 ..	22·9	20·2	2·7
1908 ..	20·2	20·2	....
1910 ..	19·7	19·7	....
1922 ..	19·1	19·1	....
1924 ..	17·1	17·1	....
1923 ..	16·5	16·5	....
1909 ..	15·7	15·7	....
1911 ..	12·2	12·2	....
1906 ..	11·7	11·7	....
1918 ..	10·5	10·5	....
1925 ..	8·6	8·6	....
1920 ..	7·3	7·3	....
Total ..	471·4	340·4	131·0

Therefore surplus to available yield

$$\frac{131\cdot 0}{471\cdot 4} \times 100 = 28\ \%$$

STATEMENT VIII/2

Kukadi Project

Statement of quantity of water which cannot be utilised if the project is planned for 50 per cent dependable flow

Year	Available yield Mcft.	Utilisation Mcft.	Surplus Mcft.
1913 ..	93.699	58,008	35,691
1914 ..	91,422	58,008	33,414
1916 ..	84,667	58,008	26,659
1912 ..	74,464	58,008	16,456
1910 ..	72,060	58,008	14,052
1907 ..	64,857	58,008	6,849
1908 ..	63,092	58,008	5,084
1924 ..	62,792	58,008	4,784
1909 ..	59,415	58,008	1,407
1919 ..	58,008	58,008	....
1915 ..	56,774	56,774	....
1917 ..	49,468	49,468	....
1923 ..	46,730	46,730	....
1921 ..	43,421	43,421	....
1922 ..	42,913	42,913	....
1925 ..	33,620	33,620	....
1911 ..	37,550	37,550	....
1906 ..	30,501	30,501	....
1920 ..	29,255	29,255	....
1918 ..	18,893	18,893	....
Total ..	1,113,601	969,205	144,396

Therefore surplus to available yield

$$\frac{14\cdot 43}{11\cdot 13601} \times 100 = 12\cdot 97$$

Say 13%.

APPENDIX No. IX

(Ref. Para. 8·11·2)

KUKADI PROJECT

Calculation for B. C. Ratio for a project planned for utilising 50 per cent dependable yield

			Rs. Lakhs
I. Value of Irrigated Produce—			
(a) Existing Irrigation system (as per project report)		..	9,47·98
(b) Extended Canals (Statement IX/1)		..	8,45·03
	Total	..	17,93·01
II. Deduct value of existing produce—			
(i) Existing Project (As per Project report)		..	90·62
(ii) Extended Canals (Statement IX/1)		..	84·18
	Total	..	1,74·80
	Net	..	16,18·21
III. Add benefits due to fish—			
Culture (as per project report)		..	12·00
	Total : (B)	..	16,30·21
IV. Cost of Project—			
(a) Existing		..	32,00·00
(b) Extension (as per Statement IX/2)		..	28,41·00
			60,41·00
(c) *Add* development charges at Rs. 150 per acre on			
Exiting C. C. A.	2,01,000		
C. C. A. of extention :			
(a) 80 per cent of C. C. A. i.e. 3,20,000)	2,56,000	..	6,85·65
	4,57,000 Acres		
	Total investment	..	67,26·65

APPENDIX No. IX—*contd.*

V. Annual cost—		Rs. lakhs
Interest charges @ 10 per cent ..	..	6,72·67
Depreciation @ 1 per cent ..	..	67·27
Administiative charges at Rs. 10 per acre of irrigation	..	39·86
	Total (C) ..	7,79·80

Existing	.. ..	184,600
Extension	.. .. ..	214,000
Total	..	398,600 Acres

B. C. Ratio—1,630·21/779·80=2·09

With factor of availability at 0·8354 (*vide* Appendix VII)

Corrected B. C. Ratio=2·09×0·8354=1·75

Corrected B. C. Ratio for 75 per cent dependable yield with a factor of availability at 0·9245 =2·16*×0·0245=2·00

[*As per project report March 1965.]

STATEMENT No. IX/1

KUKADI PROJECT

Calculations for B. C. Ratio for a project planned for utilising 50 per cent dependable yield

(a) Value of irrigated produce in the command of extended Kukadi Left Bank Canal

Crop	Area (Acres)	Yield	Rate (Rs.)	Price (Rs. lakhs)	Material expenses seed and manure: Rate (Rs.)	Material expenses seed and manure: Amount (Rs. lakhs
Jowar ..	1,07,000	6Q/Acre	41/per Q	2,63·22	41·5/Acre	44·4
Groundnut ..	1,07,000	8Q/Acre	67/per Q	5,73·52	42·0/Acre	45·0
				8,36·74		89·4
Ducted 10 per cent for farm harvest price ..			..	83·67	*Add* 33 per cent for fodder, implements.	29.5
				7,53·07		118·9
Add fodder and dung at 28 per cent				2,10·86		
			Total ..	9,63·93	Rs. lakhs.	
Net benefits	..	..	..	9,63·93—118·90=845·03		

(*b*) Value of existing produce in the command (Ahmednagar district).

Net existing produce prior to irrigation for 95,100 acres is Rs. 37·37 lakhs (please *vide* page 419 of Vol. II of Project Report, 1965).

$$\therefore \text{ for additional } 2{,}14{,}000 \text{ acres} = \frac{2{,}14{,}000 \times 37\cdot 37}{95{,}100}$$

$$= \text{Rs. } 84\cdot 18 \text{ lakhs.}$$

STATEMENT No. IX/2

Replanning of Kukadi Project for 50 per cent reliable yield

(Increase in the estimated cost)

I. Yield as given in the approved report of the project (1965)—

(1) 75 per cent reliable yield : 42,913 Mcft.
(2) 50 per cent reliable yield : 58,008 Mcft.
(3) Extra water available 16,095 Mcft. i.e. 40 per cent extra.

II. *Cost*—

(1) Cost of head works : for storage of 42,913 Mcft. ..Rs. 1,917·00 lakhs as per project report 1965.

	Rs. lakhs
Manik doh	4,83·00
Yedgaon	2,86·50
Pimpalgaon Joge	1,39·00
Dimbhe	7,98·00
Wadaj	1,94·50
Basti	16·00
Total ..	19,17·00

(2) *Cost of Canals*

(*a*) Kukadi L. B. C. *ex.* Yedgaon ..	6,18·00
(*b*) Ghod *via* Dimbhe Mina ..	3,32·00
	Rs. 9,50·00 lakhs.

III. *Water requirements.*—As proposed in the project report, 1965—

	Area (Acres)	Net Utilisation (Mcft.)
(1) Kukadi L. B. C.	105,000	24,150
(2) Ghod Mina Canal System—		
(*a*) high rainfall zone	21,400	5,240
(*b*) low rainfall zone	57,600	10,610
	184,600	40,000

IV. *Storage.* (TMC)—

	Gross	Live	Losses
(1) Manikdoh	10·88	10·22	1·09
(2) Yedgaon	3·30	2·30	0·45
(3) Pimpalgaon Joge	3·80	3·60	0·53
(4) Dimbhe	10·80	10·30	0·78
(5) Wadaj	1·65	1·35	0·06
(6) Basti	....	....	....
	28·43	27·77	2·91

V. *Costs of storages per Mcft.* Statement No. IX/2—*Contd.*

(1) Manikdoh	4,450	Average : Rs. 19,17,00,000 / 28,430 = Rs. 6,750
(2) Yedgaon	8,700	
(3) Pimpalgaon Joge	3,660	
(4) Dimbhe	7,400	
(5) Wadaj	11,800	

VI. Water required to be stored tor decreased (50 per cent) reliabilty at 66·5 per eent of propoesec utilisation i.e. in ratio of 28·43 TMC/42·91 TMC=38,600 Mcft.
Extra storage required 38,600-28,430=10,170 Mcft.

VII. Cost of Extra Storage at the average rate of 6,750 at 1965 level of rates = Rs. 675·00 lakhs

VIII. Net utilisation for 50 per cent reliability.

$$= \frac{40.0}{42.91} \times 58\cdot0 = 54\cdot2 \text{ T. M. C.}$$

Net extra utilisation = 54·2—40·00
= 14·2 T. M. C.

IX. Extended canal for this extra utilisation is proposed to grow Ground nut in Kharif and Jowar in Rabi.
Duties adopted (as per project report) Rabi Jowar 200 acres/cusec; Kharif Groundnut 200 acres/cusec.

Requirement per 1,000 acres of gross irrigation=66·2 Mcft. (Vide statement XI/3).

X. Therefore exra irrigation coverage possible in the drought areas of Shrigonda and Karjat Talukas

$$= \frac{1000}{66\cdot2} \times 14{,}200$$
$$= 2{,}14{,}000$$

G. C. A. required $= \frac{2{,}14{,}000 \times 1{,}58{,}200}{1{,}05{,}600}$
= 3,20,000 Acres (500 square miles).

XI. G. C. A. available in 50 miles of extended canal 300 square miles—
Additional 4 miles at 50 square miles/mile being on ridge of Sina and Bhima—200 square miles

Total .. 500 square miles

XII. length of canal to be extended 54 miles.

XIII. The discharge at head of canal will have to be increased by 2,780 cusecs (vide Statement IX/3)

Cost of increasing the capacity of existing Kukadi L.B.C. canal from 1,450 cusecs to 1,450 +2,780=4,230 cusecs. Present cost : Rs. 554·72 lakhs for main canals only (excluding distributaries) Cost/cusecs Rs. 38,200×2=Rs. 75,400 . Length of existing canal : 77 miles.

Cost per cusec mile $= \frac{76{,}400}{77}$

= Rs. 990
Say Rs. 1,000 per cusec mile.

Additional cusec miles $= \frac{2780}{2} \times 54$

= 75,200

XIV. (*a*) Cost of extended canals = 75,200×1,000
= 752 lakhs

(*b*) Cost of remodelling the earlier 77 miles of canals: $\frac{554\cdot72 \times 2780}{1450} = 1063\cdot50$ lakhs

XV. Cost of distribution system at Rs. 40 per acre of irrigation=2,14,000×40=85,60,000 =Rs. 85.60 lakhs.

STATEMENT No. IX/2—*contd.*

XVI. Additional cost of the project for increased scope of irrigation—

	Rs. lakhs
(i) Increase in cost of head works	675·00
(ii) (a) Extension of canals	752·00
(b) Remodelling and extension of canal	1,063·50
(iii) Distribution for extended canals	85·60
Total ..	2,576·10

Centage charges (a) Estt. at 7 ½ per cent (b) T & P 1 ½ per cent	2,31·85
Audit charges at 1 per cent on works	25·76
Secretariat charges at 3 ½ per cent on Estt. ..	6·76

Total centage charges..Rs .2,64·37 lakhs.
Total additional cost.. Rs. 2,840·47 lakhs.
Say Rs. 2,841 lakhs.

STATEMENT No. IX-3

Kukadi Project-Planning for 50 per cent dependable flow

(1) Storage requirement per 1,000 acres in extended areas.

Serial No.	Name of crop	Area (Acres)	Kharif Duty	Kharif Water required (cusec)	Rabi Duty	Rabi Water required (cusec)
(1)	Kharif Ground nut	500	200	2·5	..	..
(2)	Rabi Jowar	500	....	....	200	2·5
	Canal losses at 25 per cent		..	0·62		0·62
				3·12		3·12
	Number of days ..			122		123
	i.e. at			10·54 mcft/cusec		10·63 Mcft/cusec
				33 Mcft,		33·2Mcft.
		∴Total=		66·2 Mcft of storage for 1,000 acres of irrigation.		

(2) Canal Discharge per 1,000 acres.

AI/DC=4. Rotation 24 days

$$\therefore \text{Canal discharge} = \frac{1{,}000}{24 \times 4} \qquad 10\cdot4 \text{ cusecs}$$

Add 25 per cent losses 2.6 cusec

13·00 cusec

$$\therefore \text{Canal capacity required} = \frac{13 \times 214000}{1000}$$

$$= 2780 \text{ cusecs}$$

APPENDIX No. X

(Ref. Para. 8·11·2)

UPPER GODAVARI PROJECT

Calculations for B. C. Ratio for a project planned for utilising 60 per cent dependable yield

		Rs. in Lakhs
(1) Agricultural produce in the commanded area (statement No. X/1) ..		5,62·28
(2) Fish produce (As per project report)		6·32
(3) Water supply (As per project report)		0·50
		5,69·10
Deduct net value of existing produce (as per project report) ..	(command)	131·80
.. ..	(sub-mergence.)	+8·75
		1,40·55
Net additional benefit (B)		4,28·55

Cost of project: 14,24·98 Cost for 75 per cent dependability (15-7 TMC)
+2,85·00 Extra 3·4 TMcft storage and canal system.

17,09·98

Annual cost

10 per cent Interest		171·00
1 per cent Depreciation		17·10
Administration charges at Rs. 10 per acre for (1,05,100 acres)		10·51
	Total (C) ..	198·61

$$\therefore \text{Annual B. C. Ratio} = \frac{428\cdot55}{198\cdot61} = 2\cdot15$$

Factor for availability as per statement No. X/2=0·86

Corrected B. C. Ratio taking into consideration availability =0·86×2·15=1·85

(B/C Ratio for 75 per centage reliability as per project report =1·67)

Factor for availability as per statement No. X/2=0·91

Corrected B. C. Ratio taking into consideration availability =0·91×1·67=1·52

STATEMENT No. X/1

Upper Godavari Project

Calculation for B. C. Ratio for a project planned for utilising 60 per cent depen dable yield

Value of Irrigated Produce in the command

Serial No	Name of Crop	Area (Acres)	Yield	Rate (Rs.)	Price (Rs. in lakhs)	Material Expenses				Total	Remarks
						Seed		Manure			
						Rate	Amount (Rs. in lakhs)	Rate (Rs.)	Amount (Rs. in lakhs)		
1	2	3	4	5	6	7	8	9	10	11	12
1	Sugarcane	8,408	45 t	60/t	227·01	180	15·13	700	58.86		
2	Other Perennials	4,204	20 Mds	80/Md	67·26	300	12·61	....	....		
3	Paddy	10,510	20 Mds	45/Q	33·63	8	0·84	60	6·31		
				16/Md							
4	Onions Kharif	10,510	150 Mds	6/Md	94·59	150	15·76	....	....		
5	Vegetable Kharif	10,510	20Mds	25/Md	52·56	150	15·76	....	....		
6	Groundnut Kharif	11,561	25 Mds	67/Q	72.26	17	1·97	25	2·89		
				25/Md							
7	Wheat Rabi	12,612	15 Md	55/Q	37·84	16	2.02	40	5·04		
				20/Md							
8	Jowar Rabi	26,275	15 Md	40/Q	59·12	2	0·53	40	10·51		
				15 Md							
9	Onions Rabi	10,510	150 Md	6/Md	94·50	150	15·76	....	....		

Follow on Crops

10	Wheat	16,816	15 Mds.	20/Md.	50·45	16	2·69	40	6·73	
11	Gram	10,510	12 Mds.	48/Q 18/Md.	22·70	8	0·84	15	1·58	
12	H. W. Maize	5,255	20 Mds.	20/Md.	21·02	16	0·84	40	2·10	
13	Vegetables	5,255	20 Mds.	25/Md.	25·27	150	7·88	..	....	
14	Kharif Groundnut	5,255	25 Mds.	25/Md,	32·84	17	0·89	25	1·31	
15	Kharif Maize	5,255	20 Mds.	20/Md.	21·02	16	0·84	40	2·10	
16	Rabi Maize or Jowar	10,510	15 Mds.	15/Md.	23·64	16	1·68	40	4·20	
					336·79		96·04		101.63	197·67

Deduct 10% For Farm harvest price	93·68	Add 10% Fodder expenses 3% Implement	25·70
		20% Labour Charge	168·62
	843·11	Total ..	391·99
Add 30% fodder on items 3, 6, 8, 11, 12,14, 15 and 16.	85·87		
	928·98		
Add 3% dung receipts	25·29		
	954·27		

Net benefit 954.27—391·99 = 562.28 lakhs.

STATEMENT No X/2

UPPER GODAVARI PROJECT

Correction factors for B. C. Ratio as per water availability

75 per cent dependability

Yield (TMC)	No of Years		Per cent		
15·7	15	×	100	=	1500·0
12·2	1	×	77·7	=	77·7
11·7	1	×	74·5	=	74·5
10·5	1	×	67·0	=	67·0
8·6	1	×	54·8	=	54·8
7·3	1	×	46·5	=	46·5
	Total				1820·5

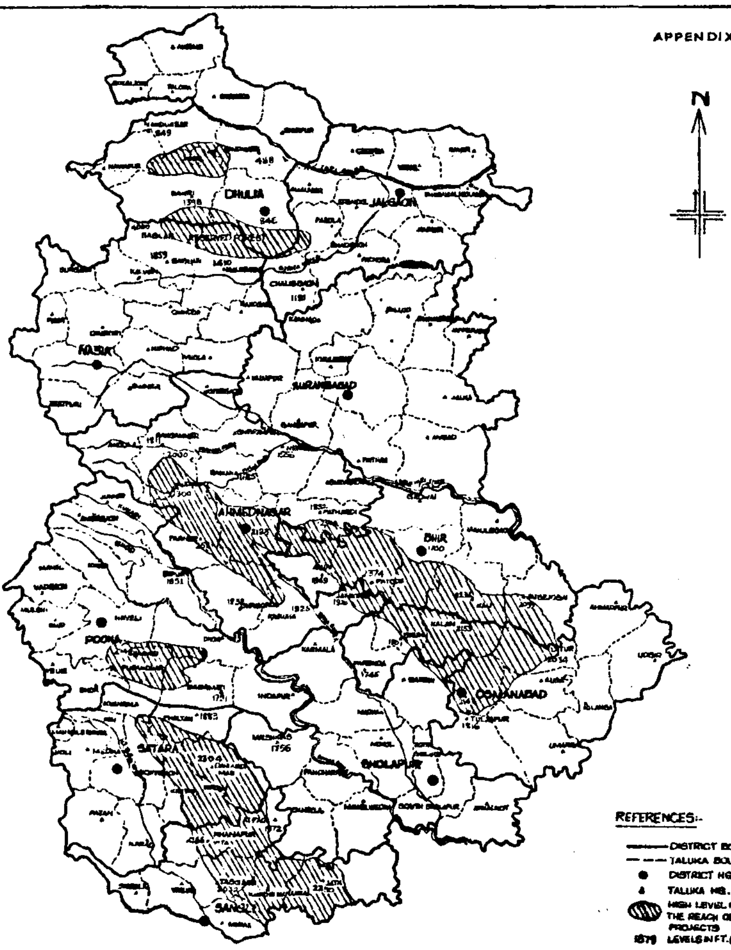
60 per cent dependabiiity

Yield (TMC)	No of Years		Per cent		
19·1	12	×	100	=	1200
17·1	1	×	89·5	=	89·5
16·5	1	×	86·5	=	86·5
15·7	1	×	82·2	=	82·2
12·2	1	×	64·0	=	64·0
11·7	1	×	61·3	=	61·3
10·5	1	×	55·0	=	55·0
8·6	1	×	45·0	=	45·0
7·3	1	×	38·3	=	38·3
	Total				1721·8

$\therefore$ Weighted average $= \frac{1820\cdot5}{20} = 91\cdot02\ \%$

$\therefore$ Weighted average $= \frac{1721\cdot8}{20} = 86\cdot09$

APPENDIX No XI



MAP
OF
DROUGHT AFFECTED AREAS
OF
MAHARASHTRA STATE
SHOWING HIGH LEVEL PATCHES BEYOND THE
REACH OF MAJOR IRRIGATION PROJECTS

SCALE 1CM =10 KM

APPENDIX No. XII

(*Ref*: Para. 8·16·1)

Losses in Irrigation System

(Figures of percentages)

Nature of Irrigation System	Losess in Canals	Losess in Distributaries	Losess in Water courses	Wastage on the field	Utilisation by crops	Approximate recommended intensity of irrigation
1	2	3	4	5	6	7
Entire system unlined ..	15	7	22	27	29	35
Only canals lined ..	4	7	25	30	34	41
Canals and distributaries lined	4	2	26	32	37	45
Whole system lined ..	4	2	6	42	46	56
Whole system lined and sprinkler irrigation introduced.	4	2	6	6	82	100

Source— Report on, 'Possibilities of Sprinkler Irrigation in India' by K. B. Khushlani in Fourth Congress on Irrigation and Drainage, Madrid — 1960.

Notes— Data appears to be based on studies carried out on Canals in Indo-gangetic plains.

APPENDIX No XIII

(*Ref* : Para. 8.20.1)

Statement giving water requirements, yields and net returns of the crops

Serial No.	Name of the crop	Life Period days	Total water requirements Metres	Yield in Quintals per hectare	Yield in Quintals per hectare metre	Yield in Quintals per Mcft.	Net return Rs. per hectare	Net return Rs. per hectare metre	Net return Rs. per Mcft.	Remarks
1	2	3	4	5	6	7	8	9	10	11
				A—Cereals						
1	Hybrid Bajri (Kharif)	95	0·450	7·0	15·6	44·2	486	1,080	2,832	
2	Jowar (Rabi)	135	0·450	17·0	37·8	107·0	525	1,170	3,313	
3	Maize (Hybrid)	100	0·450	37·5	83·3	235·9	995	2,211	6,261	
4	Hybrid Jowar (Rabi)	120	0·525	30·0	57·1	161·7	761	1,450	4,106	
5	High Yielding Wheat	120	0·525	20·0	38·1	107·9	1,112	2,120	6,003	
6	Paddy drilled (Kharif)	135	0·825	17·5	21·2	60·0	670	810	2,294	
				B—Commercial Crops						
7	Grass—Blue Panic	90	0·300	300·0	1,000·0	2,831·7	1,350	4,500	12,743	
8	Mung (Kharif)	70	0·350	12·0	34·3	97·1	715	2,043	5,785	
9	Pulses (Kharif)	70	0·350	11·6	33·1	93·7	684	1,954	5,533	
10	Sunflower (Kharif)—Irrigated	110	0·350	10·0	28·6	81·0	810	2,314	6,552	
11	Gram—Irrigated	90	0·350	12·5	35·7	101·1	773	2,209	6,255	
12	Sunflower (Rabi)	110	0·525	12·0	22·9	64·8	1,062	2,023	5,728	

APPENDIX No. XIII—*contd.*

(*Ref.* : Para. 8·201)

Serial No.	Name of the crop	Life Period days	Total water requirements Metres	Yield in Quintals			Net return Rs.			Remarks
				per hectare	per hectare metre	per Mcft.	per hectare	per hectare metre	per Mcft.	
1	2	3	4	5	6	7	8	9	10	11
13	Groundnut (Kharif)	120	0.550	14·0	25·4	71·9	944	1,716	4,859	
14	Chillies	180	0.750	16·2	21·7	61·4	2,473	3,297	9,336	
15	Groundnut (Hot Weather)	115	0.900	19·0	21·1	59·7	1,611	1,790	5,069	
16	Potato	100	1.050	200·0	190·5	539·4	4,300	4,100	11,610	
17	Long Staple Cotton (Pre-Seasonal) ..	180	1.050	20·0	19·0	53·8	1,950	1,860	5,267	
18	Vegetables (Rabi)	120	1.125	92·0	81·8	231·6	1,768	1,570	4,446	
19	Onion (Rabi)	135	1.275	275·0	215·7	610·8	4,331	3,400	9,628	
20	Turmeric and Ginger—Two Seasonals ..	180	1.725	27·0	15.7	44·5	1,925	1,120	3,172	
21	Other Perennials—(Orange and Mosambi) ..	..	1.950	..	..	..	2,477	1,270	3,596	
22	Sugar Cane (Plant)	410	3.375	1,000·0	296·3	839·0	3,125	930	2,633	
23	Grass—Gajraj—(Perennials)	..	3.625	875·0	241·4	683·6	4,848	1,337	3,786	
24	Sugar Cane (Pre-Seasonal)	450	4.050	1,250·0	308·6	873·9	3,890	960	2,718	
25	Sugar Cane (Adsali)	540	4.275	1,500·0	350·9	993·6	4,870	1,140	3,228	
26	Banana	525	4.800	500·0	104·2	295·1	6,992	1,460	4,134	

APPENDIX No. XIV

Irrigation potential (as planned at present) in the drought prone areas (Ref. para. 8.23.1)

Serial No.	Name of District		Geographical area in Th. Hectares	Geographical drought prone area in Th. hectares	Irrigation potential in Th. ha. out of (4)	Percentage of area proposed to be irrigated to the area of scarcity tract (5)/(4) %
1	2		3	4	5	
1	Dhulia	..	1256.2	680.2	42.8	6.29
2	Jalgaon	..	1137.5	513.4	120.0	23.37
3	Nasik	..	1557.4	1157.5	119.6	10.33
4	Ahmednagar	..	1702.0	1702.0	278.1	16.34
5	Poona	..	1560.0	1065.5	191.2	17.94
6	Satara	..	1043.7	549.7	64.4	11.72
7	Sangli	..	859.1	718.9	45.0	6.26
8	Sholapur	..	1499.0	1499.0	324.9	21.67
9	Aurangabad	..	1671.8	1177.7	139.2	11.82
10	Osmanabad	..	1427.2	466.1	88.1	18.91
11	Bhir	..	1092.2	771.2	36.3	4.71
	Total	..	14806.1	10301.2	1449.6	14.07

Note.—Irrigable areas will get substantially increased when projects are replanned as per recommendations of this committee.

APPENDIX No. XV

(Ref. Para 8·23·1)

Funds required for the Irrigation planned in drought prone areas

Serial No.	Name of District		Irrigation potential in Th. Hectares	Estimated cost (Rs. lakhs)	Expenditure upto March 1972 (Rs. lakhs)	Balance (Rs. lakhs)
1	Dhulia	..	42.8	1524.72	298.08	1226.64
2	Jalgaon	..	120.0	4248.01	1511.74	2736.27
3	Nasik	..	119.6	3749.73	872.97	2876.76
4	Ahmednagar	..	278.1	9461.72	3078.32	6383.40
5	Poona	..	191.2	8945.65	2126.97	6818.68
6	Satara	..	64.4	2268.36	314.73	1953.63
7	Sangli	..	45.0	1898.91	301.27	1597.64
8	Sholapur	..	324.9	11487.86	1981.41	9506.45
9	Aurangabad	..	139.2	5650.87	1542.88	4107.99
10	Osmanabad	..	88.1	1222.48	456.93	765.55
11	Bhir	..	36.3	3479.79	566.13	2913.56
	Total	..	1449.6	53938.00	13051.43	40886.57

Notes.—(1) Information about the Irrigation potential and costs is as per planning upto year 1972.

(2) Irrigable areas will get substantially increased when projects are replanned as per the recommendations of this committee.

(3) Additional expenditure for utilising yields between 75 per cent and 50 per cent recurrence will be about Rs. 280 crores.

CHAPTER IX

GROUND WATER

9.1. *Importance of Ground Water.*

9.1.1. The development of ground water resources is of particular significance to the drought zone of the Maharashtra State because the possibility of extending canal irrigation facilities is limited to about 25 per cent of the cultivable area. Even to-day wells form a significant source of irrigation in this area. 57 per cent of the irrigated area in the State has been under irrigation from wells.

9.1.2. Even within the canal commands, the conjunctive use of surface and ground water was emphasised by the Maharashtra State Irrigation Commission (1962), as the experience on the old canals indicates that ground water resources get considerably increased in the command areas of the canals. The Second Irrigation Commission (1972) has also advocated the conjunctive use of the surface and ground water resources. The Commission says, "the ground water acquifers in such cases serve as dependable balancing reservoir from which supplies can be drawn to make up deficiencies in river supplies."[1] The Commission has however emphasised the need for careful advance investigations in the following words "Before any large scale programme for conjunctive use of surface and ground water resources is undertaken, we recommend that careful investigation should be made to quantify, recognise, surface and ground water resources and interaction of one source on the other in an integrated development and combined utilisation. It is also necessary to make a cost study of various alternatives to determine the best modes of conjunctive use in an area. In advocating conjunctive use, we are aware that indiscriminate exploitation of ground water may lead to serious difficulties."[2]

GEOLOGICAL CONDITIONS

9.2. *The Rock formations.*

9.2.1. The Deccan Trap constitutes the most important geological formation in the State and all the drought prone districts are situated in the Deccan Trap area. The Deccan Trap is a vast pile of basaltic lava flows outpoured intermittently through fissures or volcanoes over a period of millions of years. The rocks are mainly different varieties of basalt having more or less uniform mineral and chemical composition.

9.2.2. In addition volcanic breccias of different kinds and red boles derived from tachylitic basalts are of frequent occurrence. The basalts in many areas in the drought zone have been intruded by dykes cutting across the flows. Rarely, inter trappean sediments and ash beds are met with at a few places like Bombay but they fall outside the drought zone.

9.2.3. Structurally the flows are of two types. Some flows occur as regular horizontal sheets with greater thickness. The other type is of thin flows which have irregular form because of variation in thickness. These may be a few centimeters to a couple of meters in thickness and may extend over a few meters to a few hundred meters. Because of their irregular form and limited lateral extent they occur in chaotic piles.

9.2.4. The Deccan Trap basalts like all volcanic rocks contain gas cavities formed by escape of gases from the lava. On the basis of gas cavities the basalts may be divided into three types :—

(*i*) the vescicular basalts with empty gas cavities ;

[1] Report of Second Irrigation Commission, Chapter V, page 89.
[2] Report of Second Irrigation Commission, Chapter V. page 99.

(*ii*) the amygdaloidal basalts with gas cavities filled with secondary minerals; and

(*iii*) the compact basalts without gas cavities.

Of these compact basalts are always closely jointed, while the vescicular and amygdaloidal basalts have few joints.

9.3. *Water Bearing Potential of Deccan Trap.*

9.3.1. The lava flows differ greatly among themselves in regard to their ability to receive, recharge, store and transmit ground water. Differences in the productivity of lava flows arise as a result of two physical characteristics namely their porosity and permeability. Inter-communicating vescicles distributed uniformly throughout the rock, increase the porosity. Massive lava flows which have neither the vescicles nor the joints have the least porosity. The yield is considerably affected by two factors namely, the degree of weathering and topographical setting. Weathering increases the porosity and permeability of a media and topographic setting affects the movement and discharge of ground water. The nature, size, number and distribution of vescicles the number and spacing of joints and the extent and degree of a weathering control the water yielding capacity of lava flows. Pyroclastic deposits such as beds of ash, tuff, etc. tend to become clayee and are sometimes poor producers.

9.3.2. Groundwater in the lava flows occurs as water table under confined conditions. The massive lava flows and thick red bole layers tend to inhibit vertical movement of ground water and thus act as confining acquicludes. The water productive layers when favourably situated receive recharge, and groundwater moves down the dip till it is withdrawn through wells or is naturally discharged by means of spring or other forms of seepages.

9.3.3. The Ground Water Survey and Development Agency in Maharashtra therefore holds the view that the lava flows act as a multi-acquifer system including both water productive and unproductive zones. Such a situation can arise at any depth so long as these zones are favourably situated for receiving recharge and transmitting the same down the dip. Productive zones in the lava flows constitute between 20 percent and 50 percent of the total thickness of the flows in any section. The Agency is of the view that the productive zones of this thickness should be able to deliver at least low yields of few thousand gallons per hour. Marginal yields in these boreholes can be sometimes raised by increasing the fracture porosity.

9.3.4. An altogether different view is held by some other geologists. In their opinion all basalts are basically non-porous and therefore there is no possibility of getting pore water from any of them when they are fresh. Therefore the only possibility of getting water in basalts is from open joints. On the basis of experience of basalts in other countries i.e. the Columbia Basalts of the U.S.A. it is thought that vescicular basalts hold large quantities of water in their vescicles. However it is contended by these geologists that this is not true of the vescicular basalts of Maharashtra. Firstly there are very few vescicular basalts in the Deccan Trap area as they have been converted into amygdaloidal basalts by the complete infilling of the vescicles. Further the vescicles whether infilled or empty are not interconnected and therefore they cannot transmit water even when they are open. The vescicular and amygdaloidal varieties are also free from joints and they are therefore on the whole impervious. One thing is thus clear that water from 'fresh' basalt rock can be obtained only from the compact basalts which are jointed. The compact basalts can also contain water only when the joints are open and interconnected. Even the compact basalts may not contain water as the joints may be irregular and not interconnected or may not have opened or may be filled with impervious material Dykes in Deccan Trap area are well jointed and may yield water. But the behaviour of dykes is very variable. Some contain large quantities of water while the majority are dry.

9.3.5. According to the latter view, conditions become more favourable for storage of water when the basalts are in an intermediate stage of weathering. By weathering, joints in compact basalts are widened. Vescicular and amygdaloidal basalts also develop spheroidal weathering or sheating or even pass into murum and thus become porous. Both the breccias and red boles are impervious and behave like amygdaloidal basalts as far as ground water is concerned. As water percolating into the above lying pervious rock cannot sink deeper when it meets the impervious red boles, it is stored in the above lying rock and comes out, where its contact with red bole is exposed at the surface.

9.3.6. Further this view expresses that over large areas the basalt-flows are generally thin and irregular and do not have extensive lateral spread. Because of this the total quantity of water in water bearing flows is not generally large and because of their limited lateral extent the flows cannot be traced over a wide area. The compact basalt often occur as thick extensive flows and make good acquifers if uniformly well jointed. But even in them, the pattern of jointing is very variable and the same flow may be well jointed at one place and not at another. This makes their behaviour inconsistent and a flow that yields water at one place may not give any at another.

9.3.7. The Ground Water Survey Agency has been carrying out the surveys and experiments in the Deccan Trap areas since 1971. So far they have surveyed 1544 villages and an area of about 4500 sq. kms. during the course of which 41,000 wells have been examined. Further experimentation and field results will alone confirm the assumption of the Agency and correctly assess the availability of ground water in these areas.

9.4. *Soils and sub-strata.*

9.4.1. Over extensive areas, the basalts of the Deccan are overlain by superficial mantle of variable thickness of soil and weathered rock. Soils fall into two classes according to their origin, the residual soils and transported soils. The only transported soils met with in Maharashtra are the alluvial deposits laid down by stream on their flood plains. Soils which are final products of decomposition are underlain by sub-strata of weathered rock in various intermediate stages of decomposition in which conditions are suitable for ground water storage. This is a favourable feature and we have to make best use of it in our schemes for development of ground water resources.

9.4.2. All soils and sub-strata in the Deccan Trap area are characterised by deposition of large quantities of Calcium Carbonate. Calcium Carbonate released by the decomposition of basalts is carried in solution by ground water. When ground water is drawn to the surface by capillary action during long dry season as are predominant under the present weather conditions in this area, it evaporates and deposits its load of Calcium Carbonate either at the surface or in the soil as kankar. This Calcium Carbonate also brings about cementation in alluvial deposits and converts them into firm rock. The very presence of large quantities of kankar is indicative inadequate ground water storage and predominance of desication effect as in the famous kankar areas near Nandgaon in Nasik district and Chas near Ahmednagar.

9.5. *Water Table.*

9.5.1. Of the rain water that percolates into the ground and is held there, a substantial part is lost by continuous evaporation and evapotranspiration. This process of percolation continues till lower strata of soil is fully saturated. After full saturation, the water starts building up its own level and unless it is drained off by under ground drainage through pervious strata, the water level continues to rise forming what is known as " water table ". In Deccan Trap area, due to rolling ground and the impervious parent rock over which lie the soils formed in situate regular extensive reservoir of ground water as such is difficult to obtain.

9.5.2. Most of the water in the Deccan Tiap areas is stored and held only in the sub-strata and weathered rock below and is generally in a continuous process of being drained away towards the natural drainage channel by gravitational movement resulting into springs.

9.5.3. The water found in local unconnected cups gets its replenishment from rain every year. In due course after filling up of these local pockets or cups the underground water finds their way to the main drainage channels. It is this underground water and the valley storage which is responsible for the sustained flow in the rivers in the post monsoon period. If drainage condition happens to be unsatisfactory, the water level in the local pockets continues to rise causing water logging in the area.

9.5.4. The course of underground water is also approximately the same as the surface land. After the monsoon most of the smaller streams over the Deccan Trap areas are dry but water is generally found in wells situated closer to the streams or the pits sunk in stream beds. Similarly wells situated near the stream have more water, better recuperation and longer life than those located higher up and further away from the streams.

9.6. *Source of Ground water.*

9.6.1. The source of all ground water is basically the rainfall. The rain water that percolates into the ground occupies minute openings in rocks and becomes ground water. Some people also carry wrong impression that water is formed in rocks. The water of natural springs is also the rain water that has porcolated into the rocks and under favourable geological conditions has found its way to the surface again. Even the water of hot spring is 80 per cent rain water which sinks to greater depths and mixes with hot magmatic water or stream and then rises to the surfaces as hot springs.

9.6.2. This being the case, the extent to which ground water resource can be developed, gets limited by the extent of precipitation the area receives.

9.7. *Potential for recharge.*

9.7.1. It the report (1970) on the "Development of Ground Water Resources and and Farm Mechanisation," recharge of 10 percent of the total precipitation is assumed and it has been considered that the ground water available can be utilised by extraction through dug wells. The manner of recharging of ground water table in the Deccan Trap area particularly in the drought areas leading to the above assumption is however not made clear in the report. The Ground Water Survey Agency has also based its calculations on the assumption of recharge at 10 per cent of the annual precipitation.

9.7.2. Following four processes of recharge can be thought of,—

(*a*) Precipitation seeping through the porous open textured material at the hill toes ;

(*b*) Precipitation on the plane tracts seeping through the soils supporting the agricultural activities ;

(*c*) Through the method of back feed from the river bed on a falling gradient ;

(*d*) By contribution from neighbouring catchments or valley through a system of joints, fissures or faults in the country rock.

9.7.3. The soils produced on the Deccan plateaue are generally of impervious type because the basalt rock does not produce much of the sand size material but produces abundance of silt and clay. The river banks and the flood plains an generally abounding in this category of material. The ability of this material to transmit the precipitation water downwards through the ground mass to the ground water reservoir may be a slow process. The water tight amygdaloidal basalts do not allow percolation of water, and once an amygdaloidal basalt is met with, further downward descent of water is stopped. If any amygdaloidal flow is occuring at the surface, there may be practically no recharge. In view of the prevalence of amygdaloidal basalts in the Decean Trap areas, conditions are not always favourable for percolation of large quantity of water. Chances of cross transfer of a large volume of water beneath the ground from one basin or catchment to another also appear to be limited, unless regional open fractures exist.

9.7.4. All underground waters are derived from rains. Therefore in their appraisal, it is very important to study the process of disposal of rain water. Of the rain water that falls on the land, some evaporates where it falls, some percolates into the soil and some runs off along the surface to evaporate or to percolate elsewhere or to enter streams and while some is used by the plants for their life processes. The atmospheric conditions and pattern of precipitation and vegetation growth thus have a great bearing on the facilities for recharge. Rain water that percolates into the ground every rainy season serves to replace the ground water withdrawn or lost by natural processes during the dry season. The amount of this recharge is determined by several factors such as total rainfall and pattern of precipitation, geological condition, topography, climate, vegetation, etc. and therefore varies greatly from place to place.

9.7.5. The precipitaion in the drought prone areas is concentrated in a very small period and is mostly not in the form of a long period continuous drizzle. The latter are favourable for soaking action and percolation of the precipitating water into the ground. Under the condition of rain storms however, once the top soil surface is saturated, the process of run off sets in and water flows down the natural drainage channels. Because of low humidity in the drought tract, larger sunny days, as also winds in the monsoon period water from nallas, rivers as also from the soil surface is continuously evaporated in very large quantity. The water that seeps into ground is also continuously brought upward through capillary action in cultivated land and is then lost by evaporation. Vegetation in the catchment also consumes some of the water from the soil for its life processes. In nature, chances for deep percolation of water in these areas are therefore limited, and any large scale recharge by annual precipitation appears to be rather improbable.

9.7.6. In the district of Sholapur [*vide* page 187 of the report in the Government's report (1970) on the Development of Ground Water Resources, Land and Farm Mechanisation in Maharashtra] the present utilisation of ground water from the existing wells already amounts to 20·31 Mcft. out of 30·29 Mcft. assumed to be available on the basis of 10 per cent recharge. This leaves a margin of 9.98 Mcft. for exploitation through additional wells. Even minor change in the assumption regarding percentage recharge will make significant difference in ground water potential in the terms of wells.

9.7.7. Extraction of ground water in different areas will have to be limited to their potential for annual recharge of ground water. There is, therefore, particularly urgent need to conserve our groundwater resources by proper "water budgetting". Water budgetting will require clear idea about the annual recharge of ground water. Lack of adequate data is the main handicap in assuming the extent of recharge in assessing the availability of ground water. Further surveys and collection of data in different areas will have to be directed towards the assessment of the extent of recharge.

9.7.8. On the whole, the potential for natural recharge in the drought zone has limitations on account of its climatic and geological setting. Hence measures for artificial recharge of ground water will have to be adopted as a mainstay of any future programme of ground water development.

9.8. *Dug wells.*

9.8.1. There will necessarily have to be an emphasis on dug wells in tapping ground water stored in sub-strata and weathered rock on the earth's crust. Even, in areas where water is available in plenty, the number of wells has to be kept limited so that withdrawal does not exceed recharge. The G.S.D.A., has indicated that there is a large unexploited potential for ground water and there is, therefore, scope for increasing the number of wells. Their calculations are based on the assumptions of 10 per cent recharge. Agriculturists from many districts expressed to us that at many places water levels in wells have been consistantly going down during the last ten years or so. This phenomenon indicates that in such areas withdrawal has already exceeded recharge and the ground water reserves are being depleted. Even the calculation of the Agency given in Table No. 1 indicates that there is hardly any potential left in some talukas of Ahmednagar and Nasik districts for additional wells.

9.8.2. As the total quantity of water that can be received in the sub-soil and the rock crust is limited by natural conditions of a basin, indiscriminate increase in the number of wells only brings about a division of the same storage over a large number of wells. A larger number of wells does not therefore necessarily mean an increase in the total amount of water. On the other hand, the ground water reserves may get depleted beyond easy correction.

9.8.3. In the absence of a sustained "water table" in the drought areas, the water level in the wells is subject to very large seasonal fluctuations. After intense rains in the monsoon period, the water starts appearing even in the wells that might have gone dry in summer, the availability of water then generally continues to be good in the period of rabi at the end of which quite large number of wells start getting depleted. The irrigation from the wells has therefore to be mostly limited to dry spells in kharif season and to rabi season. Even the availability of drinking water from dug wells gets substantially reduced in the hot weather months.

9.8.4. There does not appear to be any complete remedy for such a situation, though hot weather availabilities can be somewhat improved by the supporting ground water recharge works like the percolating tanks. The entire scheme of agricultural and water dependent operations in the drought prone areas will have on the whole, to be limited mainly to about eight months of the year. The drought areas will have to live with this inadequacy and hence hot weather uses of water will have to be regulated for the essential social requirements first, like drinking water for the human beings as also the cattle.

9.9. *Irrigation Potential.*

9.9.1. The surveys show that irrigation potential of the wells, in terms of say rabi jowar, is of the order of about 10 acres in the bunded areas. Apart from the extension of the cultivation period into rabi season, the wells also help in supplying water to the crops in the kharif seasons during the long dry spells. It is not the total water used from the wells that is only important, but the crucial time at which this water becomes available is also very important. To this extent, wells play the role of 'insurance' support.

9.10. *Bore Wells*.

9.10.1. The other distinct category of wells is the deep bore wells as distinct from the category of bore-*cum*-dug wells. In the latter, weathered and pervious rock *strata* below the bottom level of excavation in the wells is tapped to induce additional percolation into the well economically without costs of excavation through the rock. In the former case of the deep bore wells however, the aim is to tap the water stored at great depths of say 50 to 100 m. Recently the Ground Water Development Agency has been trying wells of this type in the various districts.

9.10.2. The experience of the Irrigation and Power Department on the tunnels driven in basalts, show that the besalts at such depths are generally ' dry ' for example the tunnels of the Koyna complex, the tunnels of the Vaitarna Hydro Electric Project and the Bassein CreekTunnel which inclines at both the ends driven to a depth of 400′, below the creek. Engineers have met with hardly any water in all these tunnels once they went below the upper fringe of weathering. A large number of deep bores have been taken by the same Department below the valley floors for the investigation of large number of dam sites in Deccan. Their observation is that leaving aside the top 10-20 m. the recovery of cores from the mass below is almost 100 per cent. The rocks do not show any worthwhile intake of water even under pressure of the order of 20 to 30 kg. per cm. sq. Intakes of grout under high pressures is also negligible.

9.10.3. Ground Water Survey and Development Agency is carrying out investigations to correlate the occurrence of ground water with geology. The holes drilled by it are percussion holes. To verify whether the withdrawal of ground water is within the limits set by the annual recharge it is necessary to maintain a record of levels of water in the bore wells over a period of years. The performance of some deep drilled wells will have to be watched over a long period.

9.10.4. The water availability as recorded by the Agency was found to be of the order of 500 gallons per hour and in some cases few thousand gallons. The observations appear to be on the basis of water overflow noted during the drilling operations. It is not clear whether these drill holes have tapped a dependable zone of free water reservoir or whether after some days of extraction the under ground reservoir will get depleted for want of recharge.

9.10.5. Thus it will be seen that in respect of the deep bore wells we are still at an exploration stage and it will require further extensive studies and investigations.

9.11. *Ground-water in the Irrigation Tracts.*

9.11.1. The irrigation tracts are favourably located in respect of ground water as compared to the areas not covered by the irrigation commands because of the sustained long period of application of water through the canal system and through the fields in the command. A large part of this irrigation water that spreads over the irrigated fields as also the water from the seepages from the canals and tributaries and water courses goes to form a substantial quantum of ground water which tend to drain into the natural drainage channels in the areas and giving rise to perennial flows therein.

9.11.2. Experience, on well sinking in the commanded areas of existing major and medium irrigation projects in operation, e.g., Pravara, Godavari and Nira Canal systems, has shown that in the areas commanded by canals, wells are generally successful. A number of wells sunk with the same intensity in identical areas but not falling in the command of canals in operation are found to be unsuccessful for want of water. In other words, the wells sunk in the areas commanded by canals do not depend for the underground water naturally available in the sub-soil but, virtually draw upon the water going underground by seepage from the canals.

9.11.3. The sinking of wells in the commands of irrigation canals is, however, most beneficial in certain circumstances only e.g., in the canal commands having a large concentration of perennials such sinking of wells is a very desirable feature as it helps not only to prevent waterlogging of the area, but also makes it possible to utilise the underground water derived from the seepage of the canal and the heavy irrigation of perennials for further use and extension of irrigation in the commanded area where adequate areas happen to be available for such extension of irrigation. If, however, the intensity of irrigation on the canal happens to be very high, say 90 per cent of culturable commanded area, no useful purpose would be served by sinking wells in the commands as there would be no land available for using the underground water for irrigation. We have recommended in our Chapter on Irrigation that intensity of irrigation should be not more than 50 per cent in the drought areas. Hence it should be possible to use large quantities of ground water available from the irrigation command for crops on the unirrigated lands.

9.11.4. Where irrigation projects are likely to be taken up even after 10 years, some immediate relief by way of providing irrigation wells should be considered. Even if any of these wells do not strike reliable water to-day they would do so in future after irrigation commences. We therefore feel that in the future programmes for well sinking, priorities should be given to the irrigation commands shown in the master plan for irrigation.

9.12. *Measure for recharge.*

9.12.1. From the foregoing paragraphs, it may be clear that the dependability and potential of wells considerably improves when facilities for recharge such as in canal commands are available. Hence whenever any large scale programme of ground water exploitation is thought of, a supporting programme of recharge-works has to be taken up as an integral part, otherwise the excessive exploitation of ground water without adequate recharge may make the investment on the ground water works unfruitful.

9.12.2. Among the measures for recharging the following five types of works can be considered–

(1) Bunding; (2) Afforestation; (3) Trenches; (4) Injection through wells and (5) Percolation tanks.

The utility and potential of each of these is discussed in the following paragraphs:—

9.13. *Bunding.*—Bunding aims at a longer stay of water on the field and thereby better opportunity for seepage into the ground. This has been confirmed by surveys. It is estimated that an increase of about 1½ acres per well in term of Rabi jowar is obtained in the bunded areas.

9.14. *Afforestation.*—The examples of wells drying up on account of large scale disafforestation are many. The recharge potential developed by broken sub-strata from the ever growing root system is lost by the disafforestation. It is easy to loose this asset but it requires a sustained work to build it up again. No immediate improvement in the ground water situation is possible through new plantations as in case of other measures, but conditions do improve over a long period and hence adequate attention needs to be given to all efforts aimed at growing the trees on the slopes and toes of the hills in drought areas.

9.15. *Trenches.*—Bunding as a measure for conserving and increasing moisture in the soil has been thought of and practised for a long time by now. But adequate attention to other measures for improving the recharge potential of the areas does not seem to have been given. One of the simple measures suggested to us was to take the surface run off deep into the sub-soil through trenches along the contour, through the exposed faces of which water can freely pass into the sub-soil. We understand that on a small scale this system is already in vogue in the works of the Forest Department when they undertake new plantations along the slopes of the hills. There appears to be large latent potential in this system of groundwater recharge and we very strongly recommend intensive experiments and field observations on this system by the Directorate of Irrigation Research and Development. Incidentally, the trenching work is labour intensive and equally simple like bunding works and can provide large scale employment in the periods of drought. It is necessary to develop this technique on scientific lines.

9.16. *Injection through wells.*—Trenches cannot go deep. But wells cutting through the superficial mantle of weathered rock may have a great potential for recharge. It may therefore be worthwhile to consider if the ground water reservoir can be recharged through wells, normally used for extraction, during the periods of excessive precipitation in monsoon. It is learnt that some experiments on injection of water into the ground through the wells by pumping in and diverting surplus water from the rivers and the canals in the monsoon period are being undertaken by the Irrigation and Power Department. Areas around Shendurni in Jalgaon district are proposed to be taken up for such trials. If such measures of recharge succeed they would open up an entirely new line of development of the ground water resources. It is learnt that Israel has successfully adopted a technique of injection through tube wells in their coastal areas and large scale injection through wells and lagoons is being adopted by other countries also in progressively greater measure.

9.17. *Percolation Tanks.*—

9·17·1. A more bold and forceful approach to recharge is through the construction of percolation tanks. Bunding, nalla bunding and percolation tanks can be considered as basically of the same genre but progressively bolder and more positive in approach. We are very happy to note that a large scale activity on these percolation tanks has been taken up during the current scarcity year. It is however, seen that the technique of percolation tanks has to be progressively rationalised and brought on more scientific and sound footing. Examples of the percolation tanks not being able to percolate on account of impervious ground around or percolation tanks not receiving any water on account of very poor run-off from catchment are not few. The study team of the irrigation officers appointed by the Government of Maharashtra in 1964 found that there was no theoritical approach to the problems of locating of the percolation tanks on scientific basis. On the basis of empirical observations however, the team found that generally tanks having a capacity between 5 to 12 Mcft proved successful. The irrigated areas per Mcft of gross capacity worked out to be of the order of 15 to 20 acres on an average. This is quite large and comparable with the figures from canal irrigation works.

9.17.2. The success of percolation tanks mainly depends on the percolating nature of the ground. Highly percolating base or too steep ground slope of the sub-soil are not desirable as tanks would drain out too fast. On the other hand, very flat terrain and areas with deep soil cover are also not desirable as they would not admit of percolation freely. The evaporation from the surfaces of the water is very high after the months of February and hence it is necessary that water from the percolation tanks goes into the ground before February and is stored underground for exploitation in the rest of the hot weather months.

9.17.3. In the drought zone, favourable conditions for locating percolation tanks exist not too close to the source of nallas nor too much in the open ground but at an intermediate stage of the drainage channels where adequate depth of sub-soil has been formed and valley slope is not very steep. Down-stream area on which effect of percolation can be felt is found to be limited to about ¾ of Km. wide belt along the nalla and upto 6 Km. distance on downstream. Additional wells have to be located within this belt. There also the intensity of wells cannot be generally evenly spread out on both the banks. From the experience of the developments on some existing successful tanks, it is observed that generally the 'sub-soil' potential is not symmetrical around the drainage channel. There is a much better potential on one side than the other. Only advance sub-soil surveys are able to indicate the exact situation in a particular basin and the possible intensity of additional wells.

9.17.4. One simple indication of the ground capacity for ground water development as suggested by Irrigation and Power Deparment study team 1964, is the presence of existing working wells in the valley. Further the wells before construction should preferably have recuperation of ·05 cusec after the monsoon period in October and November. After the construction of percolation tanks the intensity of wells can further be confidently increased.

9.17.5. It is also observed from their study of the crop growth on the different percolation tanks, that on an average about 200 acres of equivalent rabi seasonal can be supported by one percolation tank, even though in some cases some of the successful tanks have supported as large as 1,000 acres of the rabi seasonals. The percentage of perennial like sugarcane has been low, only 6 to 7 per cent. whereas the two seasonals like cotton and chillies are about 10 per cent. to 15 per cent., the rest being purely seasonal. The predominant seasonal nature of the 'Ground water' availability is borne out by these experiences also.

9.17.6. Recently a regular committee was appointed by the Government for the study of the percolation tanks in 1970. This committee reiterated the requirements on 5 existing useful wells below the proposed percolation tanks as it exhibited the percolating character of the ground for suitability of location. The percolation tank in an area where no useful irrigation well existed at all was considered by the committee as likely to be unsuccessful. In the studies made by the committee it is observed that ground water potential of the area supported by the percolation tanks increased almost three-fold. Thus where one acre of irrigated crop was taken additional two acres of irrigated crops could be taken. The intensity of wells reached was as high as 12 per square km. This shows the outstanding advantage of percolation tanks over the other measures like bunding.

9.18. *General recommendation.*

9.18.1. As the occurrence of groundwater will depend on geological conditions, which as has already been seen may not be favourable everywhere, every groundwater programme has to start with systematic geological studies. By carrying out such studies, areas likely to have ground water and those which are not likely to have should be clearly defined. Once this is done, efforts can be directed at increasing the groundwater supplies in potential areas, and other means of water supply developed in areas where groundwater is not likely to be available in adequate quantities.

9.18.2. It is clear that the lay of the sub-strata and its nature particularly in terms of porosity is of vital importance for the development of groundwater. Much has been done for the soils that support the plant growth as also for the rocks which weather out to produce the soils. But the intermediate material known as sub-strata which is mainly important for the groundwater conditions in the drought zone has not received adequate attention so far. We suggest that this aspect be given more attention. Studies will have also to be done on groundwater movement. In the selection of the sites for the percolation tanks the investigation on the sub-strata is the crucial one and this has to be got done by trained personnel.

9.18.3. In the areas where the potential for new wells exists, we are of the view that the programme of wells should be undertaken. In the areas, where the potential has been exhausted, the programme should aim at mechanisation of dug wells by use of pumpset, replacement of an oil engine driven pumpset on existing wells by one driven by electric power and improvement of the existing wells or old wells.

9.18.4. In areas where groundwater storage is not possible instead of digging or drilling a large number of wells, emphasis should be on creating a large number of small surface storages by constructing bunds across nallas wherever possible and utilising the water locally, by lifting if necessary. Possibilities of an integrated development of small rivers by constructing low bunds at suitable interval throughout their courses, as on the Panzra, should also be explored.

9.18.5. In the Chapter on "Irrigation" the development of irrigation in drought prone area is estimated to cover at best about 25 per cent of the cultivable area in the drought zone. The rest of the area outside the canal commands has therefore to depend on groundwater resources only as an insurance against droughts as also for increase in the crop out-turns. In view of the limited precipitation available in the drought zone it may not be possible to bring irrigation water to every acre of land, but if we are able to intensify our measure for ground water recharge sufficiently through adequate experimentation, investigation and scientific development for the percolation techniques, it should be possible to conserve a substantial part of the monsoon precipitation in the form of groundwater and utilise it in dry spells in monsoon or late in rabi season. Our aim should be to bring at least 30 per cent. of the area outside the irrigation commands under protection from groundwater resources thereby bringing about 50 per cent of the net culturable area under protection—25 per cent. from surface source and additional 25 per cent. from groundwater sources. The development of groundwater resources duly supported by works to groundwater recharge should therefore be planned with this objective in view.

TABLE I

Groundwater availability and Potential in terms of new wells.

Name of Taluka	Ground-water balance in acre ft.	Potential in terms of new wells
1	2	3
Jalgaon District		
Parola ..	17,734	1,086
Pachora ..	Nil	Nil
Amalner ..	22,858	1,399
Chalisgaon ..	8,930	546
Nasik District		
Baglan ..	Nil	Nil
Malegaon ..	Nil	Nil
Kalwan ..	Nil	Nil
Chandor ..	Nil	Nil
Nandgaon ..	11,005	673
Niphad ..	Nil	Nil
Yeola ..	Nil	Nil
Sinnar ..	Nil	Nil
Dindori ..	56,778	3,476
Dhulia District		
Nandurbar ..	Nil	Nil
Dhulia ..	Nil	Nil
Sindkheda ..	15,183	935
Sakri ..	21,210	1,299
Sholapur District		
Karmala ..	35,505	2,174
Barshi ..	43,621	2,671
Madha ..	19,542	1,196
Malshiras ..	....	....
Pandharpur ..	22,899	1,402
Mohol ..	36,186	2,216
Sholapur (N) ..	16,612	1,017
Sholapur (S) ..	33,178	2,031
Sangola ..	20,123	1,232
Mangalwedha	31,154	1,907
Akkalkot ..	1,502	91
Ahmednagar District		
Kopergaon	Nil	Nil
Akola ..	72,915	4,465
Sangamner ..	Nil	Nil
Shrirampur ..	Nil	Nil
Rahuri ..	Nil	Nil

Name of Taluka	Ground-water balance in acre ft.	Potential in terms of new wells
1	2	3
Newasa ..	8,840	541
Shevgaon ..	17,579	1,076
Parner ..	12,792	783
Ahmednagar ..	Nil	Nil
Pathardi ..	1,718	105
Shrigonda ..	6,347	401
Jamkhed ..	15,399	943
Poona District		
Baramati ..	Nil	Nil
Sirur ..	4,707	287
Junner ..	1,031	63
Purandhar ..	Nil	Nil
Ambegaon ..	19,386	1,187
Khed ..	39,504	2,418
Indapur ..	Nil	Nil
Dhond ..	12,012	7,700
Aurangabad District		
Kannad ..	26,985	1,652
Khuldabad ..	10,845	664
Vaijapur ..	27,157	1,663
Gangapur ..	25,540	1,564
Aurangabad ..	Nil	Nil
Paithan ..	41,751	2,557
Ambad ..	91,748	5,618
Osmanabad District		
Bhoom ..	21,081	1,290
Paranda ..	26,596	1,628
Kallam ..	9,730	595
Osmanabad	18,397	1,226
Tuljapur ..	15,275	937
Bhir District		
Ashti ..	33,321	2,035
Patoda ..	33,466	2,049
Bhir ..	42,446	2,699
Gevrai ..	49,135	3,008
Buldhana District		
Malkapur ..	42,588	2,607
Khamgaon ..	77,034	4,718

CHAPTER X

AGRICULTURE

10.1. In the drought prone areas kharif crops are grown on lighter types of soil. During the rabi season, medium and heavy soils are generally put under rabi jowar crop with which is mixed safflower. The output in this area is uncertain and risky on account of scanty and erratic rainfall.

10.2. An old saying that "variety is the spice of life" is applicable to all aspects of our agriculture. Due to considerable variations, agricultural development, particularly the dry-land agricultural development posses a challange to the workers in the field of research, extension, and administration. It is difficult to evolve a simple and universally applicable method of dry land agricultural development. The cultivation practices which are followed by the farmers, are evolved after a long experience in their struggle with nature and have a basis in reason. The research worker has to respect this reason while evolving new technology.

10.3. New technology is directed towards evolution of different varieties of crops which can withstand longer dry spell. The research workers have evolved certain varieties of different crops which are early maturing so that their requirement for water is low, and the root system is deep so that the roots can extract moisture from deeper layers of the soil. Another field of new technology is the evolution of proper agronomical practices which help in the conservation of soil moisture and thus provide the required moisture for the proper growth of plant. The moisture loss through evaporation can be temporarily checked by the use of surface mulch Tillage practices and planting methods have direct bearing on the yield as they weed out the unwanted plants (weeds) by tillage operations and bring additional gain by preventing that much of moisture otherwise lost through the weeds.

10.4. Inadequacy and uncertainty of rainfall has generally led to either complete or partial failure of crops in the scarcity area. The Government of India had realised the problems of scarcity areas in as early as the last two quarters of the nineteenth century. The Famine Commission (1880) had recommended that protective irrigation works be undertaken in these areas and accordingly government had undertaken such works. But such works have become possible only to a limited extent in the drought prone areas, and hence the tract still largely depends on rainfall for growing crops. The Royal Commission on Agriculture (1928) in its report observed that the crops, particularly the millets, grown in un-irrigated areas had not received the attention of the research workers. The Commission observed that the problems of cultivation in such tracts in which crops are entirely dependent on rainfall, deserved far more attention than they had received from the agricultural departments.

10.5. The State Government pioneered a systematic and scientific approach to the problems of dry land farming about 50 years ago. The Department of Agriculture took up the work in 1923 and drew up a comprehensive scheme of research, which included such aspects as disposal of rain water, water requirements of crops, soil-survey and conservation etc. The Indian Council of Agricultural Research also soon realised the importance of the problem and sponsored integrated research schemes in collaboration with the States. Even after the termination of these schemes, the State Government continued the research activities at the Agriculture Research Station, Sholapur (Mulegaon). As a result of this work a package of practices known as "Bombay Dry Farming System" was evolved for wide adoption.

10.5. The research work at Sholapur also brought to light the colossal loss of soil and water resources that has been taking place for ages even in the low rainfall areas. This led the government to take up soil and water conservation works on a large scale. In Maharashtra State soil conservation wing in the Agriculture Department was established as early as in 1942 and was gradually developed and enlarged to its present size where nearly 60 per cent of the annual Plan budget for Agriculture Department is allocated to this activity.

10.6. *Characteristics of Agriculture in drought prone areas.*—It is necessary to outline the characteristics of the drought prone areas pertaining to agriculture before suggesting a stategy for the development. These characteristics relating to land utilisation, cropped areas, soil types are as follows :—

10.6.2. (1) *Land Utilisation.*—One of the significant characteristic of the drought prone area is the high percentage of the cultivable land to the geographical area-namely 81 per cent as compared to the State average of 60 per cent.

Two reasons can be attributed. Firstly the marginal and sub-marginal lands where the cultivator ordinarily faces severe handicaps, may have been brought under the plough. Secondly the area under forest is insignificant and it, therefore, increases the availability of cultivable land. This aggravates the problem of soil erosion and surface run-off because of the absence of protective vagetative cover.

10.6.3. (2) *Cropped areas.*—Another characteristic of the drought prone area is the predominance of area under cereals mainly jowar and bajra in the cropped areas. The percentage of area under cereals is as high as 65 per cent as against the state average of 56 per cent. The main reasons for the predominance of area under cereals is the reluctance on the part of the farmer to risk a larger investment which the cultivation of cash crops entails.

10.6.4. (3) *Per capita cultivable area.*—The density of rural population in the drought prone districts is low as compared with other drought free districts. Therefore, the per capita cultivable area in these districts is 0·71 hectare as against the State average of 0·62 hectare.

10.6.4. (4) *Soil characteristics.*—The soils of drought prone areas are derived from basaltic rock. They contain clay and free lime. On wetting these soils exhibit high volume expansion which results in impeding the percolation of rain water. The soils crack heavily on drying, resulting in loss of moisture and ultimately damaging the root system of growing crops. In addition they have high moisture at wilting point. The wilting point is a stage of soil moisture when the plant begins to dry as it is unable to extract the moisture which is held fast by the soil particles. The soils have varying depths which determine total available moisture for plant growth. The available soil moisture after saturation in various types of soils is given below :—

Soil Type	Depth (Cm.)	Available soil moisture (mm)
Very shallow soils	upto 10	16
Shallow soils	22·5	37
Medium deep soils	45	65
Medium deep soils	60	96
Deep soils	90	140

In Appendix I to Chapter IV a model is presented to indicate available soil moisture in the soils with varying depths before commencement of sowing season i.e. 1st June. The model also indicates the effective rainfall required to raise the soil moisture at ⅓rd bar. The relationship of soil moisture and plant growth are discussed. The model indicates the situation when crop failures occur in the event of failure of rain in the critical periods of the growth of crops. Different crucial periods of growth have been identified and discussed in relation to the type of crop.

Shallow and very shallow soils are not retentive of moisture and hence they are considered unsuitable for raising rabi crops. The rainfall in June, July and August is in a position to saturate soil profile and hence the kharif crops can be grown. The cultivators, however, put these lands under rabi crops if the rains during the kharif season fails. But such rabi cultivation is not successful as the yields are considerably low.

Medium deep and deep soils are retentive of moisture but do not come to working condition during kharif season because of their high moisture content at wilting point of the crop. Later rains in September and October are able to saturate the soil profile as it already holds high moisture on account of the precipitation in July and August. Thus rabi cultivation is successful in these soils.

10.6.5. (5) *Types of crops.*—(*a*) Kharif—Very shallow soils which are undulating are subject to severe erosion which results in very poor soil cover. Due to their limited depth, shallow soils have very low moisture holding capacity. Generally the crops like bajra, green-gram, black-gram and groundnut are grown in the kharif season when the rains in June, July and August saturate the soil profile. But the success of these crops largely depends on the distribution of rain and duration of dry spells.

The medium deep soils are heavy in texture and are more moisture retentive. Therefore these soils are generally put under such crops as ground-nut, red-gram bajra in kharif. But the kharif cropping on these soils is risky on account of high probability of occurrence of dry spells.

(*b*) *Rabi.*—Medium deep soils and deep soils are generally put under rabi crops. Jowar is the predominant rabi crop. Next in importance is gram. Mixed cropping is also followed by putting safflowers along with jowar. The drainage of these soils is moderately low and infiltration rate is also low. Hence rain water does not saturate the profile easily. The success of rabi cropping in these soils, therefore depends upon the extent of precipitation in the months of September and October.

10.7. *Strategy for Development.*

10.7.1 We have described in brief the characteristics of agriculture in drought prone area. There are twin problems of dry farming—(*a*) problem of very low annual precipitation and (*b*) its uncertainty. This very low and uncertain rainfall increases the risk of cultivation. Therefore if farm incomes in this area are to be stabilised a three pronged strategy of agricultural development as indicated below may have to be adopted.

(*i*) Suitable crops may have to be adopted to suit the type of soil and its moisture retentive capacity.

(*ii*) Methods of cultivation require reorientation to suit the condition in drought prone areas in the light of the results of research available from time to time.

(*iii*) Integrated programme for land development and water harvesting should be taken up.

10.8. *Adoption of suitable crops.*

10.8.1. The criteria for selection of crops in the drought prone areas according to us should be as follows :—

10.8.2. (*a*) *Short duration.*—Uneven and untimely distribution of rainfall is the characteristic of drought prone areas. If the duration of crops is long the probability of occurrence of stress during the maturity period of crop growth is high and this affects the yields adversely. If the growth period is shortened, the chances of overcoming this stress are more. Therefore, an important criterion for selection of crop should be its short duration and early maturity.

10.8.3. (*b*) *Photo insensitivity.*—As a rule, plants require certain amount of sunlight for their normal growth. Certain varieties of plants are so sensitive to this factor that in the absence of adequate sunlight, the duration of their growth is shortened, thereby resulting in reduction in the outturn. In the drought prone areas due to the erratic nature of weather, the availability of required sunlight during the period of crop growth may vary. To overcome this difficulty, it is necessary to evolve varieties of crops which can sustain fairly normal growth even under condition of varying availability of sunlight. Such varieties of crops are called photo-insensitive.

10.8.4. (*c*) *Strong root system.*—The plant having strong root system can extract the soil moisture from larger area of soil and can give better yields as compared with the plants having a shallow root system. Such crops can generally withstand long dry spell.

10.8.5. (*d*) *Type of soils.*—Type of soil with particular reference to its depth is another important determinant governing the selection of crops.

The Dry Farming Research Station at Mulegaon in Sholapur district has carried research work in evolving suitable cropping for the dry farming areas. The Committee considered the results obtained at the Station. The research station recommended the following cropping in the drought prone areas according to the type of soil :—

(1) *Very shallow soils.*—These soils are mostly observed in the upper ridges and are undulating and subject to severe erosion. They are unfit for cultivation and can only be put under grasses, such as Blue Panic and Marvel-8. The average yield of grass on such soils is about 6-7 ton per hectare.

(2) *Shallow soils.*—These soils occur on rolling plains with a slope range of 3-8 per cent and even more. Due to its limited depth, the soil has low moisture holding capacity The rainfall in June and July generally saturates the soil profile and hence kharif crops can be sown. With the later showers in August and September the crops can be grown with the accumulating soil moisture. Hence the shallow soils are more suitable to kharif crops such as bajra, groundnut, sunflower, tur and other pulses by following the method of strip cropping. The crop rotation can be first year bajra, second year groundnut, third year sunflower—three year rotation.

(3) *Medium deep soils.*—These soils can be grouped further into medium deep upto 45 cms. and moderately deep upto 90 cms. The soils having 45 cms. depth have limited moisture holding capacity and require less rainfall for saturating the soil profile and hence these soils can be put under kharif cropping. The moderately deep soils are heavy and hence difficult to sow in the kharif season. Hence rabi cropping is possible in these soils. If the distribution of rainfall is proper in June, July and August and later part of September, then both kharif and rabi cropping is possible. Kharif crops like bajra, groundnut, sunflower, tur, mung, udid and rabi crops like jowar, gram, sunflower and safflower can be grown on these soils. While rotating the crops, the cereals should follow the legumes.

(4) *Deep soils*.—These soils occur in low lying areas at the extreme end of the watershed. The drainage and infilteration rate of these soils is low, hence the early rain do not saturate the whole of the soil profile easily. Moderate to heavy rains in September and October saturate the soils and hence only rabi cropping is possible. Deep rooted crops such as gram, safflower and sunflower are more suited for extraction of moisture from lower layers.

10.9. *Improved varieties of crops*.—The improved varieties recommended for both kharif and rabi seasons for different types of soils of varying depths are as follows :—

Season	Crop	Type of soils	Variety
Kharif	Bajra ...	Shallow or moderately deep ..	H B 3
	Groundnut ..	Do. Do. ..	SB XI Kopergaon 1 K-4-11.
	Red gram ...	Do. Do. ..	T-148
	Cowpeas ..	Do. Do. ..	C-152
	Green gram ..	Do. Do. ..	Hy 45
	Sunflower ..	Do. Do. ..	EB-68413
	Grass ..	Very shallow soils ..	Blue Panic and Marvel-8
	Cotton ..	Medium deep and deep soils ..	Veernar and Y-1.
Rabi ..	Jowar ..	Medium deep soil and deep soils	M-35-1
	Grass ..	Do. Do.	N-59
	Wheat ...	Do. Do.	No. 59
	Safflower ..	Do. Do.	N 62-8
	Sunflower ..	Do. Do.	EB 68413
	Cotton ..	Do. Do.	Veernar and Y-1.

The above varieties satisfy two important criteria mentioned in an earlier paragraph. They have a short duration and deep root system. Except sunflower, no other variety of crops is photo-insensitive. The research to evolve photo-insensitive variety in other crops is in progress. Major break through can be expected when these experiments succeed in evolving suitable varieties.

10.10. *Substitution and Introduction of crops.*

10.10.1. The Mulegaon Research Station also experimented, the introduction and substitution of crops such as cowpeas, sunflower and castor. The results showed that sunflower and cowpeas with an yield level of about 10 q. per ha. can be introduced as a side crop or can be taken as substitute for oilseed crops. Sunflower, being a more photo-insensitive crop, permits its cultivation in any season during the year. The crop can withstand drought conditions for longer periods and its water requirement is also low. Even in the drought areas, the cultivation of this crop can ensure a reasonable level of income. In the drought prone areas sunflower has actually shown very good performance. The sunflower crop has wide adaptability in respect of its water requirements. It is observed that this crop can withstand moisture stress in its growth phases. Even after germination the saplings of this crop keep on growing with relatively less moisture. The advantage of cultivation of this crop is that on account of its semi-xerophytic behaviour, the chances of its total failure are less. Sunflower may thus be a good substitute for groundnut crop. Another advantage of sunflower cultivation is that the seed rate is only 10 to 12 kgs/hect. as against 100 kgs/hect. of groundnut. This reduces the cost of cultivation quite substantially. The yield of sunflower compares well with groundnut. The groundnut yield is about 6 to 8 quintals per hect., whereas the yield of sunflower is 8 to 10 quintals / hect. The quality of sunflower is also quite good and has variety of uses. Besides edible oil, the oil cake is also quite nutritious as a cattle feed. The cultivation of groundnut is risky in the drought prone areas as the cost of seed is very high.

10.10.2. The gross income from the crops in the drought areas is indicated in Table No. I.

10.11. *Recommendations.*—The results obtained at the research station have wide application throughout the entire drought prone tract. We, therefore, recommend that the above crops for different seasons and soil specification with suitable modification should be adopted in the dry farming areas. It is necessary to popularise the above crops with suitable modification through incentive, extension work and credit policy. The incentives can be provided in the form of subsidies, guaranteed remunerative prices and marketing facilities. The extension methods can be more effective by introducing guaranteed demonstration village schemes. We are of the opinion that suitable extension work, guaranteed remunerative price and credit policy can bring the desired changes and compelling legislation may not be necessary or desirable.

10.12. *Role of Soil and Water Conservation and Dry farming methods.*

10.12.1 *History and present organisation.*—Bunding as a measure for control of soil erosion has been practised by the cultivators in their own way since times immemorial. But the bunds constructed by them had scanty technical basis as they generally marked boundaries of fields and did not afford adequate protection to the land from the vagaries of soil erosion. This caught the attention of the government as long back as 1907. However, the first scientific attempt of soil and moisture conservation appears to have been made in 1927 by the state government by creating a small nucleus staff, arranging demonstration of soil conservation and starting a short duration training class for the cultivators to make them bunding minded. With the advent of the first popular ministry in 1937, the soil conservation activities of the Department of Agriculture were further expanded, government also passed the necessary legislation in 1942 to enable it to undertake large bunding projects even when all the land owners did not offer their consents. The legislation came into force with effect from the 25th January, 1943. It provided for the recovery of the cost of the work and their subsequent maintenance and repairs. Real impetus to the work of bunding was, however, given in the beginning of 1943 when acute famine conditions were developed in the Bijapur District of the former Bombay State. Bunding works were started as relief works to give employment to the scarcity affected agriculturists and the agricultural labour. Since then the soil conservation section of the Agriculture Department went on progressively expanding. But the substantial expansion took place after the reorganisation of the states and taking up of intensive bunding programme. The importance of soil conservation organisation and its expansion in recent years can be understood, from the number of divisions and sub-divisions. There are 41 divisions and 212 sub-divisions in the State at present.

The field staff available for carrying out the soil conservation work consists of 212 sub-Divisional soil conservation officers, 1060 agricultural supervisors and 5,300 agricultural assistants, with necessary complement of office staff.

10.12.2. *Existing methods and progress*.—In the beginning soil conservation activity was limited to contour bunding alone in low rainfall areas of the State. With the advent of time and varied requirement of soil and water conservation measures in the different agro-climatic zones in the State, activities like graded bunding in assured rainfall area of Vidarbha for control of soil erosion and safe disposal of excess water (1958), terracing of land for converting gentle hill slopes into paddy fields (1959), land development-*cum*-horticulture development, on the lands not suitable for cultivation in the heavy rainfall areas of the Konkan (1963), reclamation of non-coastal saline and alkaline soils on a small scale in the arid zone (1964) ayacut development for proper soil and water management in the major and medium irrigation projects (1965) and gully and nalla control broadly termed as nala bunding (1969) were undertaken. The area covered under each of the above items of soil conservation work is given below :—

Details of the Soil Conservation Works Completed.

(Area in lakh Hectares)

Serial No.	Period	Contour/ graded bunding	Terracing of lands	Land Dev. *Cum*-Hort. Dev.	Reclamation of saline & alkaline lands.
1	2	3	4	5	6
1	Preplan ..	0·64	....	....	——
2	1st Plan ..	1·95	....	....	——
3	2nd Plan ..	5·26	0·02	....	——
4	3rd Plan ..	19·16	0·19	0·04	——
5	1966-67 to 1968-69 (annual plans) ..	17·17	0·39	0·18	0·01
6	4th Plan (upto March 1972)	13·75	0·30	0·21	8·028
	Total ..	57·33	0·90	0·43	0·038

A large potential for the above activities in the drought prone areas evident from the districtwise maximum potential of activity, potential covered, potential yet to be created (area available) is shown in Table No. II appended to this Chapter.

10.12.3. *Evaluation of Contour Bunding*.—So far the soil conservation activity in the State was restricted only to bunding either contour, graded or bench and some trenching and plantation of cashew. Contour bunding forms the major activity both in terms of money and area specially in the scarcity areas in the state. The experiments conducted on bunded and non-bunded areas to evaluate the benefits of contour/graded bunding indicate that per hectare additional yield is only 0·05 tons (50 kilograms only). The value of this additional produce of grain comes to about Rs. 28 per hectare worked out at the prevailing Government monopoly rates. The cost of bunding per hectare is Rs. 200 on an average. This amount with interest is to be recovered in 15 equated instalments from the beneficiaries. The annual instalment works out to Rs. 20·50 per hectare. If the maintenance charges of Rs. 2·50 per hectare are added to the instalment, yearly cost of bunding works out to Rs. 23. This leaves a small margin of direct profit only of Rs. 5 per hectare. Indirectly, however, bunding has its own intrinsic value of controlling erosion, conserving moisture, recharging ground water and preventing silting of tanks, reservoirs, etc. down-stream and, therefore, this measure of soil and water conservation has been largely practised in the State. Soils as they exist today, have been formed through the natural processes through ages. This work of ages can be destroyed in a period of few years. Therefore, the importance of anti-soil-erosion measure for successful agricultural activity has to be given similar priority as provision of drinking water to human population. The economic criterion of benefit-cost should not be given too great a consideration in such activity. Further the research on soil conservation done in the State and outside, however, indicate that yields of crop can be considerably increased when contour/graded bunding is accompanied with agronomical practices as explained in the later paragraphs.

10.12.4. *New concept of Soil Conservation.*—Soil Conservation has now developed as one of the important agricultural sciences. The discoveries and improvement made in the tools and the technique of soil conservation works need, therefore, to be suitably applied to land resources for the betterment of farming. According to the recent concept, the definition of soil conservation is rather comprehensive and not "bunding" alone. Soil Conservation may be defined as the use of land, within the limits of economic practicability, according to its capability (the way the nature made the land) and its needs (its condition resulting from the way man used it) in order to keep it permanently productive (Bannett).

Water and wind are the two active forces of soil erosion. Both remove soil from the surface of the land. The water erosion flourishes when the rains are abundant and the wind erosion is most damaging when rains fail. A cover of vegetation minimise both. In Maharashtra State we are mostly concerned with water erosion-sheet, rill and gully etc. The rate of erosion depends upon such factors like slope, nature of soil, intensity and amount of rainfall and density of vegetative cover. Soil erosion is also intensified by improper methods of cultivation, over-grazing, disafforestation, burning etc. Wherever hilly areas are cultivated without protection, there is bound to be water erosion. Where good covers of thick vegetation, either grass or forest have been maintained, there is usually no need for further pro-protection against erosion. The losses of soil under such protection are negligble. Similarly the run off of water is less. Research done at the Agricultural Research Station, Mulegaon (Sholapur) and elsewhere indicates that the soil and water losses under contour cultivation and strip cropping, combined with good rotations are much less. Therefore, vegetative cover and good agronomical practices have immense bearing on control of erosion and conservation of water. If these agronomical practices are jointly followed with bunding and other mechanical measures, the additional production even in the scarcity areas is bound to be quite substantial and remunerative.

10.12.5. *Factors depleting the soils.*—The depletion or impoverishment of ther soil is brought about by the following:—

(1) Excessive soil removal-erosion.

(2) Uncontrolled run-off.

(3) Accumulation of the toxic salts-alkaline condition.

(4) Development of harmful water logging and inadequate drainage.

(5) Improper cultivation—cultivation up and down the slope.

(6) Exhaustion of the plant nutrients through leaching, over cropping and over grazing.

(7) Improper land use leading to impairment of the soil.

(8) Lack of crop rotation resulting in poor soil structure.

10.12.6. *Measures for Soil and Water Conservation.*—Soil and water conservation is accomplished by using adaptable soil conservation practices both agronomic and engineering.

Engineering practices can be fruitfully used on the steep lands which are vulnerable to erosion and washing away of land due to the run off water. They are not, however, amenable to statistical interpretation alone, while agronomical practices can be advantageonsly followed on all the lands both steep and gentle according to the need of the land.

A. *Engineering practices.*—Engineering practices cover following items.—

(1) Bunding or terracing of the land to prevent erosion.

(2) Nalla bunding for land reclamation and impounding of water for recharging the ground water storage.

(3) Control of small gullies with grass or earthen or stone plug.

(4) Construction of outlets either with stones or grasses.

(5) Drainage installation to improve water-logged and alkaline soils.

(6) Construction of farm ponds, percolation tanks as water harvesting measures.

(7) Diversion of water in small perennial nallas for diverting water for supplementary irrigation.

(8) Flooding schemes by construction of big embankments in the fields.

(9) Land development for irrigation (grading, bunding, water channels, drains etc.)

(10) Maintenance of soil conservation structures.

B. Agronomical Practices.—In these practices land is to be used according to its land use capability. In this concept land can be used for farm crops, grass land development, afforestation and for wild life etc. The agronomical practices would include the following:—

(1) Retirement of severely eroded cultivated lands and steeper slopes from the use of intertilled crops. Such lands should be permanently protected with grass and trees.

(2) Using improved tillage, mulching, and cropping practices to conserve needed moisture and prevent soil shifting. This includes contour cultivation including ploughing, harrowing and sowing according to the requirement of the crop.

(3) Maintaining proper plant population.

(4) Crop rotation.

(5) Cover crops.

(6) Strip cropping.

(7) Use of recommended varieties of crops for the tract.

(8) Application of organic matter.

(9) Pasture development by seeding adaptable grasses and legumes, fertilising etc.

(10) Grass land improvement by rotational grazing, adjustment of grazing to carrying capacity, manuring etc.

(11) Afforestation of suitable areas.

(12) Using adoptable farm machinery.

C. Soil Amendments.—(1) Use of lime, and fertilizers.

10.12.7. *Analysis.*—From the above description it may be seen that soil conservation is the scientific use and protection of the land. Agronomical and engineering practices are complementary to each other. Adopting only one set of measure will not give the desired results. The finding of the experiments conducted at Agril. Research Station, Mulegaon, are revealing. The experiments on the effect of bunding which were initiated in the earlier years of research at Manjari were continued at Sholapur but the results were not found to be amenable to statistical interpretation. The reason given was that the experiments were not carried out on the scientific basis. Bunding, however did help in preventing soil erosion and conservation of moisture and was considered to be the first essential step in the schedule of dry farming practices.

The effects of bunding and cultivation practices as revealed from the agronomical research done at Mulegaon farm is as below :—

(1) *Bunding.*—	Results not found amenable to statistical interpretation. It did however help in preventing soil erosion and conserving moisture.
(2) *Deep Ploughing.*—(For improving tilth and infiltration capacity and eradication of weeds).	(*a*) Shallow soils—Ploughing harmful. (*b*) Medium deep soils—Once in three years.
(3) *Harrowing.*—(For preparing proper seed bed).	3 Harrowings, 23 per cent increase in yield.
(4) *Application of Organic matter*—(For improving texture, structure and water holding capacity).	17 per cent to 23 per cent increase in yield.
(5) *Interculturing.*—(To control weeds and serve as a mulch).	23 per cent increase in yield.
(6) *Proper rotation.*—(To improve soil structure).	15 per cent increase in yield.
(7) *Fertilisation.*—(For supplying crop nutrients).	20 per cent increase in yield.
(8) *Cover Crops.*—(To protect soil from erosion by canopy formation).	15 per cent increase.
(9) *Contour cultivation and strip cropping.*—(To arrest erosion and soil shifting and uniform conservation of moisture).	25 per cent increase (apart from this it reduces erosion hazard by 50 per cent.)

10.13. *Dry Farming.*

10.13.1—In Maharashtra State, agriculture over large areas is carried on under dry conditions. Present irrigation facilities hardly cover about 8 per cent of the cropped area and on account of the undulating terrain and other limitations, the irrigation facilities are not likely to be extended to more than 30 per cent of the cultivated area. Under such circumstances, the importance of dry farming practices needs no further emphasis. Added to this, the fact that 30 per cent of the geographical area of the State is subjected to drought conditions, has also to be borne in mind. Having regard to these conditions, the state department of agriculture has already made pioneer efforts in evolving a schedule of dry farming practices known as the " Bombay Dry Farming Methods. "

The essence of this "Bombay Dry Farming Method" is to grow a good crop within the limited or low rainfall conditions and includes such practices as contour bunding, deep ploughing once in three years, application of organic matter, good tillage, contour cultivation, wide spacing of plants, proper rotation, interculturing etc.

Large scale field trials on dry farming methods indicate that an increase of about 33 to 70 per cent in the yield of jowar grain can be obtained by adopting the recommended practices. The following figures indicate the average range of yield under favourable and unfavourable conditions.

Serial No.	Year of trial	Average yield per acre Improved Method		(Lbs) Local Method		Percentage of average increase	
		Grain	Fodder	Grain	Fodder	Grain	Fodder
						Percentage	Percentage
1	1958-59 ..	856·00	1,667·00	497·00	882·00	70	90
2	1959-60 ..	960·00	1,509·00	720·00	1,029·00	33	35
3	1960-61 ..	910·00	1,409·00	606·00	1,035·00	50	37
	Average ..	908·66	1,528·33	607·66	982·00	51	57

The schedule of improved practices included in the above field trials was (*i*) Contour bunding to reduce run off and arrest soil erosion, (*ii*) Ploughing the land once in 3 to 4 years to improve the tilth and infiltration capacity, (*iii*) Harrowing the land thrice to prepare the seed bed, (*iv*) Manuring at the rate of 5,000 kilograms per hectare. once in 3 to 4 years, (*v*) Use of pure sulphur treated seed of improved variety of M-35-1 Jowar, (*vi*) Wider spacing at 15" apart with lesser seed rate of 4 lbs. per acre, (*vii*) three interculturings for weed control and to serve as mulch, (*viii*) Application of 20 Kg./ha of Nitrogen at the time of sowing for nutrient supply, (*ix*) Adoption of two course rotation of jowar and groundnut with an application of 20 lbs./acre P_2O_5 to groundnut crop for improvement of soil structure and maintaining productivity, (*x*) Use of improved dry farming implements such as (*a*) seed-drill (with 3 coulters and distance between two coulters 18"). (*b*) Blade harrow for covering the seed after sowing and (*c*) Entire blade hoe and fork hoe for creating proper environment for the plants.

The incremental income even after adoption of these practices is marginal, but it may substantially be increased if the practices of contour cultivation and strip cropping are also adopted. It is necessary to have experiments with the inclusion of these methods also to obtain reliable data for a quantitative estimate of the increased income.

The agronomical practices are very important in the scheme of soil and water conservation work and should be given due importance in carrying out soil and water conservation measures. Unfortunately in the existing pattern of work, bunding work is being done in a routine manner and it has in a real sense become a labour employing tool rather than a productive venture. We are, therefore, of the opinion that bunding work in dry areas can add to any substantial production only if it is accompanied with the recommended agronomical practices as enumerated in the foregoing paragraphs. An emphasis should therefore be laid in future programme in popularising these methods in the drought prone areas.

10.13.2. *Dry Land Projects.*—In the past efforts were made to introduce the aforesaid dry farming practices in the low rainfall areas of the State. However, the follow up practice have not been properly attended to and the term soil conservation has remained limited to bunding. This lacuna has long been recognised. Even then in practise, the agronomical practices as a measure of soil conservation and keeping the land permanantly productive have been generally ignored. In order to resist the scarcity conditions on a permanent basis it is necessary to follow the whole schedule of soil conservation measures not only on the individual farm but on a watershed basis in an integrated manner. The Government of India having realised the importance, have initiated an integrated dry land agricultural development projects on pilot basis all over the country. Two such projects, one at Mandrup in Sholapur District and the other at Akola in Akola district have been started in Maharashtra. The salient feature of these projects is the integrated development of dry land agriculture. The items of development include (*a*) Land development such as soil conservation, land grading, ploughing, etc., (*b*) Water harvesting through farm ponds, flooding schemes, nala diversions, percolation tanks, etc., (*c*) Minor irrigation like surface wells, repairs to old wells and lifts, (*d*) Improved cultivation practices, (*e*) Infrastructure like crop demonstrations, demonstration of improved implements and farmers training and (*f*) Supporting occupations like Animal Husbandry, poultry etc. Since the last three years have been acute drought years, the impact of the pilot projects have not been quite evident but in the normal years, programme of this nature is bound to have a far reaching positive effect in improving the farm economy. The theme incorporated in these projects needs to be spread and propogated over all the drought prone areas if scarcity is to be resisted. It is also necessary to consider the setting of additional projects in dry farming research in different areas to make the research more broad based.

10.13.3. *Watershed treatment.*—Following the above mentioned dry farming schedule in the individual fields alone is not likely to go a long way in banishing scarcity altogether. A sure way is to treat the whole watershed or sub-watershed with suitable soil and water conservation measures so as to protect the land and water resources and keep the farming permanently productive. For this purpose the entire watershed/sub-watershed will have to be treated under the new definition of soil and water conservation i.e. use of the land according to its capability and treat it according to its need. This will require soil survey and mapping of the entire watershed, classifying the areas into land use capability units and taking suitable measures in using and protecting the land resources. According to land use capability, the soils are classified under eight units as below :—

Class I.—These soils have no hazards of use and respond to good soil and land management practices. Such lands are nearly level from 0 to 1 per cent and have none or slight erosion hazard. They are deep to very deep soils, effective depth varying from 91 Cms. to 152 Cms. or more.

Class II.—These soils are moderately deep (61 Cms. to 91 Cms.) and have moderate hazards that restrict their use by some plants and need simple soil and water conservation measures along with good management practices. These soils are gently sloping from 1 per cent to 3 per cent and soil conservation measures required are contour tillage, strip-cropping, crop rotations and other improved agricultural practices.

Class III.—These are usually shallow soils having depth of 30 Cms. to 61 Cms. and have severe limitations, which restrict their use to some crops require intensive conservation practices, along with good management and maintenance. Such lands are moderately slopy and fall within the slope range of 3 per cent to 8 per cent and require the moisture conservation measures like bunding, gully plugging along with rotations with legume, application of organic matter and fertilizers, etc.

Class. IV.—These are very shallow soils having less than 30 Cms. depth, have severe erosion with gulleys, generally have limitation for cultivation. Only with very extensive conservation measures they can be adapted to special crops and permanent type of vegetation. The slope range is 8 to 15 per cent.

Class V.—These soils have little or no erosion problems, but have problems which are nct practical to remove. Use of adapted plants is also restricted. These lands are nearly level, but cultivation on them is not feasible because of one or more factors such as wetness stoniness or some other limitation. Class-V lands usually occur in many swampy areas that cannot be drained economically. These lands are generally left to permanent vegetation mostly grass.

Class VI.—These soils have severe limitations which make them unsuitable for cultivation, except in rare cases and then only for specific crops under extremely extensive conservation measures and intensive management practices. These soils are adapted to permanent vegetation under moderate use and management, as these are very steep lands from 15 to 25 per cent.

Class VII.—Unsuited for cultivation and under permanent cover require intensive management practices and protection suitable for afforestation. Slope range is from 5 to 40 per cent.

Class VIII.—Unsuited for crops, grasses and woody plants of economic value as there is no soil, but actually needs protection for recreation, wild life, water supply etc.

On the basis of these land use capabilities and classifications, use of the land and its protection is to be planned. Slopy lands, which are vulnerable to severe erosion, need to be put under permanent cover either in the form of grass or forest. Other arable lands are to be protected both with suitable structural as well as agronomic practices as the need be and land put to use for the crops to which it is suitable.

According to the above land use capabilities, the Class I and Class II lands do not require any engineering measures for soil and water conservation. Only agronomical practices like contour cultivation, strip cropping, good rotation and proper management are sufficient to prevent erosion and conserve moisture. Class III and Class IV lands require both engineering and agronomical measures for effective soil and water conservation. Lands of other classes are not suitable for arable farming. They are subjected to severe erosion and require adequate protection and intensive management and should be necessarily left to permanent vegetation like grasses, trees, etc.

In Maharashtra bunding is presently restricted to cultivated areas and is applied to the slope range right from 0·5 per cent to 6 per cent. With the new concept of soil conservation in which both the engineering and agronomical practices are to be followed according to the land use capability, it may be possible to cover the gentle slopes ranging upto 2 per cent by agronomical measures only for its soil and water conservation without generally resorting to the engineering practices as hither to. This may help to relieve the pressure on the financial resources of the State also to same extent.

10.13.4. *Water Harvesting.*—Apart from the protection of the land, moisture conservation will also, have to be considered, more so in the dry areas. For this purpose water harvesting through percolation tanks, nalla bunding, farm ponds and flooding scheme, etc., will have to be undertaken. Similarly, the groundwater resources need to be tapped where feasible through minor irrigation schemes like sinking of new wells, repairs to old ones and undertaking installations of lift irrigation schemes. Augmenting water supply through water harvesting and groundwater tapping is essential for protective irrigation for the successful rearing of crops which we have dealt separately.

For the watershed treatment in an integrated manner and on area saturation basis, we feel that there should be complete co-ordination among different executing agencies like the Departments of Agriculture, Forest, Revenue and Irrigation and the Zilla Parishad for the developments of the watershed. A master list of items of work to be undertaken for the watershed development is as below :—

(1) Soil Survey	Preparation of soil and land use capability map.
(2) Topographic and other surveys ..	(*a*) Reconnaissance.
	(*b*) Detailed survey when a required measure is to be adopted or installed.
(3) Soil conservation measures to be adopted (as per the land use capability and protection needed).	(*a*) Afforestation and woodland development.
	(*b*) Grass land development.
	(*c*) Terracing contour/graded/bench bunding.
	(*d*) Nalla bunding, gully plugging, nalla training, small check dams.
	(*e*) Reclamation of non-coastal saline and alkaline lands.
	(*f*) Drainage improvement of the water-logged areas.
	(*g*) Water harvesting through farm ponds, small percolation tanks and flooding schemes.
	(*h*) Minor Irrigation like digging of new wells, repairs to old wells, lift irrigation.
	(*i*) Land improvement by tractor ploughing and grading, etc.
	(*j*) Ayacut development, land development for irrigation which includes land grading, bunding, water channels, drains, etc.
(4) Agronomical practices	(*a*) Adoption of suitable agronomical practices like contour cultivation, strip cropping cover crops, proper sequence of cropping, addition of organic matter, rotational grazing, strips, etc.
	(*b*) Introduction of improved package of practices in crop production including seeds, fertilizers, plant protection etc.

10.13.5. *Participation and Education of the farmers.*—Agriculture as a whole is based on the activities of lakhs of individual farmers. Land is owned and used by them. In order to improve their land by suitable soil conservation measures, their active and willing participation is necessary in the whole programme. It is, therefore, necessary to educate them in the matter of soil and water conservation and its importance. Once they realise that their welfare depends on the proper care of their land and its wise use, then the scheme for watershed treatment, on the lines enumerated above, can easily succeed. Government have spent nearly an amount of Rs. 100 crores on contour bunding so far but the efforts towards educating the farmers and people at large for proper soil and water conservation in its true sense have not been adequate. Perhaps, it has not been properly attempted and the entire emphasis seems to have been given on the bunding works on a large scale. We, therefore, recommend that people's education in the matter of soil and water conservation needs to be given a proper place in the scheme of watershed treatment. Once the barrier of ignorance of the cultivators in the subject is removed, the unconcern for the land and its protection is likely to disappear and an intelligent and willing involvement of the farmers in the soil and water conservation can be expected.

10.13.6. *Necessity of new kind of technician and a team of specialists.*—From the above narrative, it will be observed that soil and water conservation involves different disciplines, though fundamentally an agricultural activity. Soil conservation, therefore, calls for a new kind of technician who knows about the land, the soil, ts fertility while continuing in production and also knows how to keep it permanently productive by taking needed soil and water conservation measures both agronomical and structural. The disciplines involved are soils, agronomy, forestry, and engineering. A team of such specialists can only deliver the goods of proper soil and water conservation measures. Half-hearted or one-sided attempt is likely to be wasteful. We, therefore, recommend that the personnel in the soil conservation section should be properly trained in all the above aspects before it is sent to the field.

10.13.7. *Planning Cell.*—A planning cell consisting of the above specialists is also necessary at the state and divisional levels to direct the soil conservation programme on the basis of watershed treatment. We recommend that planning cells should be created for this purpose. The officers selected to man the posts in the planning cell should possess the expertise on the disciplines indicated above.

TABLE No.

Statement showing the yields of crops and gross income derived from crops

Serial No.	Name of the Crops		Yield in Kgs./Hect.	Price per quintal	Value of total produce for one hect.	Total gross income
1	2		3	4	5	6
				Rs.	Rs.	
1	Rabi Jowar ..	Grain ..	403	56	225	375
		Fodder ..	600	....	150	....
2	Bajari ..	Grain ..	304	125	375	....
		Fodder ..	600	....	100	475
3	Wheat ..	Grain ..	450	80	360	360
4	Groundnut ..	Pods ..	650	160	1,040	....
		Chaff ..	150	....	50	1,090
5	Cotton ..	Lint ..	80	200	160	280
		Seed ..	200	60	120	....
6	Sunflower ..	..	600	200	1,200	1,200
7	Gram (or Pulses) ..	..	300	200	600	600

TABLE No. II

Showing the total potential of each district as regards Soil Conservation Works in drought prone districts (in hectares)

Serial No.	District	Total Potential	Area covered upto 31-3-1972	Balance Potential	Remarks
					72-74
1	Buldhana	4,43,410	2,38,869	2,04,541	62475
2	Aurangabad	7,61,042	4,08,551	3,52,491	203414
3	Bhir	7,91,226	2,62,518	5,28,708	60911
4	Osmanabad	12,19,334	4,99,711	7,19,623	588223
5	Jalgaon	7,67,285	3,62,509	4,04,776	103153
6	Dhulia	5,06,413	3,85,140	1,21,273	6134
7	Nasik	5,51,585	4,18,240	1,33,345	-
8	Poona	5,06,594	3,86,594	1,20,000	42155
9	Ahmednagar	7,25,525	5,20,525	2,05,000	41364
10	Sholapur	9,94,933	6,51,933	3,43,000	64448
11	Sangli	4,05,016	2,76,149	1,28,867	17758
12	Satara	4,29,014	1,06,881	3,22,133	33009
		81,01,377	4,517,620	35,83,757	1223044
					5740664
			57330		734[illegible]

CHAPTER XI

AFFORESTATION

11.1. The old adage, " Forests precede man and deserts follow him " becomes a stark reality when three important natural resources, viz. the land, the water and the vegetation are disturbed by short-sighted misuse, over-exploitation and unscientific management. The relationship between land water and vegetation is intricate and any imbalance between the three, howsoever imperceptible initially, may take serious turn unless ameliorative and corrective measures are taken.

11.2. *Significance of Forests.*—Forests have important economic significance apart from the ecological effects which they produce, as they can provide base for industrialisation by assuring raw material for forest-based industries. The scope for commercialisation of the forest activities however, in the drought prone areas is somewhat limited. The significance of the forests in the drought prone areas is mainly due to ecological effects which create conditions for successful cultivation in nearby areas and as pasture lands for cattle. These effects are as follows :—

(1) Prevention of soil-erosion and recharge of groundwater.

(2) Amelioration of climate.

(3) Protection to agricultural lands.

11.2.1. The foliage of any effective vegetation forms a sheltering shield or canopy which breaks down the intensity and impact of torrential rain and thus reduces its erosive action on the soil below. Further, this water of already reduced velocity is absorbed to a large extent by spongy surface provided by the decomposed leaf litter, the humus in the sub-soil and the net work of interlacing roots of trees and vegetation. Thus the run-off on the surface is reduced and water absorbed by the soil percolates to deeper layers where it feeds the streams, springs and wells in the post-monsoon periods.

11.2.2. Trees and forests have a pronounced moderating effect on seasonal heat and cold. The closed canopy intercepts the greater part of the radiant heat of the sun. It has been estimated that radiation intensity in the open is about 12 times greater than in the forests. Trees transpire large quantity of moisture through their leaves and this increases the chances of precipitation when moisture laden winds pass over a forest tract.

11.2.3. Trees also act as protective barriers to the destructive effects of high velocity winds and scorching action of wind in view of an effective dense cover and also obstruct the blowing of fine soil and sand particles from one place to another thus minimising wind erosion. For this purpose trees are planted as wind breakers and shelter belts shielding the lands.

11.3. *Extent of Forests.*

11.3.1. The total area under forests in Maharashtra is roughly 21 per cent of the geographical area. The figures of forest area in the State as given above by the Forest Department and according to the Season andCrop Report substantially differ. According to the latter, the percentage of area under forest to the geographical area is about 17·6 per cent. Both these figures however show that the area under forest is much less than that prescribed under the National Forest Policy which lays down a minimum of 33⅓ per cent of land being kept under forests. (60 per cent in the hilly areas and 20 per cent in the plains with an overall average of 33⅓ per cent). The Maharashtra State has forest area extending to 62,311 sq. km. A Committee appointed by the Government of Maharashtra estimated the forest area under private management as of the order of 8,985 sq. km. The forests under private management mainly exist in Western Maharashtra. These private forests are generally in a very bad state of regression, sadly depleted due to unrestricted and un-regulated fellings over decades. Large areas are denuded of all tree growth and sizeable extent may be under permitted or unauthorised or warkas cultivation. Most of these areas are situated on the slopes of Satpudas and Sahyadris which are strategic water sheds of important rivers and hence their preservation is essential for the soil and water conservation. The extent of the area under forest which is privately managed in the drought prone districts is not known. We however feel that acquisition of these forests lands will have to be done immediately.

11.3.2. Table No. I shows the area under forests in the districts. It may be observed that the forest area is unevenly distributed among the districts. The drought prone districts that we have identified have forest area as under :—

Region or District	Geographical area sq. km.	Forest Area sq. km.	Percentage to geographical area
1	2	3	4
Nasik	15,591	3,299	21·16
Dhulia	13,042	3,930	30·13
Jalgaon	11,840	2,033	17·17
Ahmednagar	17,057	1,860	10·90
Poona	15,625	1,968	12·89
Satara	10,481	1,484	14·16
Sangli	8,564	486	5·68
Sholapur	15,009	370	2·30
Aurangabad	16,353	967	5·92
Bhir	11,057	219	1·98
Osmanabad	14,233	17	0·12
	1,48,857	16,633	11·13

11.3.3. The percentage of forest area to geographical area in the twelve drought prone districts is 11·13 per cent. Therein also in the districts of Nasik. Dhulia, Poona, Satara and Jalgaon, major part of the forest area is in the non-drought prone talukas. If this fact is considered, the area under forest in the drought prone areas is substantially less than the accepted national minimum. Particularly in the three districts of Marathwada the forest area is negligible. The denudation and destruction of forests has already resulted in the marked lowering down of the " water table " in the drought prone areas, and hence efforts to restore the forest cover in these districts are imperative.

11.3.4. A large part of the forest lands, particularly in the dry tracts, contains a poor and degraded growth, stunted and malformed and low in quality as well as quantity from productive as well as protective points of view. Even otherwise, in the State as a whole only 50 per cent of the forest area is reckoned as potentially productive. The functional classification of forests is given below for the State as a whole :—

Classification	Function	Area in 000 sq., km.	% to Total
A. *Area managed by State:*			
1. *In-charge of Forests Department—*			
Tree Forests	Production of valuable timber useful for commercial and industrial purpose.	20	35
Minor Forest	Supply of fuel and small timber for local consumption.	19	33
Pastures	Provision of pastures and grazing ..	5	9
Protection	Protection of physical conditions ..	4	7
Unorganised and miscellaneous		9	16
	Total ..	57	100
2. *In-charge of Revenue Department—*			
Minor forests and pastures		6	100

11.4. *Grazing Policy and Protection of Forests.*

11.4.1. Out of the total area under forest viz. 56,191 sq. km. in-charge of Forest Department as much as 49,263 sq. km. were opened to grazing by 1970-71. In 88 per cent of the area, cattle were admitted with consequent adverse effects to natural re-generation and young growth especially in heavily grazed areas by grazing damage and equally hazardous ill-effects on soil on account of induration and compaction of soil due to trampling, thereby reducing the porosity of soil and its absorptive capacity of rain water.

11.4.2. The grazing privileges in the State are not uniform. In Nagpur Division, grazing has been regulated in grazing units and grazing intensities are prescribed and villages allotted according to grazing units. The essential stock is admitted free and for additional or surplus stock, grazing fees are charged. Grazing fees are charged in Aurangabad Division for livestock permitted to graze in the forests. In Poona and Bombay Divisions, grazing fees and restrictions do not obtain.

11.4.3. The government has already taken steps towards evolving uniform grazing policy in conformity with the principles enunciated in the National Forests Policy, 1961. In Nagpur Division, where grazing settlements were completed. the rules were enforced first. In the remaining areas, the work of grazing settlement is in progress. We are of the opinion that this work needs to be completed expeditiously within definite time period in the drought prone districts in particular because of the shortage of availability of pasture lands.

11.4.4. Another related factor which has to be considered while formulating suitable grazing policy is that the useless cattle should not be permitted to graze and compete with useful cattle for the scarce fodder resources which the forests provide. Since there are limited forest areas available for grazing, these are largely over-graze resulting in serious deterioration of the pastures. It is therefore essential to enforce strictly the system of controlled and rotational grazing.

11.4.5. The problem of illicit grazing and over-grazing needs to be tackled boldly. Not only over-grazing compacts the soil to such an extent as to make it almost impervious to rain water but also makes regeneration very difficult on account of impaired soil complex and poor soil aeration. It is, therefore, necessary to prescribe severe penal action on illicit grazing and felling of trees. We, therefore, recommend that apart from making illicit grazing a cognisable offence, imposition of severe punishment may be considered by the Government to prevent the malaise of illicit grazing resulting in the destruction of the forest wealth. The existing legislation does provide for deterrent punishment but its implementation has not been strict. Most of the offences are compounded. We feel that stricter enforcement of the legal provisions would go a long way in preventing illicit grazing and felling. Another effort towards protection of forests from illicit grazing may be made by providing suitable incentives to local population for detecting offences. The government has already provided incentive in the form of cash awards to Gram Panchayats. We recommend that the following additional incentives may be considered :—

(1) To give rewards upto 20 per cent of the value of the forest produce to informants if the information leads to the detection and recovery of the produce or the value of penalty thereof ;

(2) Rewards to villagers protecting nearby forests.

In addition to the above measures, the formation of mobile courts to try the forest offences may also be considered.

Another important issue is with regard to felling of trees on the private lands which produces more or less the same effect as is produced by destruction and denudation of forests.

The Maharashtra Felling of Trees Regulation Act, 1964 prohibits felling of notified trees without the permission of revenue authorities. The types of trees brought within the purview of this Act are seven in number and include teak, hirda, mango, jack etc. But it is observed that the permission is granted liberally under the Act, which defeats the purpose of the legislation. We feel that the legislation should be implemented in the spirit with which it has been enacted so that diminution in the tree population is minimised.

11.5. *Disafforstation.*

11.5.1. The land hunger has made a tall demand on the areas under forest in the State. In 1960, a State Government High Power Committee for transfer of forest land to Revenue Department for distribution amongst the landless persons laid down that forest lands to be transferred should fulfill the following conditions :—

(*i*) The gradient of the lands should not exceed 10 per cent ;

(*ii*) The lands should not contain more than 20 trees of timber species ;

(*iii*) The lands should form a compact block of not less than 300 acres.

The third condition has been relaxed recently. It was further laid down that the lands given on agri-silvi leases and lands required for afforestation in the second and third Five Year Plans should not be transferred.

11.5.2. The government appointed a Committee in each district consisting of the Collector, the Divisional Forest Officer and the District Inspector of Land Records for survey of the lands. The suitability of the lands for cultivation was also considered in consultation with the agriculture department.

11.5.3. As against an area of 3·91 lakh hectares, released for cultivation as shown in Table No. II only 1.52 lakh hectares of land is added to the forest area in the State by acquisition of private lands or due to transfer of lands from other departments. The percentage of net areas lost to forest is 5·9 per cent. This percentage is not insignificant. It is reported that a large part of disafforested lands has not been brought under cultivation as their land use capability is limited. Though the agricultural experts were consulted and a committee decided on disafforestation, the decisions were possibly biased in favour of releasing the lands for cultivation, as a result of which the lands incapable of being cultivated were also released due to the pressure of public opinion with evident result. The effort to satisfy the land hunger even by disafforesting lands incapable of cultivation renders such effort nugatory, as it defeats the ultimate purpose of increasing agricultural production. We feel that the approach towards disafforestation should be more realistic and no land should be released for cultivation unless its land capability definitely shows that it is capable of being brought under cultivation. We suggest that the disafforested lands which can not be brought under cultivation should be handed back to the forest department after resumption.

11.6. *Management of water sheds and River Valley Projects.*

11.6.1. Erosion by water constitutes the most serious menace to lands particularly on hill slopes and catchments of river valley projects not only because it denudes the soil directly but also because it causes siltation of costly reservoirs and tanks thereby reducing the projected life of costly reservoirs. The genesis of erosion lies in the destruction of natural vegetative cover of the soil by over-felling, over-grazing and fires which leave the soils defenceless against the abrasive climatic force. Due to denudation of soil cover, the infilteration of water into the soil and thereafter into the ground water acquifers is retarded and most of the rain water goes as run-off. Soil conservation measure coupled with afforestation deserves to be considered as an important ingredient of any water management policy, specially in the entire drought prone region and in the Western Ghat regions supporting the rainshadow region on the east.

11.6.2. The life of the reservoir depends to a large extent on the protection afforded to their catchment from denudation, consequent run-off and siltation. According to the recommendation of the Central Board of Forestry, the cost of soil conservation and afforestation work should be included as integral part of the storage projects. The government has sanctioned separately four watershed management planning divisions, one each at Sangamner, Dhulia, Aurangabad and Akola, to examine the projects in the catchment areas of Ukai, Girna, Yeldari, Katepurna and Nalganga. It is reported that most of the work of preparation of detailed watershed management plans in respect of R. V. projects of the Mula and the Girna has been completed. Under the centrally sponsored scheme also, the work has been sanctioned in respect of Nagarjunsagar, Ukai, Nizamnagar and Pochampad. These schemes will not even touch the fringe of the problem and there is imperative need to undertake works on a large scale. We recommend that as far as the drought areas are concerned, the afforestation of catchment areas of minor irrigation works should be considered and the works relating to such projects should be expeditiously completed first. Relatively the catchment areas of minor irrigation tanks are small and hence the benefits of afforestation can be realised early.

11.7. *Drought Prone areas programme.*—Afforestation work as a drought prone areas programme was sanctioned in 1970. But financial outlay proposed for the five districts in Maharashtra was just Rs. 10.7 lakh. The expenditure incurred till the end of December 1972 is 7.06 lakh. The area covered by the plantation is 955 hectares. The districtwise physical and financial targets are shown in table No. III from which it may be obvious that there are no sizable gaps in the achievement and targets. We have in a later chapter commented on the operation of this programme extensively. Hereafter it is necessary to link up afforestation programme with the reservoir programme in the districts so that the benefits can be realised in a short time.

11.8. *Afforestation.*

11.8.1. We have emphasised the importance of forests from the ecological effects which they generate and help in ameliorating the climatic condition. The traditional forestry laid considerable emphasis on the conservation of existing forests by protection, regulated exploitation and sustained yield on a long rotation, relying primarily on natural regeneration. Recent approach towards afforestation programme is more dynamic and is directed towards bridging the existing gaps in demand and production and giving the industrial base in the hinterland. Apart from climatic effects which the forests produce, the industrial potential generated by these programme is of considerable significance.

11.8.2. We have outlined in earlier paragraphs the imperative need for protection of forests in the drought prone areas. For increasing the scope of afforestation particularly in Marathwada area where the percentage of forest area is considerably low, the area has to be extended by transferring the forest lands in the charge of Revenue Department to the Forests Department for afforestation. We understand that the consideration of satisfying the land hunger are no doubt overwhelming, but it is necessary to strike desirable balance between the demand of land for cultivation and afforestation, the latter being of vital importance even for successful cultivation. It is necessary to survey the waste lands from the point of view of land capability and if the waste lands are unfit for cultivation urgent steps to transfer them to the forest department for afforestation are required to be taken. We recommend that this survey may be undertaken on a priority basis particularly in the drought prone areas.

11.8.3. The forests in drought prone areas can be classified, as follows :—

Class of forest	Districts
(1) Southern tropical thorn forests ..	Sangli, Sholapur, Osmanabad, Bhir, Aurangabad, Ahmednagar, parts of Poona and Satara districts.
(2) Southern tropical dry deciduous forests.	Dhulia, Jalgaon, Poona, Satara.

11.8.4. The southern tropical thorn forest contains very poor and sparse growth mainly a scrub-bushy type with a few stunted Injalli species such as hiwara, pala, devbabul and hingana. These forests are under heavy pressure of both human and cattle population in respect of grazing and fuel. The land is heavily eroded exposing the parent rock murrum and boulders. A large part of the area is not fit for immediate afforestation as there is little or no soil to support tree growth. The first step towards rehabilitation of such areas is to close them from adverse biotic influences and simultaneously undertake intensive soil and moisture conservation measures so as to bring them to a stage where soil is built to a sufficient depth and the land is capable of sustaining tree growth. As far as the non-forest lands are concerned, the scheme of farm forestry needs to be implemented on a much larger scale than hitherto so as to raise wind breakers and shelter belts for each village or a group of villages which will go a long way not only to provide partly the local requirement of fodder thereby also relieving pressure on the limited forest lands in the dry tracts but will also provide the most effective safeguard to agricultural fields against wind and water erosion and the desicating effects of scorching high velocity winds.

11.8.5. The southern tropical dry deciduous forests occupy a significant role in the programmes for both agricultural development and providing hinterland for industrial base. The development work in these forests has the physical constraint of limited forest area. Therefore, in these areas the scope of extending afforestation by transferring lands which are not fit for cultivation may be considered. In the case of ravine lands also the schemes for reclamation and control have to be framed and operated.

11.8.6. In the drought prone areas, planting of drought resistent trees like nimb, maharukh, anjan, siras ber, kashid etc. can be considered. Also fruit trees such as sitaphal which are drought resistent can be introduced. Fodder species which are drought resistent should also be considered. The species that should be considered are Anjan, Sissum, Siras, Dhavda, Chinch, Villayati Chinch etc. Planting of fodder trees in the drought prone areas may aid in relieving the fodder scarcity in these areas during the period of distress. Agave sislana and agave veracrus are suitable for planting in dry areas. Agave plantation arrests soil erosion, provides a live hedge against cattle and barrier against fire when planted on the boundary of plantation. One of the important advantage of agave plantation is to provide raw material for rope making.

11.8.7. We agree that spectacular results cannot be achieved in the immediate future in drought prone areas because of depleted soil cover in these areas and slow rate of growth of decidous trees, but these measures are necessary from a long term point of view for making these areas drought resistent.

11.8.9. We have outlined in above paragraphs the plantations which are suitable for the drought prone areas. The forests in the Ghat zones provide fodder to the drought prone areas in the period of distress and the importance of this forest for drought prone aras cannot therefore be overlooked. The Satmalas and the Eastern slopes of Sahyadri are the strategic watersheds of important rivers bringing water to the drought prone areas. Hence a systematic development of forest is essential for the improvement of water resources of the drought prone areas identified by us.

TABLE No. I

District-wise percentage and per capita distribution of forest area 1970-71

Region/District	Geographical area according to 'Survey of India'	State administered forest area	Percentage of forest area in the District to its total geographical area	Per capita distribution of the forest area	Percentage of forest area in the district to the total forest area of State
1	2	3	4	5	6
	Sq. Km.	Sq. Km.	Percentage	Hectare	
I. Western Maharashtra.—					
1. Bombay	482	39	8.09	0.01	0.06
2. Thana	9,474	3,828	40.441	0.23	6.14
3. Kolaba	7,034	1,660	23.60	0.16	2.66
4. Ratnagiri	13,004	386	2.97	0.02	0.62
5. Nasik	15,591	3,299	21.16	0.18	5.30
6. Dhulia	13,042	3,930	30.13	0.29	6.31
7. Jalgaon	11,845	2,033	17.17	0.12	3.36
8. Ahmednagar ..	17,057	1,860	10.90	0.10	2.98
9. Poona ..	15,625	1,968	12.59	0.08	3.17
10. Satara	10,481	1,484	14.16	0.10	2.39
11. Sangli	8,564	486	5.68	0.04	0.78
12. Sholapur ..	15,009	370	2.36	0.02	0.59
13. Kolhapur ..	8,133	1,654	20.34	0.10	2.65
Total ..	1,45,341	22,997	15.32	0.10	36.91
II. Marathwada.—					
14. Aurangabad ..	16,363	967	5.92	0.06	1.55
15. Parbhani ..	12,554	383	3.05	0.03	0.61
16. Bhir ..	11,057	219	1.98	0.02	0.35
17. Nanded	10,504	1,340	12.76	0.12	2.15
18. Osmanabad ..	14,233	17	0.12	0.01	0.03
Total ..	64,701	2,926	4.52	0.05	4.69
III. Vidarbha.—					
19. Buldhana ..	9,715	1,566	16.11	0.15	2.51
20. Akola	10,598	875	8.25	0.07	1.40
21. Amraoti ..	12,233	3,671	30.01	0.30	5.89
22. Yeotmal ..	13,567	3,821	28.17	0.35	6.13
23. Wardha	6,291	890	14.15	0.14	1.43
24. Nagpur	9,952	779	27.92	0.18	4.46
25. Bhandara ..	9,277	4,279	46.12	0.34	6.88
26. Chandrapur ..	25,594	18,507	72.31	1.49	29.70
Region III ..	97,227	36,388	37.43	0.39	58.40
State ..	3,07,269	62,311	20.28	0.16	100.00

TABLE II

Forest areas disafforested and released for cultivation and other purposes

For cultivation	Hectares
(*i*) Under special surveys undertaken as per criteria of the high power Committee	
1960 Survey .. 52,618	
1965 survey .. 19,597	
1970 survey 50,035	
122,250	1,22,250·00
(*ii*) Forest lands under Eksali cultivation to be granted on 2nd class tenure ..	28,777·00
(*iii*) Forest lands in forest villages/settlements to be granted on 2nd class tenure.	71,942·83
(*iv*) Dalli lands in Kolaba district	11,913·00
(*v*) For resettlement of projects affected persons	41,062·00
(*vi*) Regularisation of encroachments in Thana, Nasik and Chandrapur districts	17,214·00
(*vii*) Forest lands from deserted villages from Nasik, Dhulia and Yeotmal districts.	3,645·00
(*viii*) Forest lands released from Thana District under special circumstances for cultivation to backward class people.	17,456·00
(*ix*) Resettlement of immigrants from East Pakistan	34,801·00
(*x*) Resettlement of Tibetan families	1,388·00
(*xi*) Resettlement of former agri-silvi plot-holders frmom Dhulia district ..	1,490·00
(*xii*) Forest land released for model colonisation for agricultural labourers.	6,738·41
Total ..	3,58,177·24

Other Purposes

(*i*) Forest land going under submergence of river valley projects	25,324·00
(*ii*) Other purposes such as gothan, railways, roads, defence, etc. ..	7,366·00
Total ..	32,864·00
Grand Total ..	3,90,861·24

TABLE No. III

TABLE No. III

The targets (Phy. and Fin.) fixed under formation of Master Plan and the target achieved and anticipated under D. P. A. P.

PL : Plantation (Ha).
PMW : Premonsoon works (Ha).
Fin. (Rs. in lakhs).

Year	District	Target fixed			Target achieved			Mandays generated	Remarks.
		Phy		Fin.	Phy.		Fin.		
		P.L. Ha.	P.M.W. Ha.	Rs.	P.L. Ha.	P.M.W. Ha.	Rs.		
1	2	3	4	5	6	7	8	9	10
1970-71	Sholapur	..	70	0·560	...	70	0·57	8,917	Achieved
	Satara	..	60	0·470	..	102	0·77	12,915	Do.
	Sangli	..	60	0·470	..	60	0·46	8,060	Do.
	Ahmednagar	..	200	1·220	..	210	1·13	22,244	Do.
	Nasik	..	100	0·640	..	100	0·58	12,440	Do.
		..	490	3·360	Nil	542	3·51	64,576	Do.
1971-72	Sholapur	70	70	0·724	70	70	0·63	14,300	Do.
	Satara	60	60	0·633	110	55	0·58	12,665	Do.
	Sangli	60	60	0·633	60	60	0·54	11,835	Do.
	Ahmednagar	200	120	0·857	210	210	0·63	34,375	Do.
	Nasik	100	100	1·017	100	100	0·84	29,285	Do.
		490	410	3·864	550	405	3·22	1,02,460	Do.

H 4485—14a

							Anticipated	Expected
1972-73 ..	Sholapur	70	70	0·749	70	70	0·66	14,980
	Satara	60	60	0·654	55	55	0·54	11,500
	Sangli	60	60	0·654	60	60	0·57	13,080
	Ahmednagar	120	120	0·827	120	120	0·63	26,464
	Nasik	100	100	1·075	100	100	0·93	28,666
		410	410	2·959	405	405	3·33	94,690
1973-74 ..	Sholapur	70	70	0·763	70	70	0·76	15,260
	Satara	60	60	0·666	55	55	0·62	11,000
	Sangli	60	60	0·666	60	60	0·66	13,320
	Ahmednagar	120	120	0·839	120	120	0·84	26,848
	Nasik	100	100	1·092	100	100	1·09	29,120
		410	410	4·026	405	405	3·97	95,548
	Grand Total ..	1,310		15·209	1,360		14·03	3,57,274

CHAPTER XII

ANIMAL HUSBANURY

12.1. In the Chapter on Long Term Strategy we have emphasised the important role that animal husbandry sector will have to play in bringing about a diversification of the economy of the drought prone areas by augmenting the employment opportunities in order to enhance the level of income of the rural population. In the following paragraphs we have described the development of these activities in four categories :—

(*i*) Sheep rearing ;

(*ii*) Dairying ;

(*iii*) Cattle breeding ;

(*iv*) Poultry farming.

12.2. *Sheep rearing.*

12.2.1. Sheep rearing has necessarily to be nomadic and thus surviving and thriving only by migration to hilly areas when land is under cultivation and returning to homesteads after the crops are harvested. The pattern of rainfall in the western parts of drought prone areas and their proximity to the hilly areas make the former more suitable for sheep rearing. Immediately adjoining the drought prone area is western hilly and high rainfall region which provides good pastures on the onset of monsoon in June with its peak fall in July. This drought prone region gets peak precipitation in August-September. This influences the pattern of migration. Right up to the end of April, the nomadic herds from the drought prone region graze hundreds of miles away from their homesteads, along the mountainous and forest routes of the Sahyadris and return home and move in the neighbourhood only during the monsoon season, which is the lambing period. Sheep are found in substantial numbers in the drought prone areas, namely in Man and Khatav talukas of Satara district; Baramati, Indapur, Purandar, Sirur and Dhond talukas of Poona district; Vita and Jath talukas of Sangli district; Malshiras, Sangola, Pandharpur and Mangalvedha talukas of Sholapur district; Bhir, Kaij and Patoda talukas of Bhir district; Parner, Sangamner, Srigonda and Pathardi taluka of Ahmednagar district. Even though this area has a larger sheep population compared to other areas, its multiplication is practically with very little or no scientific breeding or veterinary care and without any awareness of the potential profitability of this business. The marketing of livestock and livestock products such as wool, hides and skins is also in an unorganised state.

12.2.2. The Indian Council of Agricultural Research conducted a sample survey in this region in 1954-56 and the break-up of the earnings from sheep rearing has been estimated as follows :—

(1) Sale of animal for mutton ..	58 per cent to 69 per cent.
(2) Sale of wool ..	13 per cent.
(3) Folding of agricultural land ..	12 per cent.
(4) Sale of manure	5 per cent.

The price of mutton has since then nearly doubled and the estimates made by the State Animal Husbandry Department place about 54 per cent of the receipts from the sale of livestock, 42 per cent, from folding and manure and only 4 per cent from the sale of wool. The gross return per sheep per year as estimated by the Depart. ment is about Rs. 25 in a constant fleet of 50 sheep. The restrictive factors are poor lambing (70 per cent), high mortality of lambs (15 per cent. and poor return and yield of wool. The wool has practically no value for manufacture of textiles but is found to be of use for carpets or rugs. On account of the exremely poor return per sheep, their rearing cannot be a self-sustaining activity for the agriculturitsts, but it can supplement the normal source of income to agriculturist. Various measures are essential for improving the return from sheep rearing activity which are outlined in following paragraphs.

1.2.2.3. Goats are destructive of all vegetation including growing forest and by such exploitation they accelerate soil erosion. As compared with goats, the requirement of fodder for sheep is smaller. The high rate of fertility and multiplication of goats coupled with their better adaptability to varying precipitation would have since long outsted sheep from this area, but for the restrictive policies of the Forest Department and the Government to discourage the grazing of forest lands by goats. Hardly any sheep development worth the name is possible unless goats are eliminated. The grazing habits of sheep are complementary to those of cattle in the sense that the former can thrive on the left over of the latter while the goats compete with the cattle for their fodder requirements. We feet that the restrictive policies of discouraging grazing by goats should be enforced more strictly in the drought prone areas.

12.2.4. It is possible to improve the returns from sheep husbandry by providing facilities of veterinary care, controlled and systematic grazing, improvement of pasture, marketing of livestock and livestock products like wool, hides and skins and assisting the processing and cottage industries.

12.2.5. *Veterinary programme and training of shepherds.*—In veterinary programme stress should be laid on the training of shepherds in simple operations like drenching rather than on opening of veterinary aid centres. Veterinary centres are of little significance as the herds continuously move from village to village or to the forest and hilly ranges in the inaccessible tracts. A thorough study of their routes and provision of health camps at suitable distances equipped with basic drugs and competent veterinary officers trained in treating sheep diseases reduces the mortality and promotes health of the herds. At present the distribution of vet-aid centres in this region does not seem to be any better than in the other regions. Concentrated efforts will have to be made in training the shepherds during the monsoon period in treating the animals and to making available to them simple and harmless but effective drugs. A special team of workers in adequate number proportionate to the sheep population, is likely within a few years to change the economy of sheep husbandry. The present diffused schemes framed by the State or Zilla Parishad seem to have given very poor returns. Similarly opening of vet-aid camps, in other seasons on the routes of migration will provide necessary veterninary cover throughout the year.

12.2.6. *Marketing of wool and mutton.*—The price of wool is reduced by the extent of burr and dirt therein. Training in shearing of wool can very easily be a part of the veterinary aid programme. Like other agricultural produce, wool also should be sold only in the market yards supervised and regulated by market committees. The sale of wool in the market yard makes the price of wool known to all and prevents the exploitation of shepherds by the middle men.

12.2.7. At present, sheep and goats are driven for miles along the highways to Bombay and Poona which are the biggest markets for their mutton. Location of abattoires, hides and skin processing centres and blood and bonemeal plants as an integral part of the market yard is an accepted complex of livestock marketing all over the world. The existing programme as sponsored by the Government of India is confined to municipal corporation areas. A more rational planning demands the setting up of abattoires close to the places where livestock is reared as well as rail road junctions from where transport overnight to important consuming centres is possible. As a corollary, refrigerated vans or rail bogies will have to be provided.

12.2.8. The livestock which provides meat in the Poona region alone is about 72·48 lakhs. The number of sheep that can be available for slaughter can be conservatively estimated at 5,00,000 per annum ; to-day while twice that number of goats may be available for slaughter. Even if the goats are eliminated in stages the number of sheep would increase considerably. Thus in course of time about 10 lakhs sheep will be available for processing every year if abattoires are built at the central places in this region.

12.2.9. Skin and hides processing units, and industries based on the utilisation of leather and wool can spring up over this area as a cottage industry. As a matter of fact, this industry provides employment to a least about 20 per cent. workers engaged in household industries. This reveals that with availability of raw material and suitable training in the latest techniques of production and with an eye on the demand and marketability, a substantial source of income can be provided in the rural areas from the manufacture of rugs, kamblis, blankets and carpets and from footwear and other leather goods.

12.3. *Dairying.*

12.3.1. One of the important activities which can supplement the income of rural population is cattle and buffalo development. Buffalo is a milch animal which is very sensitive to heat and whose productivity is affected by hot climate. The largest concentration of buffaloes in the State is however found in Sangli, Satara, Sholapur, Poona and Jalgaon districts. The Pandharpuri breed of buaffalo is a speciality of Sholapur district. In the above mentioned districts there are at present about 7 lakhs cows in milk but it is an established practice to allow the male calf to suckle fully the cow and not to treat cow milk as a marketable commodity. With the recent welcome change in the milk pricing policy which does not over emphasise the fat contents now the cows' milk will fetch good returns.

12.3.2. Dairying is a well established livestock activity in this sem-arid region even though its productivity appears to be low. It is observed that even the best milch breeds of cattle in the country viz. Sindhi, Tharparkar and Sahiwal are evolved in arid region. There is therefore no reason why the scarcity areas in Maharashtra should not successfully adopt this activity.

12.3.3. The Dairy Development Department has opened pasturisation and collection centres in the scarcity areas at Dhulia, Poona, Sholapur and Miraj. These centres have shown a steady rise in milk collection by government or co-operative agencies working in this area. With population of about four lakh buffaloes in milk in the region, one can reasonably expect a surplus of at least 4,00,000 litres of milk. One of the obvious limitation on development of dairying in this region is that this activity is intrinsically connected with the growing of crops and a year of scarcity may play considerable havoc. To avoid such a situation we have in an earlier chapter on "Agriculture" recommended the growing of grass of Blue panic and Marvel-8 varieties on very shallow soils in this area.

12.3.4. In a recent study of Sirur taluka of Poona district by the Agricultultural Refinance Corporation comparative economics of grain cultivation under rainfed conditions for 1·75 acres of grain versus fodder cultivation with a buffalo has been worked out. The details are shown in Table No. I. The average annual net income from grain cultivation works out at Rs. 265/-. If the same farm of 1·75 acres is sown to fodder crop and the dry fodder so obtained is supplemented by purchase of green fodder and concentrates to stall feed a buffalo costing Rs. 2,000 and yielding abont 1,800 litres of milk per lactation cycle of 15 months, the net income works out to Rs. 1,100 per lectation or Rs. 860 per year. Assuming that the farmer sells only 1,600 litres of milk and uses the remaining 200 litres for domestic consumption, a net cash income from a buffalo works out at Rs. 900 per lactation or Rs. 715 per annum. The equated annual repayment instalment on a loan of Rs. 2,000 towards the cost of the buffalo together with interest at the rate of 9 per cent p.a., comes to Rs. 620 under a loan period of four years. Thus the surplus annual cash income left with the cultivator after meeting the repayment liability would vary from Rs. 100 to Rs. 205, respectively. The annual incremental income over grain cultivation can be placed at Rs. 650 which gives an internal rate of return of 19·1 per cent. on the capital of Rs. 2,000 invested in single buffalo. It, therefore, appears that the dairy activity is capable of stablising farm incomes at higher level even under rainfed conditions. If the Government forest land is used for the production of fodder and farmers are allowed to cut green or dry fodder therefrom against payment of a fee, the dairy activity can be encouraged in the areas where there is no shortage of drinking water.

12.3.5. Akola taluka of Ahmednagar district and Patoda taluka of Bhir district are among the talukas in the State which have the largest number of milch cows and buffaloes i.e. 31 and above per 100 persons and that the talukas like Ashti and Khed have very high proportions viz. between 26 and 30 milch animals per 100 persons. These and similar talukas can be considered as having considerable milk surplus and milk collection activity and breeding and veterinary activities of animal husbandry needs to be concentrated in such areas.

12.3.6. Akola taluka of Ahmednagar district is known for the Dangi breed of cattle which is reared systematically in that tract. The milk yield is also known to be better than any other breed in the State like Khillar and Deoni. Replacement of non-descript breed by improved or cross-breed in this region is likely to improve the potential dairy development pockets mentioned above.

12.4. *Cattle Breeding.*

12.4.1. One of the best draught breed of the country namely Khillar is traditionally reared in Sholapur district and parts of Satara district. The existence of draught breeds indicate that there is a future possiblility of development of cattle breeding for work and beef in this area. The smallest number of bulls reared and used exclusively for breeding purposes in this region as compared to corresponding area in any other parts of the State, indicates the high standard of selection of breeding bulls adopted here. The incentives offered in the State to the breeders of the tract are of little significance so far. It is necessary to encourage this activity of the cattle farmers by offering substantial prizes every year to a significant number of owners of outstanding breeding bulls by holding annual cattle show for the purpose in each taluka. It is further possible to improve the local breed by cross-breeding.

12.4.2. One view has been that there is a large number of undernourished and scrub cattle which cannot be used either as milch animals or for work but they compete for scarce fodder resources of the region. This view holds that proper stock management technique should be followed in elimination of uneconomic cattle which should be weeded out. The livestock census of 1972 reveals that the percentage of cows and buffaloes over 3 years classified as 'others' and 'not calved even once' is 4·7 per cent of the total cattle population in the drought prone areas. One of the reasons for the existence of scrub cattle is said to be the inhibition against slaughter of cattle, particularly cow. The opinion as expressed by people's representatives before us in the various meetings appeared to be changing in favour of slaughter of scrub cattle including cows. However an intensive study of this public opinion by appropriate social authorities will only confirm this observation.

12.4.3. In the Bombay market itself, the number of cattle being slaughtered is said to be increasing. The prices in the United States, Western Europe and the Persian Gulf Area are considerably higher than in our country. It is understood that large quantities of dressed animal beef and fresh boneless beef are at present being exported from Bombay to the Gulf Area. It is also learnt that some parties from that area have approached MAFCO for establishing processin plants for dressing, freezing and exporting of beef. There are at present restrictions on the export of cow-beef under the licensing policy as per Export Control Order, 1968. Some members therefore firmly hold that a revision of this policy in favour of export of all types of beef should be carried out.

12.4.4. They feel that apart from the export possibility of beef, the marketing facilities have to be considerably improved. The establishment of complex market yeards, abbattories and blood and bone meal plants and hides and skins processing units should not only ensure better returns to the cattle farmer but should also prevent cattle from being subjected to heavy strain of walking over scores of kilometres to centres like Bombay where they are slaughtered in highly famished condition with their skin damaged by swelling and beating.

12.4.5. Others, however, hold a different view. They hold that the cow and the bull are an integral part of our farm organism. We need cow not only as a milch animal but also for providing bullocks for the farm work. Available bullock power is alrady short of the requirements of our farms. Moreover, replacement of bullock-power by machines on lakhs of hectares under cultivation appears to be improbabale in the near future.

12.4.6. This view, therefore, emphasises that steps for improving cow which is a duel purpose animal (for draught purpose and milk) should be taken rather than taking any steps as will cause a 'drain' on it. Any promotional measures for export of be f will bring in the competitive influence of foreign currency on the internal economy of the farm industry. Temptation to sell out a working useful animal to slaughter house for an attractive price may not be resisted by the poor farmers. That will set in a process of 'cattle drain' adversely affecting not only the milk production but also the agricultural operations on the farms. Such process will be very damaging. A well-fed animal will fetch attractive prices and will be more in demand by the slaughter houses rather than the scrub and the under-nourished.

12.4.7. Hence, they suggest that in place of the approach of weeding through 'slaughter' encouragement to fodder production through appropriate changes in the crop pattern in the irrigated tracts to meet with the growing requirements of our mich animals as also the draught animals is called for. According to them the problem of over-stocking has been really the problem of inappropriate management of the farm industry in general and animal husbandry in particular over a long period. The solution to the problem lies in improving the management of the cattle stock by control on the stray cattle to avoid multiplication of non-descript breeds, selective production of the better breeds, arrangements for adequate feeding through extensive cultivation of fodder, a better managed farm manure system and marketing facilities for the milk and dairy products.

12.5. *Poultry development.*

12.5.1. Poultry is another subsidiary livestock activity of importance in this region. This bird is basically and biologically a creature environmentally most suited to tropical and hot climate. The largest concentration of poultry in this State is in the drought prone areas of Ahmednagar, Satara, Poona, Sangli and Sholapur districts. It is the backyard open range poultry of traditional type, rather than the capital intensive, import based, modern scientific poultry that is likely to succeed in these areas with a slightly improved type of birds, whose demands of health or feed are only proportionate to the type of feed locally available for poultry development. Since the region is having jowar and bajra fields the open range poultry survives, easily by picking up the left over grains in the fields. A little addition of meatmeal available from slaughter houses is likely to increase the yield of eggs per bird.

12.5.2. Removal of sub-standard cockrels and substitution of hybrid cocks with higher potentiality for egg production can be undertaken on a large scale. Similarly poultry mash of a cheap type rather than high energy ration, which is beyond the means of an average rural worker can be easily supplied all over the area, to supplement the natural feed, the birds pick up by roaming. Marketing and storage facilities should be provided on a more extensive scale than at present. The usual handicaps of running a marketing activity by Government agency can be overcome by independent marketing agency like MAFCO which obtains its supplies through the producer's co-operatives. From the estimated 55 lakhs poultry birds in the drought prone areas, one can very reasonably expect at least 10 lakhs eggs as being available in this region.

TABLE No. 1

Comparative Economics of Grain Cultivation and Dairy

Activity based on Farm-produced Fodder for a 1·75 acres Unirrigated Farm.

I. *Grain cultivation (Pre-development)—*

			Rs.
1·00 acre of rainfed jowar—	Output of grain 1 quintal at Rs. 70 per quintal		70
	Output of fodder 1 tonne at Rs. 200 per tonne		200
0·75 acres of rainfed bajra—	Output of grain 1 quintal at Rs. 60 per quintal		60
	Output of fodder 1 tonne at Rs. 75 per tonne		75
		Total receipts ..	405
Cost of cultivations at Rs. 80 per acre ..		Total costs ..	140
		Net income ..	265

II. *Fodder cultivation (post-development)—*

A. Fodder dry farm 1·75 acres at 21/2 tonnes/acre—4·37 tonnes.

Cultivation costs at Rs. 150 per acre × 1·75 acres—Rs. 262.

B. Receipts from and expenses on 1 buffalo per lactation —

(*i*) Purchase cost Rs. 2,000 inter-lactation period—450 days (of which 150 days dry). Output of milk.—1,800 litres in 300 days under each lactation.

(*ii*) Feeding costs per lactation cycle of 450 days—

(*a*) Dry fodder at 9 kgs. per day for 300 days of lactation and 10 kgs. per day for 150 dry days—4·2 tonnes (Farm produced).

(*b*) Green fodder at 2 kgs. per day for 300 days of lactation—0·6 tonne (purchased at Rs. 200 per tonne)—Rs. 120.

(*c*) Concentrates at 1 1/2 kgs. per day for 300 days of lactation 0·50 tonne at Rs. 600 per tonne—Rs. 300.

Total feeding costs—Rs. 262 fooder cultivation costs Rs. 420 purchased green fodder and concentrates.

Rs. 682, say Rs. 700 for 15 months.

Rs. 560 per year.

(*iii*) Receipts from milk 1,800 litres at Rs. 1·00 per litre—Rs. 1,600 (sale only 1,600 litres worth Rs. 1,600) (Maintenance cost of calf will be offset by receipts from manure and sale of calf).

(*iv*) Net income per lactation Rs. 1,800 less Rs. 700—Rs. 1,100 (or Rs. 1,440 less Rs. 560—Rs. 880 per year).

(*v*) Net cash income per lactation—Rs. 1,600 less Rs. 700= Rs. 900 (or Rs. 1,280 less Rs. 560— Rs. 720 per year).

C. *Surplus Cash income after loan repayment—*

Annual repayment instalment on Rs. 2,000 with payment of interest at 9 per cent per annum is Rs. 620 for 4 years loan and Rs. 515 for 5 years loan.

Annual surplus cash income Rs. 720 less Rs. 620—Rs. 100 (4 years loan).

Annual surplus cash income Rs. 720 less Rs. 515—Rs. 205 (5 years loan).

(*l*) *Additional income from Dairy.—*

Rs. 1,100 less Rs. 265 —Rs. 835 per lactation period of 15 months or Rs. 880 less Rs. 265—Rs. 615 per year.

TABLE No. II

TABLE

Livestock Population

District	Cattle				
	Males over 3 years				
	Used for breeding only	Used for both breeding and work	Used for work only	Others	Total
1	2	3	4	5	6
Nasi k	1,352	13,393	3,35,443	6,272	3,56,460
Dhulia	841	8,055	2,51,358	2,639	2,62,893
Jalgaon	688	10,770	2,30,247	5,651	2,47,356
Ahmednagar	496	14,440	3,34,236	3,422	3,52,594
Poona	366	9,334	2,49,989	2,368	2,62,057
Satara	159	2,709	1,53,725	2,668	1,59,261
Sangli	174	2,631	1,23,249	1,297	1,27,351
Sholapur	445	8,108	1,91,476	2,727	2,02,756
Aurangabad	594	9,641	3,45,364	3,148	3,58,747
Bhir	180	3,665	2,39,469	2,155	2,45,459
Osmanabad	384	10,207	2,65,379	4,909	2,80,879
Buldhana	1,630	5,753	1,88,928	2,963	1,99,274
Total ..	7,309	98,696	29,08,862	40,219	30,55,087

No. II

in Drought Prone Areas.

Cattle							
Females over 3 years							
In Milk	Dry	Not calved even once	Working	Others	Total	Young Stock	Total cattle
7	8	9	10	11	12	13	14
78,181	1,46,039	33,262	2,913	1,867	2,62,262	1,81,362	8,00,584
53,125	91,555	23,005	337	485	1,68,507	1,41,573	5,72,973
63,872	79,215	19,601	2,264	2,494	1,67,446	1,61,150	5,75,952
86,169	1,42,167	28,187	2,182	1,906	2,60,611	2,02,558	8,15,763
69,399	99,705	22,553	422	1,504	1,93,583	1,51,898	6,07,538
40,150	64.445	20,013	504	708	1,25,820	82,292	3,67,373
34,059	46,415	14,946	229	382	96,031	56,708	2,80,090
71,577	67,421	16,641	546	625	1,58,810	1,34,095	4,93,661
77.039	84,694	17,565	1,438	891	1,81,627	1,66,238	7,06,612
65,711	79,364	19,350	174	736	1,65,335	1,38,932	5,49,726
93,015	90,436	25,974	467	604	2,10,496	1,87,624	6,78,999
55,579	77,512	14,046	1,402	1,031	1,49,570	1,36,601	4,85,445
7,87,876	10,68,968	2,55,143	12,878	13,233	21,38,098	17,41,531	69,34,716

TABLE

In Drought

District		Buffaloes				
		Males over 3 years				
		Used for breeding only	Used for breeding and work both	Used for work only	Others	Total
1		15	16	17	18	19
Nasik ..	..	534	1,163	9,098	365	11,160
Dhulia ..	..	692	457	3,169	181	4,499
Jalgaon ..	..	900	406	1,434	258	2,998
Ahmednagar	..	439	341	2,796	163	3,739
Poona ..	..	439	518	1,462	213	2,632
Satara ..	..	275	664	2,082	181	3,202
Sangli ..	..	150	561	8,623	151	9,485
Sholapur ..	..	318	956	3,744	306	5,324
Aurangabad ..	..	436	648	1,777	289	3,150
Bhir ..	..	276	443	1,220	179	2,118
Osmanabad ..	..	415	833	2,349	322	3,919
Buldhana ..	..	461	752	1,399	264	2,876
Total	..	5,335	7,742	39,153	2,872	56,102

No. II—*contd.*

Prone Areas

Buffaloes							
Females over 3 years							
In Milk	Dry	Not calved even once	Working	others	Total	Young stock	Total buffaloes
20	21	22	23	24	25	26	27
24,974	21,597	7,240	580	429	54,820	30,213	96,193
26,266	27,421	8,270	294	318	62,569	37,012	1,04,080
41,599	35,359	12,688	1,053	1,263	91,962	57,568	1,52,528
23,112	23,551	6,355	684	302	54,004	30,536	88,279
48,992	36,801	18,035	255	955	1,05,038	43,339	1,51,009
60,234	54.120	18,199	924	663	1,34,140	72,212	2,09,554
71,937	39,055	15,053	405	353	1,26,803	70,419	2,06,707
42,538	26,653	7,520	619	279	77,609	58,061	1,40,994
20,611	20,651	5,405	912	256	47,835	27,866	78,851
25,824	23,020	7,238	308	317	56,707	39,055	97,880
57,741	43,197	14,427	785	467	1,16,617	85,998	2,06,534
19,431	16,676	4,336	770	419	41,632	24,723	69,231
4,63,259	3,68,101	1,24.766	7,589	6,021	9,69,736	5,77,002	16,01,840

TABLE

District		Sheep	Goats	Horses ponies	Pigs	Camels
		28	29	30	31	32
Nasik ..	..	1,36,974	3,69,578	3,379	10,640	Nil
Dhulia ..	..	40,767	2,97,536	3,603	8,203	Nil
Jalgaon ..	..	43,157	2,99,891	1,518	8,126	Nil
Ahmednagar	..	2,98,593	5,46,705	4,534	13,521	....
Poona ..	..	2,89,407	3,54,660	4,472	5,626	5
Satara ..	..	2,67,409	2,55,100	856	5,393	8
Sangli ..	..	2,22,512	2,16,430	889	5,780	1
Sholapur ..	..	2,30,075	4,26,708	1,718	11,692	8
Aurangabad	..	72,920	3,51,753	6,113	13,707	9
Bhir ..	..	87,392	2,38,147	3,851	7,385	34
Osmanabad ..	..	79,842	2,18,639	4,069	9,791	210
Buldhana ..	..	28,051	1,83,043	1,525	5,374	Nil
Total	..	17,97,099	37,58,190	36,527	1,05,238	275

No. II—*concld.*

Other Live Stock	Total Live stock	Poultry
33	34	35
3,012	14,20,360	4,31,849
1,817	10,28,979	3,40,980
3,947	10,85,119	1,86,290
4,788	17,72,183	7,73,317
3,167	14,15,884	11,69,096
2,267	11,07,960	6,96,239
986	9,33,395	5,70,463
3,088	13,07,944	6,03,889
3,781	12,33,746	2,06,183
1,870	9,86,285	2,22,360
2,605	12,00,689	2,21,120
2,103	7,74,772	1,20,983
33,431	1,42,67,316	55,42,749

CHAPTER XIII

INDUSTRIES

13.1. We have in Chapter on " long Term Strategy " pointed out the inadequacy of agriculture oriented programme alone in improving the economic conditions of drought prone areas. The capacity of agriculture in these areas to sustain the population at a fairly stable level of income is limited by the vagaries of rainfall, unless the tract has extensive and assured irrigation facilities. It becomes therefore imperative in the areas not served by major irrigation to find employment opportunities which are less dependent on rain water. The magnitude of disguised unemployment and under-employment in these areas is generally larger than that in the areas which are free from drought since utilisation of additional manpower on agricultural operations in the former areas does not result in an accretion to the output in the face of uncertain condition of rainfall. The measures designed to stabilise agricultural incomes through soil and moisture conservation and dry farming methods have limitation which we have pointed out in Chapter VII. During the period of drought a large number of people is thrown out of normal employment for whom alternative employment has to be provided on scarcity relief works. Annual additions to the labour force further accentuate the problem. Scarcity during the last three consecutive years has indicated the alarming proportion which the problem assumes and threatens the disruption of the entire economy of the State. Rural works programmes as now understood lays emphasis on unskilled works only and provide at the best a temporary solution. The diversification of the economy by augmenting employment opportunities in the non-agricultural sectors may be more effective as a long term solution. We have discussed the scope of animal husbandry in bringing about such diversification elsewhere. The role of industries in improving the economic condition in the drought prone areas is considered in the following paragraphs.

13.2. If the agricultural conditions in the drought prone areas continue to remain precarious, a flow of population therefrom to economically developed areas cannot be stemmed. Such shifts in population may create numerous problems of housing, water supply and sanitation. The social cost of meeting these problems is considerably high. This can be avoided through the policy of industrial dispersion. The main objective of industrial dispersion should be a permanent increase in the employment potential in the areas. For a policy of industrial dispersion, the village is too small a unit and city too large a unit. The approach for the diversification of the economy therefore has to foster the industry particularly small scale industry in towns at intermediate level and to link this programme to surrounding rural areas by promotion of trade and other inter connections. This evidently leads us to the problem of selection of growth centres for concentration of investment and efforts to achieve the diversification.

13.3. The drought prone areas in our State possess fortunately certain advantages with regard to the location of industries. The communications infra-structure needed for facilitating the development of industries exists in the form of railwayline which passes through drought prone districts. The rail link running north to south along the eastern strip of the drought prone area can unleash the possibilities of industrial development in this region. Since the agrarian incomes in these areas are uncertain land values are much lower than the areas where there is assured agricultural income. Labour is also easily available in these districts. A few industrially developed urban centres such as Sholapur and Nasik already exist in these areas. The development of intermediate urban industrial centres between such centres and villages may go a long way in bringing diversification of the economy of these areas.

13.4. *Development of infra-structure.*

13.4.1. The development of infra-structure required for industrial growth will have to be done in its various aspects. Firstly the industrial infra-structure which implies availability of power and land will have to be granted. Secondly the development of regulated markets along with establishment of branches of bank will become necessary. Communication facilities will have to be co-ordinated and developed. Similarly the social infra-structure will have to be built up. The existence of administrative head-quarters such as a municipality or taluka head-quarters would lead to the development of such centres. The growth of these infra-structure facilities at various urban and rural centres within the drought prone region has to be considered while selecting the growth centres which can act as pace setters for industralisation within these areas. The contiguity of irrigated tracts which can generate agricultural surplus is also another important constituent factor to be considered for selecting these centres. It is necessary therefore to carry out detailed techno-economic survey for identifiying a sufficient number of growth centres within the drought prone region for concentration of investment and efforts.

13.4.2. The Committee noticed that the communication net work in the drought prone area is not fully adequate. For the development of industries it will be essential to increase substantiality the railway facilities available to the various areas which were identified as drought prone. This would not only assist in marketing of industrial products but also assure additional employment to the people engaged in such works. In particular, the proposed Railway connecting Sholapur, Osmanabad, Bhir, Aurangabad and Dhulia is of vital importance for the economic development of the drought prone tracts. Other railway lines running East-West in this Zone also need to be built. This will have to be further supplemented by a net-work of roads allowing better communication facilities to the whole area.

13.5. *Types of Industries.*

13.5.1. The provision of infra-structure facility is not a sufficient condition to induce industrialisation though it is a necessary condition. The characteristics which an industry must possess in order to succeed in the drought prone areas are as follows :—

(1) Water requirement of these industries should be low.

(2) Emphasis should be on the industries where the labour-capital ratio is considerably high so that substantial employment potential is created.

(3) Sources of raw material and market for finished goods must be located within reasonable distance.

(4) If condition 3 is not satisfied the finished product must be able to bear high cost of transport of raw material and finished goods and high cost of packing.

Within the broad framework of these criteria the types of the industries that can be encouraged are considered in following paragraphs.

13.5.2. The propulsive character of industrial activity creates an industrial climate within the region through linkages and attracts ancilliary industrial activity and investment. The engineering industry can set the pace of industrialisation. Development at Kirloskarwadi is an example of how the face of the drought prone area is changed by establishment of engineering industry. Another allied industry that should be considered is the manufacture of electrical equipment such as assembly of pump sets, electric motors condensers etc. With less water consumption, electronic industry can generate very high employment potential.

13.5.3. It is observed that there is some tradition of skills in these areas in certain selected sectors such as weaving engineering, leather and skins. It will be necessary to identify and encourage the growth of such skills so that industries based on them can be fostered. There is tradition of handloom industry particularly weaving in these areas which will have to be encouraged.

13.5.4. The term "agro-based industry" includes not only industries dependent on agricultural output but also those which supply inputs to the agriculture like agricultural equipments, fertiliser and pesticides. In other words the term is to be understood in a wider context of industries which encourage greater input into agriculture, which lead to better processing and conversion of agricultural commodities and which ensure high returns on the processed goods. Availability of sufficient agricultural and allied products is the springboard for the development of various types of resource based industries. Therefore, *prima facie* the scope for encouraging these industries may appear to be limited. Fortunately, sizeable irrigated tracts which can generate farm surplus exist within the drought prone areas. Thus in Jalgaon district, banana fibre and oil extraction mills, in Nasik district Sugar, in Sangli, turmeric, in Satara district, tobacco processing units can be encouraged. Apart from these units which are directly related to farm surplus, agro industries providing inputs to agriculture that can be considered are disc plough and hammer for tillage operations, planters and seed drills for sowing. The establishment of such industries widens the scope for the establishment of engineering workshops, repair shops, and service centres. Another resource based industry which can be considered is that dependent on the forest produce. Bidi industry in particular is successful in Sinnar of Nasik district. It is an excellent example of labour intensive industry thriving well in the drought prone area.

13.5.5. The market oriented industries such as furniture, household furnishing equipment, utensils and travel goods can be profitably located in the areas. Other industries which can succeed in these areas where the railway length is also sizeble is brick-kiln and tiles.

13.5.6. The types of industries indicated above are illustrative. The techno-economic survey can bring out the full scope of industrial development in these areas.

13.6. *Package scheme of incentives.*

13.6.1. Two inhibiting factors for the location of industries in these areas are limited market and comparatively high recurring costs. It is, therefore necessary to induce the entreprenuer to take initiative in establishing industries by providing suitable incentives which will ultimately reduce the cost of finished goods.

13.6.2. A package scheme of incentives for stimulating the spread of industries in achieving a balanced economic development of the State and avoiding overcrowding was first introduced in 1964. The scheme was substantially revised to include new incentives in the package in 1969. The revised scheme was made applicable to 55 selected industries initially but later it was extended to all types of new industries to be set up in private, Co-operative and joint sectors. The existing package of incentives consists of—

(*a*) Interest free loans either to recoup sales tax paid or to invest in fixed assets ;

(*b*) Relief in electricity tarrif, octroi duty, water royalties and non-agricultural assessment ;

(*c*) Contribution towards cost of feasibility study ;

(*d*) State Government support for obtaining industrial licence ;

(*e*) Contribution towards cost of industrial housing ;

(*f*) Preferential treatment in Government purchase programme; and

(*g*) Assistance in technical training of personnel.

13.6.3. In the above schemes the incentives mainly pertain to sharing the recurring costs and part of capital expenditure. No incentive seems to have been provided for adopting labour intensive techniques. It is necessary to evolve suitable incentive system for adopting such techniques by sharing part of the labour cost. Such type of incentive may go a long way in inducing the industrialists for adopting labour intensive technique. One such incentive that may be suggested is sharing the employers contribution to Employee's Provident Fund Scheme. Other incentives which may be considered are sharing in the cost of transport of finished goods and capital assets, accommodation at concessional rent, priority in supply of raw material, subsidy in interest rate and extension of repayment terms to longer period in respect of machine tools. In fact, all the incentives available to industrially backward areas should be extended to the drought prone areas.

13.6.4. Apart from the provision of additional incentives, their availability at the opportune time is an important consideration. Delays in the sanction of incentive payments dampen the entrepreunerial enthuasiam. It is, therefore, necessary to take adequate steps to secure and ensure an effective co-ordination and co-operation of all concerned agencies.

13.7. *Industrial estates.*

13.7.1. One of the effective ways of attracting modern small scale industry to the country town has been by building industrial estate, and equipping them with ingress roads, warehousing and other public utilities. In the industrial estates the infra-structure necessary for starting an industry is built up by Government or co-operative efforts. The infra-structure includes roads, water supply, electric connections, built up sheds etc. Private organisational and financial resources are then expected to develop industries by taking advantage of the external economies already created in such estate and those that may be expected to be created from a group of industrial enterprises themselves emerging at one location.

13.7.2. The progress of industrial estates in the drought prone region is shown in Table No. 1. It may be observed that very few industrial estates have been located within the drought prone region. We are of the opinion that the drought prone areas should be given priority in the location of the industrial estates. Many sites favourable for location of industrial estate exist in these areas. We, therefore, feel that the setting up of industrial estates in the droght prone areas should be preceded by adequate techno-economic surveys.

13.7.3. Another important consideration that requires re-emphasis is to select such units in the estate as would create employment opportunities. Since the main purpose in industrial dispersion is to augment the employment opportunities we are of the view that the planning of industrial estates and selection of units have to be done in conformity with this relevant criterion.

13.8. *Technical training facilities.*

13.8.1. It is not easy to obtain a large number of skilled and semi-skilled workers from outside and induct them into these drought prone areas. The local manpower therefore requires to be trained in specific skills even at the lower level of expertise in a large way so as to make semi-skilled and skilled workers of lower category, available for employment. Technical training is imparted only at levels of education at S.S.C. standard and boys and girls below this standard have not enough facility for rudimentary training at present. It is, therefore, necessary to start a number of training schemes which can take up the youngsters between the 5th and 11th standard and train them in short duration courses followed by an year of actual practice. The expansion of such training facilities goes a long way in providing skilled labour for industries in these areas and ultimately diversifying economy.

13.9. In the foregoing pargraphs we have indicated the programme of industrial development in general manner. The need for carrying out techno-economic surveys for delienating the scope of industrial development, selecting growth centres and location of industrial estates in each district has already been stressed. The objective of these activities should be at least to prevent increase in the dependence of population on agriculture in the years to come by providing employment opportunities in non-agricultural sectors which will match with the annual increase in the labour force. The labour force to-day constitutes about 40 percent of the population. The annual addition to the population is at the rate of about 2·5 percent. The target for finding employment opportunities in the non-agricultural sectors should, therefore, be to provide such opportunities to at least half of the increase in the labour force in the drought prone areas not served by irrigation.

TABLE No. I

Progress of industrial estates in the drought prone district as on 31st March 1972

Serial No.	Village/Town	District	Type	Sheds constructed	Sheds under construction	Sheds working	Units functioning	Labour employed
1	2	3	4	5	6	7	8	9
1	Dhulia ..	Dhulia ..	Co-operation.	15	..	6	6	32
2	Baramati ..	Poona ..	Do.	3	3	3	3	N.A.
3	Ahmednagar ..	Ahmednagar.	Do.	23	6	22	22	N.A.
4	Shrirampur ..	Do.	Do.	18	2	14	13	45
5	Kopergaon ..	Do.	Do.	10	1	9	7	95
6	Miraj ..	Sangli ..	Do.	31	1	28	28	252
7	Vita ..	Satara ..	Do.	4	2	..	..	..
8	Sholapur ..	Sholapur	Do.	55	3	50	75	500
9	Barshi ..	Do.	Do.	4	Nil	2	1	9
10	Aurangabad ..	Aurangabad	Do.	23	4	Nil	Nil	Nil
11	Paithan ..	Do.	Do.	7	Nil	3	3	11

CHAPTER XIV

DRINKING WATER

14.1.1. Drinking water is one of the basic necessity of human and cattle life and perhaps ranks second only to the air we breathe. The entire planned effort for raising the level of incomes will appear less meaningful if this basic necessity of life is not made available to rural population. Another factor which increases the significance of the programme of supply of drinking water is that the cost involved in shifting the population as a result of scarcity of drinking water is generally much more than the cost of providing drinking water facility either through piped water supply scheme or through wells. It becomes, therefore, imperative to take adequate measures to prevent a shift in the population for want of drinking water. The scarcity of drinking water may also be experienced in some areas with high rainfall, but frequent droughts occurring in the drought prone areas lend severity to the problem of drinking water in these areas. As the rainfall is inadequate to recharge the ground water sufficiently, the ' water table ' in these areas is also considerably low and the ground water reserves hold less water. Therefore, the provision of drinking water facilities assumes priority over all other programmes in the effort to develop the drought prone areas.

14.2. *Brief History.*

14.2.1. The provision of drinking water to the rural areas has been one of the important functions of the local bodies. Lack of funds and absence of trained, personnel have been the main handicaps of these bodies in discharging this function. In the First Five Year ' Plan ' programmes of drinking water supply to rural areas were included in several schemes such as community development projects, backward class welfare programmes, etc. The subject received greater emphasis in the Second Five Year Plan. The Fact Finding Committee, 1960 in its report also suggested a programme for the provision of drinking water in rural areas on the following lines :—

(1) In the areas where the sub-soil water is available and is generally adequate, construction of wells and general facilities for deepening the existing wells would be the proper measures.

(2) Areas where there is inadequacy of sub-soil water and the underground is rocky boring programme based on village to village survey was suggested.

(3) In the areas where the well water is saline and unfit for drinking purposes the investigation for piped water supply scheme was suggested.

14.2.2. The Committee then recommended that necessary survey for exploration of tube wells and preparation of piped water supply schemes should, therefore, be initiated immediately and as far as practicable the entire programme of providing adequate drinking water facilities in these areas be completed in the Third Five Year Plan period.

14.2.3. In the Third Five Year Plan the problem of drinking water supply to rural areas attracted more serious attention of the Government. With the help of the Zilla Parishads, it was possible for the Government to make detailed investigation regarding the nature and the extent of the problem. The scheme framed by the Government had the following aspects :—

(1) Identification of "difficult" villages according to the types of works required to be undertaken.

(2) Fixing the priorities in the programme according to a definite principle.

(3) Financial assistance to local bodies for undertaking the programme.

14.3. *Identification of difficult villages.*

14.3.1. Villages where drinking water supply is not available adequately, are termed as "difficult" villages. The types of works designed to supply drinking water to villages were classified in two broad categories—(1) simple measures; and (2) special measures.

14.3.2. Specific criteria for determining the type of measures required for identifying the difficult villages have been laid down by the Government. The "difficult" villages satisfying the following criteria are considered for their inclusion in the simple measures programme :—

(*i*) There are no public sources e.g. wells/tanks, etc. at all.

(*ii*) The existing public wells/tanks, etc. may not have sufficient water to cater to the needs of the villages.

(*iii*) The public wells/tanks, etc. may dry up in summer (seasonal scarcity).

(*iv*) There may be pockets in the villages e.g. mohalla hamlet, wadi, padas, etc. which do not have drinking water sources located within them and the residents have to walk great distances (3 furlongs and above) to the public source.

(*v*) The existing public source may have become useless and may require special repairs or improvements or extensions, etc., as distinct from current repairs and replacement of machinery.

(*vi*) Villages which have step wells on which people depend entirely for their drinking water and are required to be converted into draw wells.

14.3.3. Simple measure works consist of construction of new wells, tanks, tube or bore wells, deepening and broadening of existing wells, and conversion of existing step wells into open draw wells. The minimum population for taking up one public well is fixed at 100 and in backward areas this limit of 100 can be suitably relaxed.

14.3.4. *Norm for considering a village as "difficult" for piped water supply scheme.*—Following villages are considered eligible for inclusion in the programme for special measures with piped water supply scheme for rural areas—

(*i*) Villages where simple measures will not solve the problem and the source of drinking water is at a distance of 3 furlongs or more away from goathan or the available water from wells is at a depth below 50 feet and where wells are inadequate to cater to the needs of the villagers. A high priority is to be given to villages where the source is more than a mile away from the goathan.

(*ii*) Villages in saline/kharapat areas.

(*iii*) Villages in hyperendemic, cholera-affected areas including those suffering from guinea worm.

(*iv*) Villages which are taluka places, and/or Pilgrim centres.

For such villages piped water supply schemes catering to the needs of one single village or group of villages are to be designed and implemented.

14.4. *Pattern of Financial Assistance and Facilities.*

14.4.1. The existing pattern of financial assistance for well construction programme and piped water supply scheme is as under :—

Rate of Government grant in percentage of cost of the scheme

Area	Simple measures		Special measures
	Bore wells	Others	
1. Tribal areas	100	100	90
2. Chronic scarcity and flood-affected areas ..	100	100	90
3. Backward areas	90	87½	90
4. Other areas	90	75	90

14.4.2. Various facilities are made available for payment of beneficiary's share. Village Panchayats, Panchayat Samities and Zilla Parishads car also share the contribution in respect of measures simple or special. The other facilities provided for undeitakirg piped water supply schemes are :—

(*i*) payment in three instalments if the amount of contribution is upto Rs. 75,000 and in four instalments if it exceeds that amount ; and

(*ii*) payment by obtaining a loan—

(*a*) Advances from District Development Fund, and

(*b*) from the government to the extent of 60 percentage of the amount if the cost of the piped water supply scheme is upto Rs. 5 lakhs and to the extent of 80 percentage, if the cost exceeds Rs. 5 lakhs.

14.5. *Agency for implementation.*

14.5.1. There are two main agencies entrusted with the implementation of drinking water supply schemes :—

(*i*) State Public Health Engineering Organisation which looks after investigation, preparation and execution of piped water supply schemes the cost of which exceeds Rs. 1 lakh, and

(*ii*) Zilla Parishads which undertake—

(*a*) simple measures like digging of wells, tanks, special repairs like deepen ing of wells, etc.

(*b*) investigation, preparation and execution of normal piped water supply schemes (those not having bores as source) costing upto Rs. 1 lakh net, and

(*c*) implementation of piped water supply schemes with bore as source in the case of successful bores.

14.6. *Magnitude of problem.*

14.6.1. The 1971 rural population of 35,851 villages in the State is 3,46,32,489. Out of this population about 2,37,42,584 people (68 percent) stay in difficult villages. Out of these the problem of drinking water supply for the population of 1,19,48,640 souls can be solved by simple measures while that of the population of 1,18,62,954 souls needs to be solved by difficult measures i.e. piped water supply schemes. District-wise figures may be seen in Statement I, attached to this Chapter.

The rural population of drought prone area is 1,83,80,933. In that area population residing in difficult villages is 1,29,49,082 or 70 per cent. of the rural population.

14.7 *Special measures works Rural Piped Water Supply Schemes.*

14.7.1. Normally per capita cost of Rural Piped water supply Schemes is about Rs. 160. However, when reliable source is not available nearby, and distant perennial rivers or storages are to be considered, a number of villages are grouped together to form a Regional Rural Water Supply Scheme. In such cases the per capita cost of the scheme is of the order of Rs. 250. In extreme cases such as water supply to pathar villages in Ahmednagar district the cost has gone up beyond Rs. 500 per capita. The normal annual recurring cost for running these water works ranges from Rs. 5 to Rs. 10 per capita. For rural regional water supply schemes it is slightly higher and in the extreme cases cited above it is above Rs. 30 per capita.

14.7.2. Generally the assured sources for small piped water supply schemes are wells on the banks of nalla/river in the vicinity of the village. If yields are inadequate, percolation trenches or trench galleries are constructed to augment the yield of wells. Wherever necessary these are further supplemented by storages in anicuts constructed in the beds of nallas/rivers for storing the supply required in the dry summer period. Where even such measures are inadequate or not feasible, irrigation storages of perennial rivers are selected as a source of supply. In a few cases storage reservoirs are also constructed exclusively for drinking water supply schemes. As stated earlier, since cost of such storages is high, normally storages are proposed only for regional schemes of rural water supply or large towns.

14.7.3. The assuredness of source is considered on the basis of the availability of per capita supply from a source for a prospective population of the village 30 years hence. The public health standards prescribe their requirement of per capita supply from 5 gallons to 15 gallons per day. However, where adequate yields are not expected, the schemes are designed for a supply of 10 gallons *per capita* per day and in other cases they are designed for 15 gallons per capita per day so that the ultimate lower limit of 5 gallons per capita per day as suggested by the Public Health Engineering Manual could be maintained during summer months when the water supplies are generally depleted. In these schemes no consideration is made for supply of water to cattle.

14.7.4. As a cheap alternative to piped water supply schemes with surface sources in these difficult villages, drilled wells with hand/power pumps, are being considered. It is understood that, by next year, the government will have at least 30 drilling rigs and these are intended to be used on the programme of providing adequate drinking water supply in the difficult villages.

14.8. *Urban Water Supply.*

14.8.1. Urban areas also experience the shortage of drinking water in the period of drought and effective measures to locate such urban areas are necessary. It is understood that nearly 32 municipal towns in the drought prone areas identified by us are suffering from the shortage of drinking water during the current year of scarcity.

14.8.2. The responsibility of providing potable water supply to the urban area is cast on the municipal bodies by legislation. As local bodies are unable to raise the funds for capital investments on projects for installation or augmentation of water supply a scheme to aid the local bodies in the matter of financing has been evolved. The present pattern of financial assistance in this respect is as under :—

Serial No.	Class of Municipal Council	Government Grant-in-aid (Per cent)	Share of cost to be borne by Municipal Councils	
			Loan from L.I.C.	Contribution of Municipal Corporation
1	2	3	4	5
1	'A' Class (more than 50,000 population)	$23\frac{1}{3}$	$66\frac{2}{3}$	10
2	'B' Class (population more than 20,000 and upto 50,000).	40	50	10
3	'C' Class (population upto 20,000)	50	50	...

Schemes involving government grant-in-aid and guarantee for L. I. C. loans are executed by the government on an agency basis after charging costs of preparation and supervision.

14.9. *Recommendations.*

14.9.1. *Priorities.*—From the details furnished in paragraph 14·6 above, it can be seen that the percentage of population in difficult villages to total population in the villages in the drought prone districts is 70 per cent and that for drought free districts is 66 per cent. We feel that the schemes for villages located in drought prone areas should be given priority over those in the drought free areas when curtailment of the programme is likely due to paucity of funds or other reasons.

14.9.2. *Public Contribution.*—We appreciate the intention of the government in introducing the element of public contribution with a view to give a feeling of participation to the local population in consonance with the accepted principles of community development. We feel that the drought prone areas deserve special treatment in this connection. The government seems to have recognised such a necessity and has decided to meet the entire cost of simple measure but the element of public contribution still persists in the special measures of piped water supply. We feel that the progress of this programme might be handicapped particularly in villages where simple measures can not meet the needs of the local population. The schemes for drinking water supply to rural areas should be considered as part of the infrastructure for making these areas drought resistent and the cost of such schemes should be met entirely through Government funds. We, therefore, recommend that the entire cost of the schemes may be borne by the government irrespective of the type of schemes needed for these villages.

14.9.3. *Taking over maintenance.*—As the works under the special measures are completed these are now handed over to Village Panchayat/Zilla Parishad for maintenance. Large sums are given as grant-in-aid on the capital cost of these schemes and our recommendations are that the entire cost may be borne by the government. Hence the government should be equally interested in the maintenance of these schemes and ensuring that the benefits so created reach the common man. A system needs to be evolved by which the maintenance of these schemescould be stream-lined. It is an accepted fact that in rural areas trained personnel would not be available for running and maintenance of water works unless proper guidance is given to them by the engineering department dealing with this type of work. Hence, the entire system of financing and management of these water works needs to be reviewed. In this connection it is suggested that instead of public contribution on capital cost, the Village Panchayat/Zilla Parishad may be called upon to agree to pay, on completion and commissioning of the scheme, an annual depreciation of the scheme every year. The entire capital investment on the scheme would then really be a long term interest free loan and the system would ensure further augmentation of the schemes as and when found necessary.

As regards the regional water supply schemes, it is felt that the maintenance schemes may be kept with government organisation as deposit work on payment of actual maintenance charges plus centage charges for tools and plants and audit as would be fixed by government from time to time. The centage charges for the preparation and establishment may be waived on these maintenance works as a special concession. Such concessions are essential if the use of large physical resources created in the rural areas is to be used and maintained properly. It will also bring some uniformity in the system of management of rural water works.

14.9.4. *Inclusion of revitalisation of wells under simple measures.*—Under the programme for simple measure schemes we recommend that the item of revitalisation of existing wells with revitalisation units, and ordinary callyx drilling machines should receive a high priority and should be made eligible for financial assistance if the same is not being done at present.

14.9.5. *Unified agency for simple measures and difficult measures.*—In paragraph 14.5 above, the agency for execution of works under simple measures and special measures is detailed. The present limit of one lakh rupees gross estimated cost of the scheme under special measures, for execution of piped water supply schemes by Zilla Parishads appears to be arbitary. For streamlining of this programme it is felt that the entire programme of piped water supply schemes, irrespective of cost, may be entrusted to a single agency particularly in view of our recommendations at paragraph 14.9.3 above.

14.9.6. *Water Supply for Cattle.*—The requirement of water for cattle is not considered while designing Rural Public Water Supply Schemes. The number of cattle in a village may be approximately the same as the human population itself. It is further seen that the rural population is finding it difficult to maintain even those modest drinking water supply schemes which are planned and executed for drinking water supply excluding cattle. The requirement of cattle may be placed at approximately 45 litres per head per day. It is suggested that for this purpose, either village tanks or a succession of Kolhapur type of weirs be constructed on the nallas and rivers nearest to each village requiring difficult measures so that the monsoon or post monsoon flows can be stored for use of cattle during the summer season. While selecting the sites of such small storages, first preference should be given to those nallas/rivers on the banks of which the source well/trench gallery or bore wells have been constructed for Rural Piped Water Supply Schemes so that in addition to the surface pounding, the sub-soil in the area of the source well can get charged and drinking water supplies from the source are thus made more reliable in the summer months.

14.9.7. *Reliability of schemes for rural drinking water supply.*—Normally, for storage reservoirs constructed under Rural or Urban Water Supply Schemes ; reliability aimed at is 90 to 95 per cent. For storages over smaller catchments where 95 per cent reliable yield is not adequate for the yearly requirement of the scheme particularly in summer months, reservoir capacities should be suitably increased to accommodate the extra storage, by carry-over studies. Reliability of most of the well water schemes can be greatly enhanced by improving the facilities for ground water recharge. Schemes not backed by such a facility are likely to let down the population in years of drought. Hence general measures for ground water recharge should be considered along with the schemes for supplies of drinking water. In fact an approach integrated with the development of general water resources of the drought areas, more particularly so in the case of the difficult villages, is very essential.

14.9.8. *Bore Wells.*—The water availability as recorded by the Ground Water Development Agency which has by now drilled about 800 bore wells was found to be of the order of 100 to 500 gallons per hour in most of the bores. Unfortunately, no tests, pumping out or pumping in, could be conducted by the Agency so far. The observations are purely on the basis of water over-flow noted during the drilling operations. Even taking that as a rough guide, it seems difficult to account for any availability of water from the deep zones for irrigating the fields. Even for the development of water supply schemes for the small villages, it is doubtful how-far each bore will be able to sustain a sizeable population with so low yields. It is not clear whether these drills have tapped a dependable zone of free water reservoir or whether after some days of extraction the underground reservoir will get depleted for want of recharge. Unless this is known, it will be difficult to develop this source further as a dependable measure for drinking water. It is felt that such bores may *at best* serve a very small population of say 500 souls and be considered as only supplementary to development of water supply schemes for the larger villages in the drought prone areas in particular, where the precipitation itself is low and the potential for recharging is very poor. Detailed observations on the yields available from these bores over a period of years need also to be made.

14.9.9. *Priority to drought prone areas in urban water supply schemes.*—In paragraphs 14.7.1. and 14.7.2. the scheme for urban water supply has been outlined. In addition to the schemes of grant-in-aid, the State Government has been taking up complete responsibility of constructing and augmenting water supply schemes for some special reason such as :—

(1) Water supply schemes as incentive for industrial development.
(2) Water supply schemes for defence establishments and cantonments.
(3) Water supply schemes for hill stations.
(4) Water supply of towns having special difficulties.
(5) Water supply of pilgrim centres.

Since the urban centres in the drought prone areas suffer from recurrent shortage of drinking water, a high priority needs to be given to the schemes of these centres also. We recommend that the responsibility for water supply schemes in urban centres in the drought prone areas should be assumed by the government after identifying such centres of drinking water shortage, investigating their needs and assessing the financial position of local bodies.

14.9.10. *Priority for drinking water in the use of water in the Dam.*—In the chapter on long term strategy we have emphasised that the first priority for the use of water should be assigned for the purpose of drinking. During the period of drought, this priority should be ruthlessly observed by prohibiting the use of water for irrigation.

14.9.11. *Recurring expenditure.*—With the construction of a large number of water works in rural areas, recurring financial liabilities on the Village Panchayats and Zilla Parishads are imposed. According to the present estimates these generally vary from say cost Rs. 4 to Rs. 15 per capita per year and can go to Rs. 30 per capita in exceptional cases. It would be necessary to investigate the effect of other development measures in the region which can ensure the capacity of rural population to pay to the local bodies the charges for using this consumer facility because in some areas the shifting of a wadi or a hamlet to a suitable alternative site may be a more economical alternative than providing a facility involving high recurring expenditure.

STATEMENT No. I

Rural Drinking Water Supply (comparison of population in difficult areas with total rural population in the District)

Serial No.	Name of District	Total Rural population	Population of difficult villages in drought free zone Districts to be tackled by			Population of difficult villages in drought zone districts to be tackled by			Percentage to total rural population of district
			Simple measures	Difficult measures	Total	Simple measures	Difficult measures	Total	
1	Thana ..	.. 14,52,922	6,01,746	3,58,733	9,60,479	....	....	....	65.9
2	Kolaba ..	.. 11,08,544	1,62,936	7,69,151	9,32,077	....	....	....	84.1
3	Ratnagiri ..	.. 18,17,931	12,18,051	5,23,173	17,41,214	....	....	....	95.8
4	Dhulia ..	.. 13,73,511	....	....	....	2,29,370	4,74,585	7,03,955	51.15
5	Nasik ..	.. 16,88,944	....	....	....	5,61,353	6,32,697	11,94,050	70.75
6	Jalgaon ..	.. 16,20,623	....	....	....	1,97,461	10,68,609	12,66,070	78.20
7	Poona ..	.. 18,44,879	....	....	....	10,05,777	3,87,615	13,93,392	75.5
8	Sholapur ..	.. 16,35,100	....	....	....	9,21,725	5,41,256	14,62,981	89.45
9	Ahmednagar ..	.. 20,16,540	....	....	....	6,09,806	5,14,977	11,24,783	55.9
10	Satara ..	.. 14,92,973	....	....	....	3,27,330	9,12,949	12,40,279	83.2
11	Sangli ..	.. 12,49,615	....	....	....	3,76,252	8,67,465	12,43,717	97.6
12	Kolhapur ...	.. 16,04,566	6,39,017	8,69,921	15,08,938	....	....	....	94.10
13	Aurangabad ..	.. 16,28,778	....	....	....	4,52,195	5,26,278	9,78,473	60.1
14	Nanded ..	.. 11,69,099	2,84,945	6,33,485	9,18,430	....	....	....	78.50

STATEMENT No. I—*contd.*

Rural Drinking Water Supply (Comparison of population in difficult areas with total rural population in the district)

Serial No.	Name of districts	Total Rural population	Population of difficult villages in drought free zone Districts to be tackled by			Population of difficult villages in drought zone districts to be tackled by			Percentage to total rural population of districts
			Simple measures	Difficult measures	Total	Simple measures	Difficult measures	Total	
1	2	3	4	5	6	7	8	9	10
15	Bid (Bhir)	11,34,832	....	....	....	4,46,311	2,33,005	6,79,316	60·00
16	Parbhani	12,61,881	4,59,680	1,16,473	5,76,153	....	....	....	45·75
17	Osmanabad	16,55,809	....	....	....	7,35,943	6,95,556	14,31,499	86·60
18	Nagpur	8,85,675	2,78,950	2,99,766	4,88,716	....	....	....	55·10
19	Wardha	6,87,402	2,50,349	1,03,017	3,53,366	....	....	....	60·30
20	Chandrapur	1,46,825	4,04,648	1,69,768	5,74,416	....	....	....	39·00
21	Akola	11,47,087	3,27,273	2,57,257	5,82,530	....	....	....	51·80
22	Amravati	11,19,754	3,04,891	2,61,042	5,65,933	....	....	....	50·60
23	Yeotmal	12,26,790	4,41,379	3,87,181	8,28,560	....	....	....	67·60
24	Buldhana	10,39,329	....	....	....	0,52,587	1,77,980	2,30,567	23·10
25	Bhandara	14,01,275	5,90,675	1,71,015	7,61,690	....	....	....	54·40

Total of rural population of drought free areas .. .. 1,62,51,251 Total population of difficult villages in drought free area .. 1,07,92,502 Percentage .. .. 66 per cent.

Total of rural population of drought affected areas .. .. 1,83,80,933 Total population of difficult villages in drought affected areas .. 1,29,49,082 Percentage .. .. 70 per cent

CHAPTER XV

RURAL CREDIT

15.1. Credit has always been one of the significant needs of the rural economy. The phenomenal growth in the demand for credit is due to increased efforts in the productive activity in the agricultural sector. Technological improvements and improved inputs have made agriculture a business proposition in recent years in areas which have favourable natural endowment or in areas where irrigation facilities are available. Even in areas where rainfed cultivation is practised, apart from the demand for credit for inputs, the demand for long term credit for levelling of lands, digging of wells, soil conservation, bunding, etc. have assumed importance. Technological improvements which can be practised by a limited class of cultivators tend to widen the regional disparities and also disparities among different classes of cultivators. This has created a need for providing credit for small and less privileged cultivators.

15.2. This increase in demand for credit has resulted in rapid growth of co-operative movement in Maharashtra in the recent past. Co-operatives have emerged to be the dominant financial institutions in the rural credit structure. As against the total number of 58 lakh khatedars in the State, the membership has covered nearly 38·84 lakh khatedars. The membership has nearly doubled during the last decade. The size of fresh loans advanced every year has increased from Rs. 40 crores in 1960-61 to Rs. 115 crores in 1970-71. The comparison of this figure with the state income from the primary sector of agriculture and allied activities which was of the order of Rs. 1,160 crores in 1970-71 at current prices indicates the significant role played by co-operatives in the agrarian economy.

15.3. Co-operative credit in the State, however, depicts a duel picture of rapid expansion of the credit per member on the one hand and mounting overdues on the other. Many reasons are attributed for mounting overdues such as faulty lending policies, slack supervision, mis-utilisation of credit and failure to take steps to recover. There are external factors beyond human control which tend to push up overdues. The most important of these is crop failure. The drought conditions during the last three years have distorted the picture of agricultural economy in the State.

15.4. An analysis of the overdues position of advances by the primary co-operative societies for the last 5 years shows that overdues have increased from Rs. 43 crores in 1967-68 to Rs. 74 crores in 1971-72. This figure does not include the loan amounts which had fallen in arrears but were converted into medium term loans, under the normal agricultural credit stabilisation fund rules. The percentage of overdues to total outstanding has gone up from 37 to 44 during these years. There is large variation in the position of overdues with reference to outstanding amounts from district to district. The districts which are above the State average of 44 per cent. are indicated below :—

District	Percentage of overdues to outstanding
Nanded and Chandrapur	Over 70 per cent.
Thana and Bhandara	60 % to 70 %
Ratnagiri, Jalgaon, Buldhana, Akola, Amravati, Yeotmal and Wardha	50% to 60%
Kolaba, Nasik, Poona and Sholapur	44% to 50%

15.5. The districtwise position of overdues is shown in Table No. I attached to this Chapter. It can be inferred from the statement that the prevalence of overdues is not the peculiarity of the drought prone districts. As the existing concession of conversion facilities is given by examining the case of each individual member on merit, it is difficult to draw any co-relation in the analysis of overdues by considering the number of villages in the scarcity affected district as against the others. It cannot be denied that a general resistance prevalent and mounting against recoveries is one of the significant causes of the present malaice. Nevertheless, there is no escape from the conclusion also that widespread crop failures during the last three years have generally impaired the repaying capacity of the cultivators.

15.6. The problem relating to strengthening of co-operative movement or its role in the rural credit system is a large issue which requires closer examination and has been dealt by various committees appointed at the State and national level. Our committee intends to deal with the problem posed by recurrent scarcity conditions in channelising the credit. It is contended that the repaying capacity of the borrower is impaired to such an extent that the stage has come to consider the suggestion of writing off the loan amounts.

15.7. While it is necessary to ensure the recovery of dues in the interest of a healthy growth of the co-operative movement, there is imperative need to ensure that the large number of defaulting members is not deprived of the agricultural credit essential for the agricultural operations on account of default for reasons beyond their control. While the interest of building up of a healthy co-operative movement is paramount, special circumstances warrant the extension of certain concessions in the larger interest of ensuring the level of production. It is rightly feared that these large number of defaulters will have to fall into the clutches of indigenous money-lenders with its attendant evils if the problem is not considered sympathetically. In the light of these considerations it is necessary to examine and reconsider if necessary the existing concession granted in the co-operative credit in the event of a natural calamity.

15.8. The All India Rural Credit Survey Committee recommended that arrangements be made in the co-operative credit system in certain contingencies such as the failure of crops. The Committee recommended the creation of agricultural credit stabilisation funds in co-operative credit institutions at different levels. The funds were intended to provide for conversion facility of short term loan into medium term loan in the event of a natural calamity. Accordingly the rules were framed. The funds at various levels are financed out of the profits of the institutions and contribution from the state government. The rules lay down the purpose for which the funds are to be utilised :—

(1) For conversion of short term loans into medium term loans and for providing conversion facilities to the instalments of medium term loans in those areas where crop yield has been declared below 6 annas and where such conversion is jusitfied.

(2) In the event of recurrence of crop failure during the currency of converted short-term loan or instalment of medium term loan, the said loan is again eligible for rephasing from 3 years to 5 years besides according conversion facilities for 5 years from the beginning itself.

15.9. Any member seeking the conversion facility has to apply for such conversion after the collector has declared the suspension of land revenue. A committee investigates the reasons for conversion and recommends the grant of the said facility. The managing committee of the society has to pass the necessary resolution. No conversion facilities are granted to the medium term loans advanced for individual member for the purchase of pump sets or oil engines for sinking of new wells and repair of old wells. Conversion facilities of agricultural loans are however granted to the primary societies by the central bank and in turn by the apex bank to the central bank, after necessary inquiries.

15.10. It will be apparent from the existing rules, that there is no automatic conversion of loans but it is only granted after the receipt of application made by members and scrutiny thereof. Therefore the existence of number of cases wherein the conversion facilities might not have been made available to the cultivators in spite of their eligibility cannot be ruled out. Such a situation might have been caused by the failure of member concerned to apply or by the failure of the primary credit society to apply in time for such facility. It is reported that in 1965-66 even though as many as 12,360 villages were declared as drought affected, overdues to the extent of Rs. 8 crores were not converted. This means that these borrowers were classed as defaulters. It is estimated that overdues of Rs. 74 crores are due from 7 lakh cultivators including those who were refused the facility of conversion even when they were entitled.

15.11. In the years of unprecedented drought of 1970-71, 1971-72 and 1972-73 the same broad areas or agro-climatic zone have been affected. No effective method of identifying the individual drought affected borrower with reference to condition in their holdings or in all their fields and then deciding their repayment capacity can be devised particularly when a very large number of cases were required to be dealt. In the year 1970-71 sum of Rs. 17 crores covering 2·11 lakh borrowers and in the year 1971-72 Rs. 12 crores covering 1·34 lakh borrowers were allowed to be converted into medium term loan. The possibility of large number of borrowers entitled for the grant of conversion facility but not given that facility cannot be ruled out. The credit channel for these eligible members is blocked in future if their cases are not reopened. Their cases for conversion may have to be considered by adopting a wider definition of a cultivator affected by drought so as to include those borrower defaulters who have cultivated land in villages where suspension or remission of land revenue has been ordered as a result of drought and further where such borrower defaulter is entitled to conversion facility under the existing Agricultural Credit Stabilisation Fund Rules. We therefore recommend the re-opening of cases of those borrowers and further recommend that in view of very large number that may be involved, such examination may be restricted to the years from 1970-71 onward.

15.12. The problem of those cultivators who have availed of the facility of conversion may not be also less distressing. According to the existing rules, the first conversion of loan advanced in 1970-71 was ordered for 3 years and obviously the converted instalment fell due in the 2nd and 3rd years of drought. Because of the recurrence of scarcity in 1971-72 i.e., during the period of converted instalment the loan of 1970-71 has been rephased in five instalments. The conversion of loan advanced in 1971-72 is in progress. Under the existing rules therefore the dues will become payable within three years starting from the year 1973-74 and ending upto 1975-76. Thus the net burden on the cultivator increases from 1.X to 1·66.X annually during the years of 1973-74 to 1975-76. If one crop loan is assumed to constitute approximately 40 percent of the gross produce, the repayment of 1·66.X will mean that the producer will have to utilise 66 percent of his gross produce every year for the repayment of loan. If the loan of 1972-73 is also converted, its repayment obligation during the subsequent years will be practically outside the reach of an ordinary cultivator as he will have to forego still larger part of the produce in meeting this obligation.

15.13. To deal with such types of cases, the All India Rural Credit Survey Committee recommended the constitution of national fund for relief and guarantee in order to give grants by way of relief to co-operative institutions for the purpose of writing off the irrecoverable arrears arising out of natural calamities. The Government of India did not accept this recommendation on the ground that, when necessary it could come to the help of the co-operative movement even without the creation of a separate fund. The State Government has however constituted such a fund. The

Advisory Committee of the Reserve Bank of India recommended that the contribution to the fund may be related to the level of lending effected by the primary co-operative societies. For the State of Maharashtra, a contribution of 1% of the level of lending by the co-operatives has been recommended. The Government of India did not accept this suggestion though they would not object to the continuance of the fund by the State Government. The policies regarding this fund have not yet been finalised as is evident from the following remarks of the All India Rural Credit Review Committee(1969) which observes, "we consider it unfortunate that the policy regarding relief and guarantee funds is yet to take shape though the relevant recommendations of Rural Credit Survey Committee have been before the Central and State Governments for over fourteen years. The incidence of recurrence of natural calamity presents such a widespread and important problem and has already had such adverse impact on the repayment performance of co-operative credit that arrangement and rules for writing off should be finalised without delay ". [1]

15.14. The ultisation of the fund is suggested on the following lines. If a second natural calamity occurred before the first conversion loan is repaid, the situation should be met first by extending the remaining instalments of the converted loan upto a period of five years from the date of first conversion and, secondly by sanctioning the second medium term loan for three years of converted amount falling due in that year. If a third calamity justifying conversion occurs while these two former loans are outstanding—(*a*) the balance in the first conversion may be written off; (*b*) the second conversion loan may be rephased into a five year loan from the date of its commencement; and (*c*) a new conversion loan for three years might be sanctioned in respect of those years, amount due and not paid. It was also proposed that a ceiling of Rs. 300 be placed on the amount which may be written off in the case of any one cultivator, as the relatively larger cultivators could be assumed to be in a position to meet the situation by drawal on their past savings.

15.15. The present balance of guarantee fund in Maharashtra is Rs. 14 lakhs. It is reported that the estimated amount required for the writing off the balance of first converted loan is around Rs. 6 crores to 10 crores for which there is no provision in the fund. Therefore a write off of the amounts of the order mentioned above means considerable drain on the scarce resources of the State which have already been drained by prevalence of scarcity conditions.

15.16. Another handicap in Maharashtra State in regard to the problem of a write off is the ban on drawing from the Relief and Guarantee Fund until the funds under stabilisation Fund are exhausted. The Venkatappiah Committee recorded discordant note on this arrangement in the following words, " It is not however, meaningful to make the access of a society to the relief and guarantee fund conditional on the exhaustion of the resources in the stabilisation funds as the two funds are intended for different purposes and some members might have received the facility of a write off even though resources may still be available in the stabilisation funds ". This appears to be a purely technical difficulty which can be overcome by suitable amendment to the rules, if the write off is justified on merit.

15.17. Apart from the financial implication of the proposals of write off, the main argument against it is that it is not financially prudent to follow a policy of writing off of the loans due, as recommended by the Committee without reference to the economic condition of an individual borrower. It has to be appreciated that it may be wrong to treat every cultivator in whose case remission and suspension of land revenue has been ordered on common footing as the economic condition of individual borrowers may not necessarily be related to the outstanding and hence each case needs to be examined on merits. It is argued that the provision requiring

[1] All India Rural Credit Review Committee Report Chapter XVII page 540.

full utilisation of the stabilisation fund emphasises the re-payment obligation of the cultivator, which he has to meet inspite of crop failures by making as best efforts as possible which may even include operating on a portion as a saving out of his produce in subsequent normal years. Therefore, the write off may be resorted to only in the final analysis when all other avenues of rehabilitation programmes are exhausted and that too by examining each case on its merits. Before considering a proposal for write off, it is necessary to build up a sufficient balance in the guarantee fund. Another argument advanced against the write off is that the existing general feeling amongst the defaulters that the government dues and those of the co-operative are going to be written off some day or the other is going to be strengthened by such action. Such a tendency will adversely affect the building up of a sound co-operative credit structure as the general resistence against the recoveries is likely to be accentuated by even tempting the honest borrowers to resort to default.

15.18. The Working Group of Secretaries appointed by the Government of Maharashtra recently examined the problem of relief and agricultural credit to the agriculturists who have been in arrears due to the existence of crop failure and drought. The Group suggested the alternative of rephasing the loans due in such a manner as to make the repayment in subsequent years does not exceed 1·33 every year. If moratorium for three to four years is granted, such rephasing is possible. The Group further recommended that the cases of write off may be considered on merit only if there is another crop failure during the period of rephasing of loans. Our Committee is in agreement with the suggestion made by the Group.

15.19. Another related issue which has been brought to the notice of our Committee is over capitalised structure of many primary societies. Even though the minimum share capital contribution has been fixed statutorily, the contributions thereto have been recovered in excess of this limit with a view to increase the society's owned resources. Thus on the one hand the overdues from borrowing members have increased and on the other hand there has been an increase in their share capital contribution. There is a demand for getting the concerned amount set off against the overdues. Our Committee agrees with the suggestion of the Working Group of Secretaries that the rephasing of the loan suggested above should be done after adjusting the excess share capital against the overdues.

15.20. *Tagai.*—With the development in co-operative credit the tagai loans from the government have been progressively playing less important role in the rural credit system. The main reason for a decline in the amounts of tagai advances is the limitation of funds. Apart from this limitation, there is also a realisation that the system of tagai has well known drawbacks including the small size of loans, delays in disbursement, inadequancy of supervision over utilisation and poor recoveries. In recent years, the role of tagai has been restricted to transitional period till the institutional credit structure is built up. The All Indian Rural Credit Review Committee has conceived the role of tagai as a short term measure in the areas where the establishment or re-activisation of the co-operative credit structure or promotion of supplementary credit arrangements are likely to take so long that the current agricultural programmes may suffer for want of rural credit. Another role assigned to the tagai system is its availability during the period of natural calamities when the local institutional credit structure may fall short of the needs of the area. The role of tagai will have to be significant also in the post-scarcity years in order to see that the agriculturist is rehabilitated for undertaking successful cultivation. In short the principle underlying the approach is that the government finance should be complementary rather than competitive with the institutional credit. The tagai system has the advantages of a lower rate of interest and absence of obligation to pay any share capital contribution. The development of institutional credit which can mobilise the resources in addition to providing flexible credit structure is essential in the larger interest. We agree with this general approach of introducing complementarity in the rural credit system.

15.21. The position of overdues and outstandings is no less alarming in the tagai system than in the rural co-operative credit system. At least in the case of co-operative credit, the case for conversion is examined on merits by a Committee. On the other hand, the tagai dues are suspended without any investigation once annewari of crops is declared. The main reason for overdues in tagai system are relaxation in this work by the recovery machinery, real difficulties arising out of uncertain crop condition and irresponsible and dishonest defaulters taking advantage of the situation.

15.22. The approach to the problem created by natural calamity in tagai dues should be the same as in the rural co-operative credit structure namely that of insisting upon recovery and not encouraging a write off. We agree with the Group's suggestions that tagai loans overdue should also be rephased in such manner that the additional burden on repaying should not be more than 1/3rd of his normal entitlement of new credit under the crop loan system.

15.23. One of the significant lacuna in our credit system is that the credit needs of artisans are not properly taken care of during the period of scarcity. The artisans also suffer because of reduced purchasing power in general in the rural areas during the period of scarcity. Therefore adequate attention is to be paid to the credit needs unless they are provided with alternate employment. Institutional credit may not be forthcoming to artisans since they do not have adequate security to offer. Therefore, the responsibility of extending credit coverage to the artisan class may be accepted by the government.

TABLE No. 1

Comparision of Loans Overdues and Outstanding of Primary Agricultural Credit Societies (1971-72)

(Rs. in thousands)

Name of the District	Loans Outstanding	Amount of Loans Overdues	Overdues to outstanding percentage of
1	2	3	4
1. Greater Bombay	57	45	79·9
2. Thana	16,026	10,888	67·9
3. Kolaba	22,105	10,597	47·9
4. Ratnagiri	10,991	5,663	51·5
5. Nasik	99,251	47,643	48·0
6. Dhulia	63,128	26,653	42·2
7. Jalgaon	98,189	51,902	52·8
Total Bombay Division	3,09,807	1,53,891	49·5
8. Ahmednagar	1,82,497	73,312	40·2
9. Poona	52,251	29,265	54·1
10. Satara	81,298	27,041	33·3
11. Sangli	92,355	23,304	25·2
12. Sholapur	76,719	35,090	45·7
13. Kolhapur	1,18,468	28,508	24·1
Total—Poona Division	6,03,588	2,15,521	35·7
14. Aurangabad	96,871	72,163	74·5
15. Parbhani	73,522	25,727	35·0
16. Bhir	54,595	17,943	32·9
17. Nanded	77,424	60,632	78·3
18. Osmanabad	1,03,735	42,906	41·4
Total—Aurangabad Division	4,06,147	1,79,371	44·2
19. Buldhana	56,603	28,616	50·6
20. Akola	59,973	32,819	54·7
21. Amravati	59,058	30,458	51·6
22. Yeotmal	67,849	34,013	50·1
23. Wardha	26,340	13,693	52·0
24. Nagpur	35,417	11,624	32·8
25. Bhandara	29,696	17,859	60·1
26. Chandrapur	29,211	21,302	72·9
Total—Nagpur Division	3,64,147	1,90,384	52·3
Grand Total	16,83,689	7,38,667	43·9

TABLE No. II

Working of Agricultural Credit Societies in Maharashtra

Year	Number of Societies	Number of Members (000)	Working Capital (Rs. lakhs)	Advances (Rs. lakhs)	Outstanding (Rs. lakhs)
1	2	3	4	5	6
1958-59	17,558	1,479	3,216	2,326	2,692
1959-60	20,381	1,852	4,453	3,032	3,699
1960-61	21,400	2,170	5,812	4,256	4,788
1961-62	21,628	2,359	7,270	4,593	6,039
1962-63	21,762	2,620	9,089	5,551	7,532
1963-64	21,723	2,875	11,359	6,771	9,353
1964-65	21,551	3,238	14,056	8,001	11,618
1965-66	20,861	3,360	17,500	9,130	14,328
1966-67	20,784	3,561	20,658	9,070	16,525
1967-68	20,750	3,697	22,985	10,418	18,595
1968-69	60,684	3,733	26,771	12,044	21,747
1969-70	20,606	3,822	30,643	13,388	25,158
1970-71	20,426	3,794	34,329	13,296	28,410
1971-72	20,348	3,928	37,605	12,547	29,403

CHAPTER XVI

FINANCE

16.1. The recurrence of scarcity conditions is a characteristic of the drought prone areas. In the foregoing chapters, we have suggested short term measures for amelioration of scarcity conditions during the period of scarcity and banishment of scarcity in the long run. Till the drought prone areas become scarcity resistent through various long term measures, the short term ameliorative measures will have to be undertaken during the period of drought. Both these aspects of relief measures have to be kept in mind, while considering the question of financing of the relief measures.

16.2. In a federal polity, the relief to sufferers of natural calamity is the joint responsibility of the Centre and the State. Successive Finance Commissions appointed periodically for evolving the scheme of devolution of taxes and grants-in-aid have taken into account the average relief expenditure incurred during past years in recommending revenue grants. The Commission prescribes the amount which the state government should consider as the normal relief expenditure in the event of natural calamity for taking into account for mobilising resources. If in any year, the expenditure on scarcity exceeds the margin recommended by the commission, the central assistance is given to the state government to the extent of 75 per cent of expenditure in excess of margin, 25 per cent by way of loans and 50 per cent by way of grant. Some of the items which are eligible for central assistance are indicated below :—

(1) Free or concessional supply of food;

(2) Cash payment to indigent persons for purchase of necessaries and cash doles to disabled;

(3) Free or concessional supply of fodder, seeds and manure;

(4) Measures for prevention of cattle epidemics;

(5) Provision of drinking water;

(6) Provision of transport facilities for goods to be moved on relief account;

(7) Relief works.

16.3. Unforeseen expenditure on natural calamities upsets the finances of States particularly so as all available resources of the State including the resources of additional taxation are assessed and taken into account at the time of formulation of the Five-Year Plans and in making annual provisions in the budget both for plan and non-plan expenditure. One effective way of meeting the unforeseen expenditure is to make a contribution in the normal year to a fund created for such purpose and utilising the amounts from the fund in the years of distress. This method of financing the contingencies such as famine, floods was recognised even prior to Independence. According to the Devolution Rules made under Government of India Act, 1919, the Government of Bombay State was maintaining a Famine Relief Fund. The Government of India Act, 1935 did not contain provision for the continuance of this Fund. When Part-III of Act of 1935 was to come into force, the Devolution Rules were to cease to operate resulting in the Fund being discontinued as a statutory Fund and merging in general finances of the State. As a result the amount in the Fund could have been spent on ordinary services. Hence Bombay Famine Relief Fund Act was enacted in 1936 to provide for the establishment and maintenance of statutory Famine Fund apart form the general finances of the State for meeting any contingency that may arise for urgent and unanticipated expenditure on a large scale famine relief. The Fund under the said Act was initially constituted out of the balance from the Fund. The annual contributions through budget provision were to be made if such fund fell short of Rs. 2 crores by Rs. 10 lakhs at any time. The legislation provided for the utilisation of Fund for relief on severe famine and the relief of distress caused by serious drought flood or other natural calamities. If the balance in the Fund exceed Rs. 2 crores, the excess could be utilised for the grant of loans to cultivators repayment of advances from the Central Government and meeting irrecoverable loans granted to the cultivators for relief purposes.

16.4. The Act of 1936 was replaced by a fresh legislation in 1958, to unify legislations necessitated by re-organisation of States. Similar funds existed in Ex-Saurashtra and Ex-Madhya Pradesh States. The legislation in 1958 therefore unified the provision of these Acts. A Fund was constituted out of the shares allotted to Bombay State from the Funds maintained by Saurashtra, Madhya Pradesh and former Bombay State. The Fund was again reconstituted by an amendment after the formation of State of Maharashtra. In 1963, by another amendment, the Fund was renamed as Scarcity Relief Fund.

16.5. The revised legislation did not make significant change in the substantive provision governing the utilisation of Fund and investments of the Fund. Few changes made in the legislation are stated below. The corpus (i.e. the minimum balance in the Fund) was left to be determined by delegated legislation. The Government subsequently fixed such corpus at Rs. 3 crores. Secondly the amounts in excess of the corpus could not be utilised under revised enactment for repayment of advances from the Central Government. Thirdly, the contribution from annual budget not exceeding Rs. 15 lakhs was made mandatory till the Fund reached Rs. 4 crores.

16.6. The balance in the Fund as on 31st March 1972 stands at Rs. 4·76 crores. Though the Fund is in existence for long time, it has not been used on a single occasion after 1958 even when wide-spread conditions prevailed more than thrice during the last decade. The continuance of the Fund therefore seems to be only a product of historical accident as legacy of Government of India Act, 1919 rather than the product of a purposive policy for creation of the Fund. The relief expenditure in recent years has been more than ten times the corpus in the Fund and economy cuts had to be imposed on several plan and non-plan schemes during the years of scarcity in the past but the amounts in the Fund were not withdrawn. A convention seems to have developed that even during the years of scarcity, the drawal of the Fund is to be resorted to only if the funds are not available as advances from Contingency Fund and annual budgetary provisions.

16.7. We have recommended the preparation of contingency plan for the years of scarcity in an earlier chapter. The dislocation of State's resources cannot be avoided unless some special arrangement is made for financing the relief expenditure in such a contingency. Unless the source of finance for contingency plan is firm and sizeable the effort in preparing such plan to avoid dislocation of State's economy will be rendered nugatory. Perhaps it may be argued that the continuance of the Fund will be anachronistic in the light of existing financial arrangements between the Centre and the State relating to finance of relief expenditure. But the State Government has to bear 25 per cent of the relief expenditure in excess of margin prescribed by Finance Commission and has also to repay loan content of the assistance. We are therefore of the opinion that more positive approach should be adopted in framing rules for contrbution and utilisation of the Fund. We suggest two important changes in the existing legislation. The size of the Fund has to be revised in the light of size of relief expenditure in recent years. The limit of Rs. 4 crores was fixed taking average of relief expenditure in past years. The size of relief expenditure has considerably increased owing to increase in wage rates and other reasons. The size of the Fund may be revised in the light of this expenditure and may be related with the size of contingency plan. The provision regardnig utilisation also should be more specific. A financial limit may be determined on the basis of past experience upto which the expenditure may be met from normal budgetary provisions for relief measures. The drawal from Fund may be resorted only when the expenditure exceeds this limit.

16·8 There should also be an advance plan for reduction of expenditure on normal schemes, in case, the provision in the annual budget and the balance in the fund are together found to fall short of the anticipated expenditure on scarcity works in any particular year. The recoupment to the Fund may be made by annual contributions within specified period. Creation of Fund at the Centre on similar lines may also facilitate smooth flow of assistance from Centre to the State. Sixth Finance Commission is already seized with the problem of creating such Fund at the Centre.

16·9. As regards financing of long term programme no special programme for the drought prone areas was framed till 1970. Normal State plan schemes were expected to take care of the drought prone areas. In 1970, however special programme was started under Centrally Sponsored Scheme. In a later chapter, we have expressed our views on the effectiveness of the programme. Though, the Government of India had the intention that the state government should give weightage to these areas in stepping up conventional measures, under the present arrangements and financing system there is no direct evidence of extent of weightage given to these areas.

16·10. It has therefore been suggested that there should also be a Fund for financing long term programme for banishment of scarcity in the drought areas. Many reasons are cited in favour of such suggestion. It is argued that apart from lending sense of urgency and importance to the problem of drought prone areas, creation of Fund will ensure that the funds earmarked for drought prone areas are not diverted to other areas and sectors. Fact Finding Committee (1960) also considered the desirability of creation of Fund but concluded that the creation is not desirable. The Committee said " It would not be desirable to set apart any special fund for such a large purpose like the development of scarcity areas. Instead, the scarcity areas should participate increasingly in the growing size of the development programmes....................".[1]

16·11. Creation of Fund is considered desirable when the expenditure arising out of unforeseen contingency is to be met. The drought prone areas programme will be a continuous process. Contribution to a developmental Fund and withdrawal from it will almost be a simultaneous process as it has happend in the case of Road Development Fund. Many areas, sectors and classes deserve special attention such as small farmer, marginal farmer and industrially backward areas. Once a special fund for the drought prone areas is created, it will be difficult to reject the claims of these interests. This may result in splitting of annual budget in contribution to different funds thus created. The resources of developing economy are growing and creation of Fund will deprive these areas from sharing in the growing resources as the development programme will get restricted only to balances in the Fund. Further the programme has no direct link with augmentation of particular tax revenue. Therefore it has to share the general resources of the State. Hence even though we are in favour of the creation of a Scarcity Relief Fund as a contingency relief measure, we do not suggest creation of any Developmental Fund for long term programme for drought prone areas.

16·12. In the foregoing chapters, we have suggested various measures for the development of drought prone areas. Size of the programme in certain sectors is also indicated. The ultimate size of the programme will however depend upon availability of resources. We have already recommended that the drought prone areas should be considered as a separate unit of planning. But it is not enough to see that the drought prone areas as a whole is treated as a separate unit for planning and financial allocation but there should be guarantee that the resources earmarked for the programme are not diverted to some other areas.

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[1] Report of Fact Finding Committee 1960 Page 47.

16·13. There will be no disagreement on the point that in planning for economic development, these areas deserve special attention. The entire planned effort will appear less meaningful if the drought continues to endanger human existence in these areas. Therefore it will not be disputed that in financial allocation, the drought prone areas should be given due weightage. The sectoral priorities in the programmes for the drought prone area will have to be different. The development of social services in these areas may wait for some time. The priority should therefore be given to the schemes for development of water resources, production oriented schemes and schemes which will bring diversification of economy by augmenting employment opportunities in the non-agricultural sector suggested by us in earlier chapter. We also suggest that the State legislature should be kept regularly informed by reporting the financial allocation for these areas and performance of the programme at the time of submission of budget proposals.

CHAPTER XVII

ORGANISATION

17.1. In the earlier part of this report, we have outlined the dimensions and policies of the programme for alleviating the economic conditions in the drought prone areas and to provide reasonably minimum and steady level of income to the population in these areas. An integrated area development approach will have to be adopted for ensuring the effectiveness of the programme. The droughts are quite frequent in the drought prone areas and their occurrence has to be considered as a regular feature to be taken into account in framing any plan for the development of those areas. The term " relief measures " is not to be understood in the limited context of works for relieving immediate distress during the periods of drought but should be assigned a wider meaning to include all works directed to make the effects of scarcity less pronounced even if they are undertaken in the normal years. While short term relief measure are mainly aimed at alleviating the conditions of distress during the period of scarcity, long term measures aim at building up capital assets within the region which will help in banishment of scarcity in the region. While former measures are mainly curative the latter are of preventive type. Relief measures, therefore should be considered as a continuous process and should not be considered only as an emergency measure for relieving the distress in the years of drought. This concept of relief measures as a continuous process has to be borne in mind while thinking of an organisation for the administration of relief measures. Such an organisation will have to carry out in the normal years the task of building up assets which will help in making the areas scarcity resistent and in the period of scarcity, it will have to switch over to the task of relieving the immediate distress.

17.2. The organisation for the development of the drought prone areas will have to fulfil the following functions:—

(1) Planning and direction of the programme;

(2) Implementation of the programme;

(3) Supervision of the programme.

17.3. *Planning and Directions.*

17.3.1. The agency for planning and directing the programme will have to perform the following functions:—

(*a*) Preparation of a perspective plan for the area. The plan will have to include measures to be undertaken in the normal years as a part of long range programme and relief works to be executed during the period of scarcity for ameliorating the scarcity conditions;

(*b*) Dovetailing of the drought prone areas programme and relief works in the state plan as a whole;

(*c*) Continuous evaluation and monitoring of the plan.

17.3.2. We have already stressed the need for preparing a master plan for the entire drought area based on the techno-economic surveys, indicating the developmental measures, the growth points to be selected as centres of development activities, proposing suitable investment pattern and details of various local schemes for development of the drought prone areas within each district as a long term strategy of development. The long term perspective plan should indicate among other objectives, the desired shifts in the occupational distribution in the districts. This long range plan will have to be phased in suitable annual plans indicating the size of investment in each year and laying down priorities within the sectoral allocations. The emergency plan of scarcity works to be undertaken during the period of scarcity will have to detail out various works to be undertaken in the years of drought. The drought prone areas programme and emergency plan for scarcity works will have to be integrated with the state plan to avoid overlapping of schemes, duplication of expenditure and resulting waste of scarce resources of the State. A continuous process of evaluation of the programme will be necessary to lend a more realistic character to the planning for drought prone areas. Such a process of evaluation will bring the lessons from the experience gained in the course of implementation, in the planning for the future.

17.3.3. The nature of the functions implied in the direction and planning necessitates the creation of an organisation at state level to discharge the above functions. Even though the Famine Commission of 1880 suggested the agency of the Agriculture Department for the task of implementing scarcity relief works, the brunt of directing supervising and implementing the relief programme was in practice borne by the Revenue Department. Before the Fact Finding Committee's report in 1960, special programme for drought prone areas did not exist. The centrally sponsored scheme of drought prone areas programme in the year 1970 for the first time introduced an approach of integrated area development to some extent in the planning for drought areas in the State. The administration of this programme as a whole has been entrusted mainly to the Agriculture Department while the direction and supervision of scarcity relief works during the period of scarcity continued with the revenue administration. This has eventually created the problems of co-ordination and dovetailing of the two programmes. This separation of the administration of scarcity relief works from the implementation of the long term programme for drought prone areas has to be replaced by entrusting the task of directing, planning, implementing and supervising both types of programmes to a single agency in the interest of a co-ordinated approach.

17.3.4. Our Committee considered the proper placement of such organisation under the existing departments of the Government. Various schemes in the drought prone areas programme fall within the jurisdiction of different departments such as Building and Communication Department, Irrigation and Power Department, Agriculture Department and Revenue and Forests Department. But one of the significant aspects of the drought prone areas programme is its integration with the state plan. We therefore feel that the organisation responsible for the administration of drought prone areas programme may be placed directly under the development commissioner who is in overall charge of the developmental activities in the State. Apart from facilitating the co-ordination with the state plan, such an arrangement will lend developmental outlook to the programme. We, therefore, recommend the creation of a separate cell for the drought prone areas programme under the development commissioner. The staffing pattern of the cell will depend on the size of the programme ultimately sanctioned by the Government and the work-load it will entail.

17.4. *Implementations.*

17.4.1. The implementation of the drought prone areas programme will be at the district level. The district level agency will have to discharge mainly the functions of planning and implementation of schemes in the programme. We have earlier advocated a unified approach to the planning for drought prone areas programme and scarcity relief measures. The significance of integration of these programmes with the state plan has also been brought out in the earlier part of this Chapter while discussing the agency for directing and planning the programme at the state level. In implementation of the district plans for the drought prone districts, the same unified approach will have to be adopted by entrusting the task of planning for the drought prone areas of the district and the scarcity relief measures to a body which frames the normal district plans. We understand that the government has decided to create a Planning Board at the district level for the preparation of the district plan and supervision over its implementation. We are of the opinion that if the planning for both these programmes is entrusted to the same agency, it will bring coherent approach towards the implementation of the programme and the plans.

17.4.2. The pursuance of the various activities envisaged in the programme however will have to be done by the officers of the various departments working at the district level. It will be necessary to co-ordinate the activities of the various departments during the course of the implementation of the over-all programme. The task of co-ordination may be entrusted to the agency which will be discharging the functions of co-ordinating the programmes included in the normal state plan at the district level. We have already advocated the preparation of contingency plan indicating alternative pattern of investment in the years of scarcity. The agency implementing the scarcity relief measures embodied in such a contingency plan will have to be strengthened by suitable staffing arrangements in the years of drought.

17.4.3. The implementing, directing and planning of the scarcity works is being done at present by the collectors at the district level. Our Committee has no doubt that the collectors with the co-operation of other district officers are discharging this function effectively and with the utmost expedition. However, we would like to record the fact that the collectors are over-burdened with multifarious functions and many responsibilities. The responsibilities of the collector in the district are so wide and the assigned functions are so many and varied that it has not been possible to eventually quantify these responsibilities. He is the chief functionary of the revenue administration in the district and thus has to perform the role of the appellate authority in respect of revenue laws and tenancy laws. He also exercises supervision over the recovery of government dues and matters pertaining to government lands. As a district magistrate he is responsible for the maintenance of law and order. The public distribution system of essential commodities is also supervised by the collector. Inspection of treasury, supervision of municipal councils, supervision over agriculture produce market committees, election to legislative assembly, municipalities, zilla parishads, etc., are the important items in the list of the functions which the collector is discharging. This list is only illustrative of the multifarious and mutually exclusive functions discharged by the collector. As a result of such multifarious responsibilities it has not been possible for the collector to arrange priorities in the various tasks entrusted to him since no department normally considers its work assigned to the collector of less importance than others. Moreover as and when contingency arises there are only additions to his duties and responsibilities from all the sources, without having regard to the extent of his existing duties and responsibilities. When the British government created the in stitution of collector, he was cast in the role of a leader or commander. Recently particularly since independence with the growth of functionaries of other departments he has mainly to perform the role as a co-ordinator of activities of the various departments. We feel that the time has now come to consider rationally and quantify the exact nature and quantum of his functions and then to divest him of some of the unimportant functions so as to enable him to concentrate on the rest in the larger interest. Our Committee feels that the drought prone areas programme including scarcity relief works is one of the important programmes and its implementation requires to be entrusted to a senior and responsible officer in the district who will be able to give a full time and concentrated attention to this work.

17.5. *Supervision*

17.5.1. An intermediate organisation between the implementing agency and directing agency is normally considered desirable for exercising an over-all supervision over the implementing agency. Such organisation can also keep abreast the planning and directing agency, the practical difficulties involved in the implementation of the programme and suggest remedial measures in the light of its practical experience. Divisional commissioners exercise over-all supervision over the work of collectors and chief executive officers in their respective jurisdictions. Even though the departments normally follow the practice of issuing instructions directly to the collector who is the implementing authority, the commissioners are also kept informed. The commissioners exercise over-all supervision over the collectors regarding the implementation of the instructions issued by various departments and also bring to the notice of government any suggestion for improvement of the existing programmes and procedures. We are of the view that in the implementation of the drought prone areas programme, the above procedure be continued and the divisional commissioners should exercise an over-all supervision over the implementing agency in the district. We have learnt that the post of additional commissioners are being created at the divisional level. The additional commissioner is expected to bear the brunt of the routine revenue work of the divisional commissioner and thus facilitating the latter to concentrate on his supervisory functions with regard to the general developmental activities in his respective division. In view of this, the supervision of the drought prone areas programme is not likely to overburden the commissioner. As such, we recommend, he may conveniently be, assigned the supervisory function.

CHAPTER XVIII

DROUGHT PRONE AREAS PROGRAMME

(CENTRALLY SPONSORED SCHEME)

18.1. *History*

18.1.1. The recurrence of scarcity conditions in 1952-53 and again in 1965-66 in a large part of our country dispelled the belief that the general process of economic development will by itself ultimately banish the spectre of scarcity. The need for a special programme for the drought prone areas was recognised by the Government of India, when it advised the state government for framing suitable programme for mitigation of scarcity conditions. The steps to be taken were listed as follows:—

(*i*) Identification of areas to be followed by a general survey of programmes to be undertaken.

(*ii*) Stepping up of the conventional measures for moisture conservation and attaining a full coverage.

(*iii*) Undertaking minor and medium irrigation works in the areas.

(*iv*) Undertaking a more efficient utilisation of the land combining agriculture with forestry and fodder production.

(*v*) Provision of other types of employment based on subsidiary agricultural occupations and village industry.

18.1.2. The programme was to include schemes of lasting benefit, based on investigation and surveys. The Ministry of Food and Agriculture also indicated the guidelines for selection of areas on the recommendation of the Planning Commission. The guidelines are summarised below:—

(1) The programme is essentially an area programme for planning and operational purposes, the area unit to be taluka, district being relatively large unit.

(2) The immediate object of development should be to etablish minimum security against drought to provide the basis of further development without the risk of a set back which may occur in the absence of minimum foundation of security.

(3) The initial development programmes would be generally related to the primary resources in land and water. Industrial development in most cases be a secondary case and dependent on the existence of several factors favourable for industrial growth and long range development programme.

(4) In view of limitation of financial resources and the urgency of positive measures of development, quick maturing production oriented and scarcity resistent programmes should be preferred to relief and amenities.

(5) The developmental programmes for these areas should be regarded as additional to and integrated with the normal plan programmes of development such as soil conservation, irrigation, power, animal husbandary and fodder etc.

(6) Talukas of promising resources may be given priority over equally vulnerable taluka with less promising resources. Talukas should be arranged in the order of priority.

(7) The criteria for sanctioning the schemes should be (*a*) technical soundness of the schemes and (*b*) technical preparedness of the scheme.

18.1.3. The nature of the programme intended in the above guidelines was mainly supplementary to the normal plan schemes. The guidelines further suggested that the State plans should be so drawn up that drought affected areas got a substantial weightage in the distribution of conventional programme among different districts. The programme was deliberately directed to centre round small areas so as to make visible impact on the areas.

18.2. *Size of Programme.*

18.2.1. The programme was treated as centrally sponsored scheme. The State Government was appraised that the size of the programme for each district may not exceed Rs. 2 crores. The project area was to be restricted to hard core areas within the district so that at the end of the programme its impact could be significant. It was however conceded that the areas ultimately to be tackled might have to be much larger forming a sizeable part of the State. But it was emphasised that they might be dealt at a later stage after sufficient experience was gained in dealing with the hard core.

18.3. *Identification of Areas.*

18.3.1. The Fact Finding Committee (1960) sugggested some criteria for identification of chronically drought affected areas and their gradation. In fact, the instructions issued by the Government of India endorsed the same criteria for identification of areas for adoption at the national level. The data relating to annewari, rainfall and declaration of scarcitiy in the past was re-examined by the State Government in 1967 in the light of criteria suggested by the Fact Finding Committee (1960) and endorsed by Government of India. For gradation of chronically-drought affected areas also, the State Government followed the same criteria, as inunciated by the Fact Finding Committee (1960). At first, the Government of India agreed to sanction the programme in chronically drought affected areas in class 'A' and 'B'. Two districts of Ahmednagar and Sholapur were selected by the Government of India. The State Government, pressed for the extension of this programme to all the 9 districts identified by it and also demanded an increased allocation for the programme. The programme was ultimately sanctioned for six districts. The request of the State Government for inclusion of 'C' class areas was rejected on the ground that the programme was intended to confine to hard core areas. The Programme was however extended to some of the chronically scarcity affected talukas in 'C' class in the districts of Ahmednagar and Sholapur. Thirty-four talukas of six di[illegible] (*viz.* Nasik, Satara, Sangli, Sholapur, Ahmednagar and Poona) are now covered [illegible] programme sanctioned in 1970 (*vide* list enclosed).

18.4. *Pattern of financial assistance.*

18.4.1. The pattern of financial assistance sanctioned by the Government of India is as follows :—

(1) Full subsidy for minor irrigation works both in State as well as local sector.

(2) Full subsidy for additional staff created for minor irrigation works (11 sub-divisions of minor irrigation works in the State sector and 18 sub-divisions in the local sector) and subsidy at 1·5 per cent of expenditure on the works as utilisation charges for tools and plants.

(3) Full subsidy for afforestation programme.

(4) Full subsidy for road works.

(5) As the State Government recovers from the cultivators 75 per cent cost of contour bunding and 50 per cent cost of nalla bunding, the central assistance on soil conservation is restricted to 25 per cent and 50 per cent of the cost in respect of contour and nalla bunding respectively, which corresponds to the grant of subsidy under programmes.

(6) Hire/use charges on account of heavy equipment and machinery like road rollers, bull dozers etc. can be reimbursed but such equipment and machinery cannot be purchased.

18.5. *Financial framework of the programme.*

18.5.1. The master plans were prepared for each of six districts in the State, to facilitate framing of the yearwise programme and schemes. The master plans indicated the physical resources of the district, set out certain objectives and proposed some schemes which could be quick yielding within the broad guidelines given by the Government of India. The size of the programme indicated in the plans fixed the total outlay of Rs. 12·78 crores for the six districts.

18.5.2. Table No. I indicates the distribution of programme districtwise and sectorwise allocations. The size of the programme for each district adheres to overall financial limit of Rs. 2 crores except in the case of the districts of Sholapur and Ahmednagar which have received slightly more allocations presumably because of the relatively large project area in these districts as compared with other districts. A State level co-ordination committee was formed to decide the content of the programme. In its first meeting the following allocations were tentatively fixed for various schemes as follows :—

Minor irrigation, State sector	Rs. 75 lakhs.
Minor irrigation, Local sector	Rs. 100 lakhs.
Afforestation, ground water and others	Rs. 25 lakhs.

The detailed allocations for the district were worked out on the above basis as far as possible. It was decided in the said meeting that major and medium irrigation projects should be ruled out because of financial constraints as otherwise it would have meant a concentration of all the programme at only a few places. The schematic pattern of the programme indicates a larger emphasis on the minor irrigation works in an effort to give emphasis on quick yielding and production oriented schemes. We feel that the inadequacy of these projects to resist drought has been overlooked. The allocation for soil conservation is comparatively less, as the programme under the centrally sponsored scheme has to rely on the funds in the normal State plans for meeting the loan content of the programme; such availability of funds being restricted to the overall plan ceiling for that sector. A deliberate decision was said to have been taken to keep the expenditure on ground water development to the minimum as most of the ground water works were in the experimental stage. Another reason for assigning lower priority for ground water development is that the works are to be appropriately taken up by individual cultivators on their initiative through institutional credit. Afforestation is the small ca[illegible] of the programme as the forests in the areas are dominated by shrub growth and the inclusion of afforestation programme on a large scale in the programme would have meant the denial of funds to more productive scheme of minor irrigation. Though the guidelines included the programmes for village and small scale industry the said schemes have not found place in the programme. No allocation is earmarked for the development of subsidiary occupations in the animal husbandry sector. Overall financial constraint on the programme and its essential supplementary character seem to have considerably influenced the schematic pattern of the programme particularly in giving emphasis on only minor irrigation works.

18·6. *Financial Achievements.*

81.6.1 Table No. II shows the financial achievements of the programme. As the programme was started in October 1970 the expenditure in the first year of the programme was 8 per cent of total outlay proposed in the master plan and 10 per cent of the anticipated outlay during the three years of the programme. The expenditure in the second year of the programme was fourfold of the total expenditure in the first year of the programme. It constituted 30 per cent of total outlay proposed in the master plan. The outlay for 1972-73 is Rs. 481·94 lakhs which is approximately 40 per cent of total outlay proposed in the master plan. Against the outlay of Rs. 481·94 lakhs in 1972-73, the expenditure of the order of Rs. 295·82 akhs has already been incurred till the end of December 1972 which is nearly 60 per cent of the outlay proposed for 1972-73. If the entire expenditure proposed in the outlay for 1972-73 is incurred by the end of the financial year the total expenditure will amount to 75 percent of the proposed outlay.

18.7. *Physical Achievements*

18.7.1. Table No. III shows the physical achievements in the programme district-wise. A review of physical achievements is given below in brief:—

18.7.2. *Minor Irrigation.*—According to the master plan, 41 works involving an estimated cost of Rs. 602·98 lakhs are proposed to be undertaken in the State sector. In the first two years, 38 works have been started and the total expenditure incurred has been of the order of Rs. 203·93 lakhs. Seven more additional schemes have been taken up for implementation in Poona (4), Sangli (2) and Satara (1). Nine schemes have been completed in the State sector by June 1972. It is expected that 34 minor irrigation works will be completed by July 1973 creating irrigation potential of 5,142 hectares.

18.7.3. In the local sector, the master plan contemplated 192 works with an estimated cost of Rs. 485·97 lakhs, 161 works costing Rs. 427·26 lakhs have been started, and the expenditure incurred so far has been in the order of Rs. 202·02 lakhs. 26 additional works which are not included in the master plan have also been started. Out of these 187 works, 41 works have been completed.

18.7.4. *Ground water Surveys.*—An outlay of Rs. 6 lakhs is earmarked for ground water surveys. At first it was decided to restrict the programme only to four districts of Ahmednagar, Satara, Sangli and Nasik in view of the fact that other two districts of Poona and Sholapur would be covered by the U.S. A.I.D. Project on ground water. Later, the decision was altered and the scheme was extended to all the six districts. This scheme is awaiting the sanction of the Government of India but in the meantime the State Government has initiated basinwise survey of ground water resources throughout the State.

18.7.5. *Road works.*—The road works as such have not been proposed in the programme except the scheme for construction of submersible bridge on Ghod river in Sirur Taluka of Poona district at a cost of Rs. 61 lakhs. There is no progress under this scheme as the decision regarding the executing agency is only recently taken. The Buildings and Communications Department is to execute the work.

18.7.6. *Soil Conservation.*—The main handicap of the soil conservation programme has been the limited availability of the funds in the normal State Plan for the loan content of the programme on account of the overall plan ceiling. Against the target of covering 2·25 lakhs hectares, the achievement during the two years of 1970-71 and 1971-72 is 0·68 lakhs hectares.

18.8. *Effectiveness of the Programme*

18.8.1. The review of the programme and its effectiveness is included as one of the terms of reference to our Committee. We have analysed the physical and financial achievements of the programme in the foregoing paragraphs. As will be obvious from Table No. II, a large number of the works are still in progress and their impact will be visible only after completion. Further a clear appreciation of the D.P.A.P. as a long term operational plan is not possible because the three years of the implementation of the programme also synchronized with the years of acute scarcity conditions. About 86 per cent of the programme is of minor irrigation works which are basically dependent on rain water. Since these were scarcity years, the utilisation of the capital assets created under the programme became difficult.

18.8.2. The programme emphasises the stepping up of the conventional measures for moisture conservation and attaining full coverage and also undertaking minor irrigation works in these areas. The schemes have limitations because these projects fail to retrieve the drought situation when the total precipitation is inadequate in the catchment of these projects which lie in the low rainfall belt. In our State it is acknowledged that there is no possiblility of a large scale tube well programme on account of inadequate underground water reserves. Therefore in the irrigation policy considerable emphasis has to be placed on the projects which store water in areas lying in high rainfall zone and transport it through a net work of canals to the drought prone tracts. The emphasis therefore in the drought prone area programme has to be equally on the speeding up of the major irrigation projects benefitting the drought zones rather than over emphasising the minor irrigation schemes.

18.8.3. The guidelines contemplate the creation of a minimum foundation of security in these areas against drought to provide the basis for further development without risk of the set back. In the absence of quantification of minimum foundation of security against drought, this guideline only provides a catch word, and does not suggest concrete programme. We realise that the minimum foundation of security in the drought prone areas will differ from one area to another. Keeping this fact in view we have suggested in an earlier Chapter the imperative need for techno-economic surveys which will provide such foundation.

18.8.4. The programme was initially intended to be restricted to hard core areas. Further the guidelines of the Planning Commission suggested that the order of priorities among the talukas should be arranged in such a manner that the talukas of promising resources should be given priority over equally vulnerable talukas with less promising resources. The underlying intention behind the programme had been to select one or two talukas in a district for concentration of investment and efforts. The existence of a large number of drought prone talukas in the large number of districts competing for the special programme in the State possibly led to the inclusion of a much larger area in this programme than originally conceived in the scheme. The financial allocation for the district was not however raised. It therefore resulted in spreading out the meagre resources over larger area without significant impact. If a taluka had been adopted as the unit for financial allocation and if substantial allocations had been made thereon the impact could have been probably very significant.

18.8.5. The programme suffers from limitation because of the fixed financial allocation. Some of the sectors such as animal husbandry and industries have not even been touched by the programme. Though the programme is expected to be integrated with the State plan, the master plans do not provide such a total picture. There are no projections of the effects on the overall economy of the areas which the programme is likely to produce. We have expressed in an earlier chapter the inadequacy of the programme which only contains the schemes in agricultural sector. The basic approach to the land should be to aim at its utilisation according to land use capacity. The analysis of behaviour of sectoral and *per capita* incomes over a period of years, the examination of occupational distribution in the area and the capacity of agriculture to sustain the population at fairly stable level of income are some of the basic prerequisites for drawing up suitable programme. The estimates of desirable shifts in the occupational distibution, selection of appropriate sectors for emphasis in different parts of the drought prone areas according to the availability of physical resources, selection of growth centres and correct choice of investment and technology are some of the basic issues which the master plan should bring out. In foregoing chapters, we have spelt out our approach to the development of chronically drought affected areas and the policies and programmes that should be designed to fulfil the objectives.

18.8.6. The operation of limited programme for the drought prone area cannot be expected to make visible impact on the socio-economic conditions of these areas. We have in an earlier chapter outlined the necessity for giving priority to the development of drought prone areas as the conditions in these areas are precarious. Such conditions necessitate rapid rate of growth in the near future. The magnitude of such programme therefore, is so large that the centre's assistance over and above plan ceiling will be essential. We are of the view that the central assistance should bear some definite proportion to the total financial commitments of long term perspective plan for drought prone areas, instead of operating small additive programme under centrally sponsored programme. Further there should be full delegation of powers to the State Government to alter the detailed works in the programme within broad type of works according to exegencies of the circumstances in respect of individual schemes. The pattern of financial assistance as indicated above will have two distinct advantages of ensuring integration of the programme with the State plan and providing adequate incentive to the State Governments to give due weightage to the drought prone areas in the normal State plan.

18.8.7. The need for reorienting the areas programme has also been recognised by the Planning Commission in its "Approach to the Fifth Plan 1974-79" (January 1973) The Planning Commission says, " By and large these programmes were conceived in isolation and their operation were locationally dispersed. In the Fifth Plan it will be necessary not only to accelarate the pace of implementation of these programmes but also to make distinct operational improvements. The experience with these programme has shown that, if an impact is to be made, the development programmes in general and the special programmes in particular will have to be integrated. "

TABLE No. I

Outlays proposed in the Master Plan for the drought prone areas programme.

(1) Outlay in lakh Rupees.

(2) Mandays in lakhs.

Serial No.	District	Minor Irrigation				Soil Conservation		Afforestation		Road		Total Outlay	Total Mandays
		State Sector Outlay	Local Sector Outlay	Ground Water Survey Outlay	Total Outlay	Mandays	Outlay	Man-days	Out-lay	Man-days	Outlay		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Ahmednagar ..	135·16	103·03	1·00	239·19	46·90	34·30	35·76	3·74	0·63	..	277·23	83·28
2	Sholapur ..	113·27	79·62	1·00	193·89	27·01	43·12	46·34	2·80	0·46	..	239·81	73·81
3	Poona ..	63·80	107·83	1·00	172·63	23·83	17·15	19·38	1·50	0·30	6·00	197·28	43·51
4	Nasik ..	104·10	43·07	1·00	148·17	19·10	29·65	34·11	3·82	0·64	..	181·64	53·88
5	Sangli ..	100·14	71·02	1·00	172·16	24·93	18·92	22·10	2·42	0·41	..	193·50	47·44
6	Satara ..	86·51	83·18	1·00	170·69	23·68	16·24	18·90	2·42	0·40	..	189·35	42·98
	Total ..	602·98	487·75	6·00	1096·73	165·45	189·38	176·82	16·70	2·83	6·00	1278·81	344·90

*This outlay represents only grants of 25 per cent and 50 per cent of the cost of works on contour bunding and Nala bunding respectively.

TABLE No. II

Sector-wise position of expenditure in respect of the drought prone areas programme (Rupees in lakhs)

Serial No.	Sector	Outlay as per Master plans	Expenditure during 1970-71	Expenditure during 1971-72	Outlay proposed for 1972-73	Total for 3 years (4, 5, 6)
1	2	3	4	5	6	7
		Rs.	Rs.	Rs.	Rs.	Rs.
1	Minor Irrigation (State Sector) ..	602·98	30·16	173·77	224·00	427·93
2	Minor Irrigation ..	487·75	37·19	164·17	170·30	371·66
3	A. Utilisation charges for tools and plants and addl. establishment for Minor Irrigation Works.	..	10·85	24·04	20·71	55·63
3	B. Groundwater Surveys ..	6·00	..	..	4·28	4·28
4	Road Works (Bridge in Poona District.).	6·00	..	..	..	..
5	Soil Conservation ..	159·38	17·23	20·71	58·74	96·68
6	Afforestation ..	16·70	3·50	3·22	3·91	10·43
	Total ..	1278·81	88·96	385·91	481·94	966·61

TABLE No. III

District-wise and Sector-wise progress of physicai targets and achievment under the drought prone areas programme.

(Figures of Mandays in Lakhs)

Serial No.	Sector	Physical Targets as per Master Plans.	1970—71		1971-72		1972-73 Targets.	Remarks.
			Achievment.	Mandays	Achievment	Mandays.		
1	2	3	4	5	6	7	8	9
				Ahmednagar District.				
1	Minor Irrigation (State-Sector) works.	9	14	0·80	9	4·53	9	All 9 works in progress.
2	Minor Irrigation (Local-Sector) works.	30	13	0·85	30	6·07	24	6 works completed.
3	Soil Conservation. ..	50,107 (Hect.)	7,306	1·74	8,502 (Hect.)	6·41	17,400 (Hect.)	....
4	Afforestation.—							
	P. L. ..	450 (Hect.)	..	....	210 (Hect.)	0·34	120 (Hect.)	....
	P.M.W. Inspection	570 (Hect.)	210 (Hect)	0·01	120 (Hect.)	..	120 (Hect.)	
	Pathutment (Nos.) ..	570	..	....	120	..	....	
				Sholapur District.				
1	Minor Irrigation (State-Sector) works	8	4	0·63	6	3·25	8	All the works in progress.
2	Miner Irrigation (Local-Sector) Works.	27	17	0·01	30	5·41	32	4 works not incluted in M.P' have been started and two new additional works proposed for 1972-73.
3	Soil conservation ..	44,600 (Hect).	9,285 (Hect.)	2·01	8·288 (Hect.)	5·37	13,657	
4	Afforestation.—P.L. ..	420 (Hect.)	..	....	Plantation started.	0·14	70 (Hect.)	
	P.M.W. ..	280 (Hect) ..	70 (Hect)	0·03	....	..	70 (Hect.)	

TABLE No. III—*contd.*

(Figures of Mandays in Lakhs)

Serial No.	Sector	Physical Targets as per Master Plans.	1970-71 Achievement.	1970-71 Mandays	1971-72 Achievement.	1971-72 Mandays.	1972-73 Targets.	Remarks.
1	2	3	4	5	6	7	8	9
				Poona District				
1	Minor Irrigation. (State sector Works)	5	2	0·10	5	2·74	9	5 works from M. P. are in progress and 4 new works have been proposed for remaining 2 years.
2	Minor Irrigation (Local sector) Works.	55	19	3·20	31 (8 works completed)	11·57	23	28 works from the M. P. were started. Besides 3 works not included in M. P. have been started and 4 additional works proposed for 1972-73.
3	Soil Conservation ..	27,860 (Hect.)	..	....	2,247	0·73	11,930	....
4	Afforestation P.L. ..	120 (Hect.)	..	....	....	..	....	....
	P.M.W.	175 (Hect.)	..	....	....	..	....	Since 30 additional forest area is available in the district. no programme under the S.P.A.P. is undertaken.
				Nasik District				
1	Minor Irrigation (State sector) Works.	7	6	0·02	7	4·48	7	All the 7 works in progress.
2	Minor Irrigation (Local-sector) works.	2	12	1·12	27	6·70	27	Out of 27 works 18 have been completed and 5 works not included in M. P. are in progress. Additional 44 works have now been proposed.
3	Soil Conservation ..	51,900 (Hect.)	5010 (Hect.)	0·80	13,350	7·84	18,285	....
4	Afforestation P.L. ..	200 (Hect.)	100 (Hect.)		100 (Hect.)	0·29	120 (Hect.)	....
	P.M.W.	300 (Hect.)	..	..	100 (Hect.)		120 (Hect.)	

TABLE No. III—*concld.*

(Figures of Mandays in Lakhs)

Serial No.	Sector	Physical Targets as per Master plans	1970-71 Achievement	1970-71 Mandays	1971-72 Achievement	1971-72 Mandays	1972-73 Targets	Remarks
1	2	3	4	5	6	7	8	9
				Sangli District.				
1	Minor Irrigaation (State Sector) works.	6	4	0·98	6	4·09	6	6 works are in progress, and one new work has also been proposed now.
2	Minor Irrigation ..	24	7	0·78	35 (5 works completed)	3·52	40	5 works have been completed. No. of works taken up from the M.P. is 23 12 works not included in M.P. have been started and 5 more are to be proposed for 72-73.
3	Soil Conservation ..	26,800(Hect.)	5,897	1·16	2,979	1·54	7,927	....
4	Afforestation PL. ..	180(Hect.)	..	..	Planning and digging of trenches undertaken.	0·12	60 (Hect.)	
	P.M.W. —	240 (Hect.)	60	0·07	....	....	60 (Hect.)	....
				Satara District				
1	Minor Irrigation (State sector) works.	6	2	0·05	6	1·28	8	6 works from the M.P. are in progress and 2 new works have been proposed for this year.
2	Minor Irrigation (Local sector) works.	24	22	0·96	33	6·77	29	Out of 33 works in 1971-72, 4 were completed, 4 works not included in M.P. have been started.
3	Soil Conservation. ..	22,948(Hect.)	4,778 (Hect.)	1·17	2,102	1·73	6,600	....
4	Afforestation PL. ..	180 (Hect.)	....	....	Plantation and trenches are in progress.	0·13	35 (Hect.)	
	P.M.W. ..	240 (Hect.)	120	0·11	0·5	....	35 (Hect.)	....

List of talukas for Drought Prone Areas Programme.

I. Nasik District	1. Nandgaon 2. Yeola 3. Chandor 4. Niphad 5. Sinnar 6. Malegaon.
II. Satara District	1. Man 2. Khatav 3. Phaltan 4. Khandala.
III. Sangli District	1. Jath 2. Atpadi 3. Khanapur.
IV. Sholapur District	1. Karmala 2. Mangalveda 3. South Sholapur 4. Barshi 5. Sangola 6. Madha 7. Malshiras 8. Mohol 9. Pandharpur.
V. Ahmednagar District ..	1. Shrigonda 2. Parner 3. Ahmednagar 4. Sangamner 5. Pathardi 6. Karjat.
VI. Poona District	1. Purandhar 2. Indapur 3. Sirur 4. Baramati 5. Dhond 6. Haveli.

CHAPTER XIX

SUMMARY

19.1. *Historical Background*

19.1.1. Famines and scarcities resulting from drought appear to have been recurrent feature in India since times immemorial as is evident from the references in the ancient Indian literature. In the inter-national setting also, the famines resulting from drought have been the peculiarity of countries situated in the monsoon tract. In Maharashtra, it is seen that famines from drought have occurred almost in all the districts at one time or the other, recurrence in some of them being much larger than in the others. (Paras 2.2.1. to 2.8.3.).

19.1.2. The main characteristics associated with the famines in the past were the rise in prices of grains, increased demand for employment, death from starvation and epidemics, loss of cattle, migration of cattle and people. Reliable account of relief measures undertaken in Pre-British period is not available. After the report of the Famine Commission (1880), the relief policy adopted by the Government was embodied in the Famine Relief Code. The relief measures normally undertaken were opening of relief works, suspension of land revenue, grant of loans for improvement of lands and gratuitous relief to infirm and weak etc. (Para. 2.9. to 2.10.4).

19.1.3. The ravages caused by famines in the 19th century were so devastating that three famine commissions had to be appointed within two decades. Three successive commissions appointed in 1880, 1898 and 1901, suggested various measures for effective implementation of relief works, for granting relief to cultivator class and emphasised permanent measures such as irrigation and development of railways for banishing famines in the country. These Commissions generally felt that the famines in India did not involve a food problem but mainly a problem of development of means of communications. (Para. 3.11.).

19.2. *Physical Features of Maharashtra*

19.2.1. Physiographically the State may be divided into four regions (1) Konkan Coastal strip, (2) Deccan Plateau, (3) Tapi Trough, (4) a very small area of Narmada Through. (Paras 3.2.1. to 3.2.4.).

19.2.2. The major part of rain is received from South West monsoon in Maharashtra State. The distribution of rainfall over the State is uneven and a large part of the State suffers from crop failure due to the vagaries of monsoon. As the margin between the normal rainfall and the adequacy of rainfall needed for dominant crops in the region is small, the effect of any small variation in the aggregate rainfall is more pronounced. Farming practices are adjusted to the normal character of rainy season but it is the departure from the normal pattern in a particular year which brings more hardship depending upon the extent of departure and its degree. (Para. 3.3.2.1. to 3.3.2.5).

19.2.3. Geologically, major portion of Maharashtra State is underline by basaltic rock known as the Deccan Trap. Only a small part of Nagpur district, a small part of Yeotmal district and Chandrapur and Bhandara districts consist of other rock formations namely, quartzites etc. Physiographically the State has hilly or undulating topography which has affected the soil formation with varying depths and textures. The soils of the State can be classified into lateritic soils, coastal alluvial soils, coarse and loamy soils, reddish brown soils, soils derived from Trap rocks under moderate rainfall and yellowish brown and red soils of mixed geological formation. (Paras 3.4.2.1. to 3.4.2.6).

19.2.4. Agro-climatically the State has been divided into nine distinct agro-climatic zones namely high rainfall zone with lateratic soils, high rainfall zone with non-lateritic soils, Ghat zone, Transition zones I and II, Scaricity zone, assured rainfall zone, moderate rainfall zone and eastern high rainfall zone (Paras 3.5.1. to 3.5.9).

19.3. *Criteria for identification.*

19.3.1. There is no universally acceptable definition of the term "drought". Drought is not understood as any absolute condition but a relative term, its interpretation depending upon the context in which the term is used. It is not disputed that if agriculture is to be successful, there must be enough rainfall to meet the soil, evaporation and transpiration needs of crop. Even though the drought is the function of interaction of several variables such as precipitation, temperature, wind velocity, sunshine, soil texture, soil moisture and antecedent rainfall, the dominant factor is rainfall, total precipitation, its distribution and variability and its capacity to meet evapo-transpiration needs of an area. Agricultural drought, therefore, may be considered as a situation arising out of adverse balance between available soil moisture and evapo-transpiration needs of an area impeding normal agricultural operation and ultimately resulting in total or almost total failure of crops. (Paras 4.1.1 to 4.1.3.).

19.3.2. There is distinction between scarcity and drought. While drought is a meteorological phenomenon, scarcity denotes its socio-economic consequences. Scarcity is caused by several factors such as excess rains, infection of crops due to pests etc. Scarcity may include drought but drought need not necessarily result into scarcity if, for example, the year of drought is preceded by abnormally good year. There is distinction between economically backward areas and drought prone areas in the nature of their problem and also measures for their improvement. The effect of drought on socio-economic life of a region are more intense in backward region than in economically developed areas. While the measures for development of economically backward areas encompass the entire realm of problems connected with raising the level of income, the improvement of drought prone area takes mainly the form of minimising uncertanties in agricultural production and diversification of economy in order to make it less dependent on rainfall. This Committee is only concerned with the scarcity arising from drought situation. (Para. 4.3.1. to 4.3.2.).

19.3.3. Though the Fact Finding Committee (1960) considered three criteria for identification of chronically scarcity affected areas, namely, rainfall, annewari and suspension of land revenue and declaration of scarcity in the past, it relied mainly on annewari and declaration of scarcity in the past in identification of chronically scarcity affected areas. Subjective character of annewari, diversity in the procedure of its determination and non-availability of annewari data for all regions in the State renders the efforts of identification of chronically scarcity affected areas on its basis somewhat nugatory. (Paras. 4.4.1. to 4.4.4.).

19.3.4. The Second Irrigation Commission (1972), considered, various criteria such as meteorological data, revenue remission, frequency of famine or scarcity and availability of irrigation facilities. Out of these criteria the Commission mainly relied on the meteorological data and availability of irrigation facilities. It considered drought as a situation occurring in any area where rainfall is less than 75 per cent of the annual normal rainfall. It considered areas where there is 20 per cent probability of above occurrence and adverse water balance as a broad drought zone. After identifying a broad drought zone, the Commission eliminated from the list furnished by State Governments (a) talukas falling outside the drought zone (b) talukas in which more than 30 per cent of net sown area is under irrigation, (c) areas forming small part of the district where rainfall is adequate.

It appears that the Commission has restricted its consideration to the areas declared by the Government of Maharashtra as chronically scarcity affected and did not consider the entire list of areas included by the Government in its memorandum to the Commission. It was necessary for the Commission to consider all the areas in Maharashtra State de novo. Even when figure 8·2 in its report showed larger areas in Maharashtra State in the broad drought zone, the Commission, surprisingly, did not include these areas in its final list in Appendix 8.1. of its report e.g. Sakri in Dhulia district and also did not offer any explanation for deletion of these areas. (Paras. 4.5.1. to 4.5.17).

19.3.5. The Committee feels that any criterion for identification of drought prone areas should satisfy three essential characteristics. It should depict drought situation. It should be possible to have quantitative measurement. Reliable data should be available. Some criteria relate to the cause of drought, others relate to the effects of drought.

19.3.6. Three criteria which can be grouped in the first category are (i) Normal Precipitation, (ii) Timeliness of rainfall and (ii) Moisture retentive capacity of soils.

19.3.7. Normal annual rainfall is the most significant criterion for classifying the drought zone. Various methods used to quantify droughts can be broadly classified into two categories namely rainfall analysis and water balance technique of which latter approach is more objective because it takes into account the precipitation evapo-transpiration and soil-moisture storage though the computations involved in such approach are more complicated and require further research. Indian Meteorology Department has demarcated areas with nil water surplus. The area where there is 20 per cent probability of 25 per cent deficit from annual rainfall has also been demarcated by I. M. D. Areas falling within the isohyete of 750 mms. satisfy both criteria of water balance as well as periodicity of departure from the normal rainfall. In addition, there are certain areas located on the south-east of this zone upto isohyete of 800 mm. which deserve also to be considered on the basis of one or other criteria (Paras 4.7.1. to 4.7.8.).

19.3.8. Timeliness of rainfall is an important factor governing crop growth. A model has been presented to illustrate how the crop failures occur in the event of uneven distribution of rainfall. Minimum requirements of major crops at various crucial stages have been worked out in the model and it shows various situations in which there will be partial or total failure of crops if these requirements are not met with. If such models are developed for major crops in agro-climatically distinct small zones, it may be possible in future to base declaration of scarcity on the objective criteria. A systematic collection of data and further research may enable us to base the identification of drought prone areas on the basis of such models, by testing its veracity, building alternative models if necessary and verifying it with actual rainfall pattern during past years. In the meanwhile, the weekly distribution of rainfall has to be considered in simpler form for understanding the effects of uneven distribution of rainfall on crops. After observing the weekly distribution of rainfall for the recent 15 years, the Committee concluded that crop failures were generally witnessed when 11 weeks out of 22 weeks from June to October were deficient weeks. The Committee therefore felt that the frequency of occurence of more than 11 drought weeks over a period of years can be a very convenient index of erratic character of rainfall. (Paras 4.8.1. to 4.8.9.).

19.3.9. Soil moisture is a limiting factor for the plant growth. Even though the rainfall is the main source of soil-moisture the same quantity of rain will affect soil moisture differently under different conditions of soil depths, slopes and the location of the site in the watershed. Thus shallow soils are less retentive of moisture, while deep soils have more moisture retentive capacity. The moisture retentive capacity of the soils governs the response of soils to varied rainfall conditions and tolerance of dry spells. The soil types widely vary from area to area and it is difficult to assess representative soil type in an area. The predominant soil type of area can be inferred from the contiguity to river. Within broad drought zone, the areas having less retentive soils are more susceptible to drought than the areas having more moisture retentive soils. (Paras. 4.9.1. to 4.9.3.).

19.3.10. Following criteria based on the effect of drought were considered by the Committee :—

(1) Annewari and suspension of land revenue.

(2) Declaration of scarcity in the past.

(3) Out turn.

(4) Marketable surplus.

(5) Migration.

(6) Fluctuation in the prices.

(7) Foodgrain offtakes.

(8) Density of population.

19.3.11. One of the major defects of the annewari is the subjective or personal element involved in eye-estimation of annewari which largely distorts the condition of crop. Apart from the diversity in the procedures for determination of annewari prior to the formation of State of Maharashtra, the procedure for determination of annewari suffers from many defects. The revision of standard yield every ten year fails to take into account progressive increases in the yields on account of improved agricultural practices. The number of crop cutting experiments conducted are small and selection of posts for such experiments is biased by actual condition of crops. There are two advantages of the annewari as criterion namely availability of data for smaller unit of identification and adequate representation of drought situation on account of its linking with declaration of scarcity. The defects of the system however overwhelm the advantage mentioned above. The Committee therefore, did not consider it as an acceptable criteria. (Paras. 4.10.1. to 4.10.16.).

19.3.12. Linking of declaration of scarcity with annewari lends subjective character to declaration. Hence the declaration of scarcity in the past is not acceptable criterion. (Paras. 4.11.1. to 4.11.3.).

19.3.13. Other criteria were considered by the Committee and rejected (Paras 4.12.1. to 4.17.).

19.3.14. After considering various criteria, the Committee is of the opinion that the method of identification should be as follow :—

(1) Identifying broad drought zone on the basis of normal precipitation.

(2) Verifying drought prone character of areas by frequency of occurrence of large number of deficient weeks in the monsoon months over a period of years.

(3) Eliminating the areas within the broad drought zone which are sufficiently drought resistent on account of the moisture retentive capacity of soils or which have become drought resistent on account of the facility of large canal irrigation system. (R. 1).

The Committee identified the drought zone to consist of :

(*a*) Areas falling within the isohyete of 750 mms.

(*b*) Areas falling within isohyetes of 750 mms. and 800 mms. which have shallow soils; and then applied the tests mentioned in 2 and 3 above (Paras. 4.18.1. to 4.18.4).

19.3.15. In nature, a rigid line of demarcation does not exist as there is a gradual transition in the natural conditions. Instead of rigidly grading the drought prone areas, the Committee prefers to rely on techno-economic surveys to bring out the difference in the nature and content of programme to be adopted in different parts of the drought prone areas. (R. 2) (Paras 4.19.1 to 4.19.2).

19.3.16. A large number of rainguages may be set up in the drought prone areas for closer analysis of rainfall and its management may be entrusted to one department namely Irrigation and Power Department which deals with water resources of the State. (R. 3).

19.4. *Drought Prone Areas in Maharashtra.*

19.4.1. On the basis of the method mentioned above, drought prone areas in Maharashtra identified by the Committee have been listed in Table No. II to Chapter V. The Committee has identified 83 talukas as drought prone in the State. These talukas are from 5 districts from Poona Division, 3 districts from

Bombay Division, 3 districts from Aurangabad Division and 1 district from Nagpur Division. In the case of 39 talukas, the entire area of the taluka has been identified as drought prone. In the case of another 26 talukas, though the whole taluka had been recognised as drought prone, the area served by large irrigation canal system has been considered as drought resistent. In the remaining 18 talukas, only some parts of the taluka have been recognised as drought prone.

19.4.2. [It is, estimated that the area which is drought prone in Maharashtra is approximately a little over ¼th of the area of the State, while the population living in drought prone areas is more than 20 per cent of the population of the State.

19.5. *Relief Measures.*

19.5.1. There are twin objectives of relief measures of mitigating immediate distress by providing employment and harnessing the man-power released by scarcity for the improvement of the affected tract.]

The Committee recommends that the Government should consider dovetailing of scarcity works with employment guarantee scheme as such a change will have several advantages namely possibility of delinking scarcity with annewari and having machinery ready for implementation. (R. 4) (Paras 6.3.1. to 6.3.3.).

19.5.2. The procedure embodying relief policy in the Code was being followed since the recommendation of Famine Commission (1880). In Bombay Province, the Code was framed in 1885 and remained in force till the Draft Scarcity Manual replaced it in 1952-53. This Manual made three significant changes in the relief policy—

(*i*) abolition of distinction between famine and scarcity;

(*ii*) inclusion of provision regarding starting of test scarcity works to judge the existence of scarcity; and

(*iii*) abolition of minimum wage to able-bodied persons.

Instructions in this Scarcity Manual are modified from time to time by Government according to the exigencies of circumstances.

In the recent scarcity, number of instructions have been issued and it is desirable if fresh manual is immediately brought out incorporating the latest instructions relating to the scarcity. (R. 5). (Paras 6.4.1. to 6.4.4.)

19.5.3. The Committee examined the following aspects of relief policy :—

(1) Planning for scarcity works.
(2) Opening of test scarcity works.
(3) Declaration of scarcity.
(4) Policy regarding location of works.
(5) Priorities in selection of works.
(6) Procedure in selection of works.
(7) Policy regarding drinking water.
(8) Policy for livestock.
(9) Wage policy.
(10) Other aspects of relief.

19.5.3.2. The Committee recommends that a contingency plan should be prepared on the assumption that the employment will have to be provided to 25 per cent of affected population. Apart from including works which will be adequate to meet the scarcity condition for three consecutive years, it should detail the arrangements relating to fodder, drinking water, location of labour and cattle camps and requirement of tools and equipment etc. The unit of planning should be a block. Block plans and district plans thus prepared should be dovetailed into State contingency plan, which should be intergrated with the normal State plan. The copies of such plans should be kept with all the concerned officers and the plan should be annually revised. (R. 6). (Para. 6.4.7.).

19.5.3.3. For opening of test scarcity works, it is necessary to lay down objective test other than assessment of the situation on the basis of factors like probable annewari and rush of labour on normal public works, etc. The Committee considers that occurrence of 4 continuous drought weeks (50 per cent less than normal rainfall in a week) should be considered as a first indication of threat of drought in drought prone areas and the Collector should think of starting test scarcity works when such situation occurs. Similar tolerance limits can be laid down for other areas by Agriculture Department taking into consideration major crops. (R. 9) (Para 6.4.8). In future, when models as illustrated in Appendix I to Chapter IV are built for major crops in agro-climatically distinct small zones, it may be possible to base declaration of scarcity on the basis of such models. (R. 7) (Para. 6.4.9.).

19.5.3.4. The policy for locating works should be governed by nearness of works to the affected population and accepted list of works should be extended to include works relating to afforestation and works increasing the recharge of ground water such as trenching, injection through-wells, etc. Large central works involving shift of affected population should be resorted to in circumstances when list of small works is exhausted. (R. 8) (Para. 6.4.10.).

19.5.3.5. In selecting the works, overriding consideration is effectiveness in relieving the distress by providing employment to a large number of persons nearby. The principles governing the priority in the selection of works in addition to above consideration should be as follows :—

(i) Works essential for survival of human and cattle population.

(ii) Works having direct bearing on agricultural production and whose benefits can be ascertained.

(iii) Works falling in category (ii), but where benefits are indirect and cannot be easily ascertained.

(iv) In selecting sites for (i), (ii) and (iii), it should be seen that maximum advantage is derived by less privileged class of farmers.

(v) Works beneficial to the rural economy as a whole without having direct bearing on agricultural production.

Accepted list of works should be arranged in the following order of priority :—

(1) Community wells for drinking water.

(2) Works of medium and major irrigation projects, and minor irrigation schemes.

(3) Percolation tanks and nalla bunding.

(4) Land development works for soil and water conservation.

(5) Desilting of tanks, canals and wells.

(6) Unskilled works in lift irrigation schemes.

(7) New road works including improvement of road works.

(8) Metal breaking. (R. 9) (Para 6.4.11).

19.5.3.6. The selection of work should adhere to the priority indicated in the contingency plan. (R. 19) (Para. 6.4.12).

19.5.3.7. Several measures for relieving the fodder shortage should include, restriction on movement of fodder, opening of cattle camps, grant of tagai loan and procurement and distribution of fodder through co-operatives. In cattle camps, the policy of admitting only useful cattle should be scruplously followed. Available water from the irrigation tanks should be diverted to cultivation of fodder and grass in affected areas. (R. 11) (Para 6.4.14).

19.5.3.8. Three possible approaches for determination of wage-rates are (i) need based wage, (ii) linking of wage with agricultural wages ; and (iii) linking of wages with the level of wage on normal public works. The Committee considers third method of determining the level of wage as appropriate. (R. 12). The policy of paying the workers employed on the scarcity work at ·90 per cent of the piece-rate on normal public works should be followed as the normal piece-rate includes contractor's profits. Such a policy would also prevent diversion of labour from normal plan works. (R. 13). The Committee also agrees with the policy of fixing a maximum limit on the earning of workers employed on scarcity relief work. However the Committee recommends that the maximum should be fixed keeping in mind normal output of an average worker engaged on scarcity works. (R. 14). The Committee recommends that the foodgrains quantum of workers employed on scarcity works should be substantially increased so as to meet major part of their requirements from the fair price shops. (R. 15). The worker should also be suitably compensated if he is required to buy the tools because of failure of the Government to supply it. (R. 16). The existing method of payment of wages on the basis of outturn should be continued. (R. 17). The Committee also recommends that suitable disincentives should be adopted to divert the labour to agriculture on the onset of monsoon (R. 18) (Para 6.4.15).

19.5.3.9. The elimination of contractors in the execution of works is a desirable step in effective implementation of relief works. (Para. 6.5.3).

19.5.3.10. The Committee noticed certain operational difficulties during its tours. Inspite of being a productive work, the labour attendance on soil conservation work was much less as compared with other works because of low wage rates. The Committee feels that as far as possible the relief works should not become competitive with each other. (R. 19). In most of the districts, minor irrigation schemes were not ready with advance surveys. The criterion of yardstick in the earlier period restricted the number of percolation tanks, which could be taken up. The shortage of technical staff was one of the major handicaps. The Committee recommends that training schemes which can suitably train the non-qualified staff to undertake simple engineering works should be started to overcome this difficulty (R. 20). Shortage of tools and equipment was another handicap. Suitable alternative equipments should be provided to overcome the shortage. (R. 21) (Paras. 6.5.1. to 6.5.8).

19.5.4.1. One of the significant difficulties which the Committee experienced is the absence of reliable data particularly relating to the districtwise break up of works. The Committee recommends that the practice of publishing annual reports which was discontinued since 1961-62 should be revived and such reports should be placed before the legislature. (R. 22) (Para. 6.6.1).

19.5.5. The position of scarcity relief works during four major years of scarcity is as follows :—

Year	Population affected	Expenditure	Per capita	Maximum labour attendance	Percentage of 5 to 2
1	2	3	4	5	6
			Rs.		Per cent
1965-66 ..	1·30 crores ..	11·77 crores ..	9·00	5·50 lakhs ..	4
1970-71 ..	1·88 crores ..	2·23 crores ..	1·50	....	....
1971-72 ..	1·12 crores ..	41·51 crores ..	32·00	14·60 lakhs ..	7
1972-73 ..	2·00 crores ..	75·46 crores .. (upto 31st March 1973).	37·50	35·04 lakhs .. (As on 31st March 1973).	17

In the era of rising aspirations it is difficult to comment on the adequacy of coverage as it is a relative concept. But above table illustrates that the coverage has been wider in the recent years. It also reveals the magnitude of the problem that has to be tackled particularly in view of the fact that the population affected is 28 per cent to 40 per cent of the population of the State. The expenditure on scarcity works per capita for affected population is also $\frac{1}{3}$rd of per capita development expenditure. The committee feels that it is necessary to avoid other considerations such as desire for increasing the pace of development in the district and removal of large scale unemployment existing even in normal year from creeping in the distribution of expenditure. The expenditure should be distributed according to the severity and intensity of scarcity conditions. (R. 23). (Paras. 6.6.1 to 6.6.9).

19.5.6. In selection of works, it is necessary to strike a balance between the immediate need for scarcity works and availability of funds for spillover works. (R. 24) (Para. 6.6.9).

19.5.7. It is necessary to review the quantum of reserve stock of tools to be kept during the normal years for the period of scarcity and also to evolve a system of issue of tools through the help of non-official agencies. (R 25) (Para. 6.6.8).

19.6. *Long term Strategy.*

19.6.1. In the drought prone areas by force of circumstances the primary aim of a developmental activity has to be the stabilisation of income and provision of basic necessities of human and cattle life. (Para. 7.1).

19.6.2. The realisation that final solution to the problem of famine lay in economic development did not come in the Government thinking till the dawn of Independence. The recurrence of scarcity conditions due to drought even after Independence revived thinking for special programme for these areas and the Fact Finding Committee (1960) was appointed for this purpose. (Para. 7.2 to 7.5).

19.6.3. The Fact Finding Committee (1960) emphasised the need for special programme, laid the objective as assuring one minimum crop and maximising its yield by development of land and water resources. It recommended programmes in this direction (Para. 7.6).

19.6.4. The eradication of drought which is a meteorological phenomenon is not within the reach of human effort at the existing level of scientific knowledge. There are no major minerals in the drought prone areas. The natural resources consist of land, water and man-power. The development of drought prone areas has to depend mainly on the interplay of these resources. There are evident limitations for the development of agriculture in these areas on account of inadequate precipitation. The capacity of agriculture to sustain the population is limited. Under these conditions measures limited to assure one crop may not make large impact on the living standard of rural population. There is, therefore, imperative need to diversify the economy of these areas by augmenting the employment opportunities in non-agricultural sector. (R. 26) (Para. 7.8).

19.6.5. The objective of planned effort in these areas should be directed towards the stabilisation of income levels and ensuring growth of the areas along with other areas, by—

(i) Provision of drinking water and fodder which are basic necessities of human and cattle life.

(ii) Development of all sources of irrigation to the maximum extent possible.

(iii) In the areas which cannot be adequately served by irrigation projects—

(*a*) Development of agriculture through appropriate dry farming methods where the land capability shows that agriculture can be developed successfully.

(*b*) Afforestation programme.

(*c*) Diversification of economy by augmenting employment opportunities in the non-agricultural sector by—

(1) Development of animal husbandry and dairy farming.

(2) Development of industries. (R. 27) (Para. 7.12).

19.6.6. Master-plan for development of these areas on the above lines will have to be prepared on the basis of techno-economic surveys. These plans should indicate in an integrated manner the programme in the various sectors. (R. 28) (Para. 7.183).

19.6.7. The drought prone areas should be considered as a separate unit of planning. A perspective plan will have to be prepared, setting out the size of the plan over a period of years and priorities among the sectors and within the sector. A contingency plan indicating alternative pattern of activities to be adopted in the drought years for relieving immediate distress will have to be kept ready. (R. 29) (Para. 7.19).

19.7. *Irrigation.*

19.7.1. Ways and means for improving the availability of water to the maximum possible extent has to be the key-note of the development of the drought prone areas. That irrigation can only bring solace to the drought affected tracts has been long recognised by several commissions and committees of inquiry appointed in the past. The 2nd Famine Commission set up by the Government of India after the famines of 1896-97 had recommended that among the measures that may be adopted for giving India direct protection from drought, the first place must unquestionably be assigned to works of irrigation. (Paras. 8.1.1. 8.2.1. 8.3.1).

19.7.2. After making an extensive, study of all the areas of the Bombay State which are prone to drought, Mr. Beale, Superintending Engineer submitted his memorable "Report on Protective Irrigation in Deccan" in 1910. The heavy precipitation in Sahyadri ranges was to be stored and transferred for utilisation in the area receiving scanty rainfall. The four protective irrigation schemes Girna, Godavari, Pravara in the Nira valleys taken up on these lines prior to 1930, covering about 1·5 lakh hectares, have shown how irrigation could completely change the economic condition of the tract from Nasik, Ahmednagar, Poona, Satara and Sholapur, which was once facing famine. Out of the projects that Mr. Beale had suggested as protective works, six more schemes have been subsequently taken up after independence and are completed or are nearing completion by now and provide protection to an additional area of over 2·00 lakh hectares in the drought areas of Maharashtra now. (Paras 8.4.1. 8.4.2).

19.7.3. Importance of major irrigation with laid out canal systems as an effective protective measure for scarcity areas got another formal recognition by the report of the Bombay Irrigation Enquiry Committee, presided over by Late Shri M. Visvesvaraya (in 1938). Later, in the report on the survey of the direct and indirect benefits of the Godavari and Pravara canals, Prof. D. R. Gadgil, Director of Gokhale Institute of Politics and Economics in 1942, also brought out the greater social benefits of such irrigation works in the drought areas in comparison with the other areas with favourable rainfall. (Paras 8.5.1. 8.6.1).

19.7.4. The problems of the scarcity areas were gone into afresh by the "Fact Finding Committee for Survey of Scarcity Areas in Bombay State" in 1960. That Committee observed that "Provision of the irrigation facilities would generally be the most important measure in any developing programme of the area and hence suggested a high priority to the major medium schemes that would benefit the scarcity areas.". (Paras 8.7.1. 8.7.4).

19.7.5. All the problems of irrigation in the State as a whole received a careful and comprehensive consideration at the hands of the Maharashtra State Irrigation Commission, which submitted its report in the year 1962. The Commission recommended amongst other things the dispersal of the benefits of irrigation over as large an area of the State as physically possible and stretching of the meagre water resources as far as possible. Projects of lower dependability, upto 50 per cent. were recommended to be harnessed in those basins where the available yield of 75 per cent. dependendability is inadequate. In order that areas along the canals, but out of their command, should also be eligible to the benefit of irrigation, they recommended that cultivators should be allowed to pump water from the canals by paying normal rates of irrigation. To achieve equitable distribution of the irrigated area, the Commission recommended that fresh application for irrigation water should also be accommodated by reducing a sanctioned area of existing irrigators to the extent necessary. (Para. 8.8.1. to 8.8.3).

19.7.6. Recently, the 2nd Irrigation Commission appointed by the Government of India observed in its report in March 1972, that meaningful irrigation policy of India must have a national objective of a socialistic pattern of society. Accordingly, the Commission has supported adoption of a liberal policy in respect of irrigation works in the drought areas and has recommended that the benefit cost ratio in respect of major and medium works in those areas may be relaxed upto unity. The Commission noted that the Maharashtra Government already allows the relaxation in B. C. ratio in respect of irrigation schemes costing less than Rs. 3 Crores. The Commission recommended that irrigation works in the area should aim at giving 'protective' irrigation to as wide an area as possible, if necessary, by introducing the principle of localisation. With regard to the size of projects, the Irrigation Commission has observed that "the surest way of providing assured irrigation in a big way is to harness the flow of rivers with big storage."

19.7.7. Fortunately, the drought prone areas of our State are located on the downstream of a heavy rainfall zone of the Sahyadri ranges receiving normal precipitation of over 2000 mm. and the water surplus of this high rainfall tract alone can mitigate the distress of a large tract of about 20 per cent. of the drought area through assured protection by irrigation. Very successful and economic irrigation storages can be constructed in this hilly tract rapidly. Projects with storages in Sahyadri need therefore, to be pursued with the utmost expediency to provide assured protection to a large tract of chronic scarcity. (R. 30) (Paras. 8.10.1 to 8.10.3).

19.7.8. At present, irrigation projects are arbitrarily being designed to utilise 75 per cent. dependable flow. This amounts to non-utilisation of at least as high as 30 per cent. of the water resource available in nature. There is hardly any justification for leaving the valuable resource of water so largely unutilised in the drought areas. Even if we use 50 per cent. dependable flows at the reservoir site the total water availability in the irrigated tract over a period of years remains as high as 83·54 per cent. The present arbitrary level of high dependability being insisted upon by the C. W. & P. C. has put an artificial and severe limitation on the total area that could be protected by irrigation. Considering the paramount importance of irrigation in the economic development of the drought areas in the State, it is necessary that the projects for which irrigation command is physically available, the storages should be planned for 50 per cent dependable flows To achieve such a situation, it may be necessary to build up additional storages in our valleys and take up extension and remodelling of the existing canal systems to extend protective irrigation to a larger area from the drought tract. (R. 30). (Paras. 8.11.1 to 8.11.4).

19.7.9. The surplus in waters of the river in monsoon can also be utilised in the years of good run-off for charging the underground water table at the eastern tips of the canals, which lie in the drought tracts. (R. 31). (Para. 8.12.1).

19.7.10. Apart from the principal aim of assuring protection against drought, supplementary measures for general rise in the economic standard of this drought area are required to be taken by making the maximum possible use of the available water in this tract through smaller and dispersed storages all over the tract. Recent advances in agriculture have opened up the possibility for increase in production particularly with the use of high yielding seeds, fertilisers and pesticides. But this increase is feasible only under irrigation facilities. It is, therefore, necessary to cover as large areas from the drought zone as physically possible by irrigation facilities to make adequate water available for agriculture at least in the years of good rainfall. Small storages dispersed through the drought tract can be used for this purpose ; minor irrigation tanks, percolation tanks, and village tanks or gaontalavs utilising smaller and smaller catchments progressively. Accordingly, in Maharashtra, the annual spending on minor irrigation has been considerably stepped up in recent years and is now 4 times more than what it was at the end of the Third Plan. (R. 33). (Paras. 8.13.1 to 8.13.4).

19.7.11. But it has been the experience that silting of the small tanks in the drought areas is very fast. Afforestation of the catchment of the medium size and small size irrigation tanks in the drought zone is, therefore, an urgent necessity. We recommend that the small irrigation works should be taken up in the drought prone areas as an integrated programme along with afforestation works in their catchments. The little precipitation that is received in the catchments of small tanks, should also be effectively utilised by water harvesting techniques. In fact, there has to be an integrated approach to soil conservation, water conservation and water harvesting measures. Otherwise, the utility of the small tank which is very susceptible to rainfall run-off characteristics will greatly diminish. (R. 34). (Paras. 8.13.6 to 8.13.8).

19.7.12. The 2nd Irrigation Commission of 1972 has already expressed in favour of the percolation tanks. We also find that the percolation tanks, can be successful under certain favourable situation of topography and geology. Even if water does not percolate efficiently, the tank provides a worthwhile storage of water for the community and the cattle around. The very presence of water in a drought area is conducive to general well-being. Even in the normal times construction of such tanks would provide a worth-while employment potential under the employment guarantee schemes. (R. 35). (Paras. 8.14.3. to 8.14. 4).

19.7.13. In the areas of very scanty rainfall of say less than 500 mm., the percentage of run-off to the rainfall is hardly 10 per cent. to 13 per cent. Minor irrigation tanks cannot be depended upon in these areas. The Committee therefore, recommends that for all such areas supplies of water from the lakes situated in the high rainfall zones should be considered as the principle source of irrigation and lifts on canals or rivers made perennial by releases from such sources should be liberally allowed in this tract. (R. 36). (Para. 8.15.1).

19.7.14. But it has to be remembered that all the drought areas in the State are not favourably situated with respect to the available water resources. Large areas are situated at such a high elevation that no water can possibly reach there either by flow or even with a reasonable lift of 50 m. What best can be done is to develop some isolated spots through percolation tanks and small tanks. But because both these have a poor reliability as protection against drought, the entire economic pattern of the society in these areas will have to be reoriented basically from agriculture to non-agricultural activities. (R. 37). (Para. 8.15.2).

19.7.15. Irrigation in the scarcity areas has to be so practised as to conserve water and maximise its use by avoiding losses. Scope for development of the sprinkler type of irrigation appears to be limited. But the drip type of irrigation system appears to be worth giving a trial in our drought areas. (R. 38). (Paras. 8.16.1 to 8.16.3).

19.7.16. Another method of conserving water is to utilise it fast from the reservoirs, avoiding long time exposure of the reservoir to the sun and the winds. Water that would have been lost in hot weather by evaporation can then be utilised for irrigating more hectares of lands in the earlier months. It is time that irrigation on existing canals from the Godavari, Pravara and Nira is also re-planned on this basis and irrigation benefits extended to additional lands by extension of canals or by additional lifts from canals and reservoirs progressively. Reservation of water in the reservoir for sugarcane crop in the hot weather is neither beneficial nor necessary in view of the supplies available from groundwater and should be avoided hereafter in the drought zone at least. The 2nd Irrigation Commission (1972), has also recommended the limiting of sugarcane crop to the areas where irrigation needs during the dry weather season can be met from ground-water sources. (R. 39). (Paras. 8.17.1, 8.17.2, 8.18.1).

19.7.17. Irrigation projects in the scarcity areas should aim at covering as large tracts as possible so that in the case of failure of monsoons, the canal system can extend protection to a large number of fields. We, therefore, recommend that the canal system in the drought areas should be planned for a subtantially reduced intensity of irrigation, say at about 50 per cent. of the culturable area (i.e., about 30 per cent. of the command areas), as against 90 per cent assumed at present. It is true that this needs an extended system of canals with larger initial investment. But the drought from these extended areas will stand permanently eliminated. (R. 40). (Para. 8.19.1).

19.7.18. Further these areas should be utilised for only such irrigated crops as require less water and give reasonable yields with fewer waterings. Based on the water requirements and the known yields, an estimation of the possible benefits of various crops per unit of water have been worked out at 1972 price level. Net return per unit of water, which indicates the productivity per unit of resource is found to be maximum in the case of mung followed by potato, onion and bajri. It is interesting to note that paddy and sugarcane give the lowest return per unit of water used. The 2nd Irrigation Commission (1972), has observed that significant results in increasing the yields of pulses and cotton can be achieved under irrigation in the State of Maharashtra. We are strongly of the view that in determining the cropping pattern to be followed in the areas covered by an irrigation system, emphasis should be on crops which give maximum output per unit of water used. (R. 41). (Paras. 8.20.1, to 8.20.3).

19.7.19. Yields from initial few watering is spectacular but there is limited addition in the yield at the subsequent watering. In the areas where water is severely limited as in the drought prone areas, larger areas can be served and more farmers benefitted, if the number of irrigations is limited. The Committee, therefore, strongly recommends adoption of such a practice on the irrigation canals in the drought areas. (R. 42). (Para. 8.20.9).

19.7.20. It is also necessary that the work of land development in the commands of all the irrigation tanks is taken up as part of the project work to make the full use of water early. (R. 43). (Para. 8.21.1).

19.7.21. Irrigation schemes should not normally impose a burden on the general revenues. However, in the drought prone areas, in view of the initial poor financial capacity of the cultivators in the drought zone, this Committee feels that the betterment levy should not be charged for a longer period, say five years, after commencement of irrigation and its collection should be spread over a longer number of years. The 2nd Irrigation Commission (1972), has recommended that the water rates should be related to the gross income from the crops. The prevalent rates are clearly far low and need to be upgraded early. Moreover, for the successful operation of irrigation schemes on which short sighted farmers do not utilise the available water, it is very strongly recommended that consolidated assessment on lands which can derive irrigation benefits, should be levied. Some methods to charge the beneficiaries for the water from the percolation tanks should be designed. (R. 44). (Paras. 8.22.1. and 8.22.3).

19.7.22. The progress on the irrigation works aimed at the protection to the drought zone should not be allowed to suffer on account of the variations in the budget provisions from year to year. Instead of spending large amounts on relief measures when faced with scarcity, it is desirable that a certain minimum amount is set aside every year for the development of the drought prone areas, particularly for building up of the irrigation assets therein, so that the projects once taken up can be assured of their funds year to year upto completion within the shortest possible time. (R. 45). (Para. 8.24.1).

19.7.23. Hydro-Meteorological data are basic to the formulation of any irrigation scheme. It is necessary that without loss of time adequate number of hydro-meteorological stations are installed in all river systems in the drought zone and in the Ghat catchments feeding the drought zone. To achieve full utilisation of the water resources for the benefit of the drought areas our committee strongly recommends the establishment of a permanent organisation for the assessment of the water resources on a continuing basis. This organisation should be in charge of all the rain guage stations in the State and should analyse the rainfall data collected in liaison with the I. M. D. It should also guage the flows in the rivers and reservoirs and build up reliable rainfall run-off correlations. In the absence of such an organisation, there is no coherent organisation to guide the individual enterpreneur also endeavouring for lift irrigation schemes. It is, therefore, necessary that such an organisation is established early. (R. 46). (Para. 8.25.1.).

19.8. *Ground water.*

19.8.1. The significance of ground water resources for Maharashtra State is evident from the existing pattern of irrigation in which the well is major source of irrigation. The importance of conjunctive use of ground and surface water has been stressed by the Second Irrigation Commission (Paras. 9.1.1 to 9.1.3).

19.8.2. Deccan Trap constitutes most important geological formation which is a vast pile of basaltic lava flows. On the basis of gas cavities, basalts in Deccan Trap are divided into vescicular basalts with empty gas cavities, amygdoloidal basalts with gas cavities filled with secondary minerals and compact basalts without gas cavities. Of these compact basalts are always jointed and vescicular basalts have few joints (Paras. 9.2.1 to 9.2.4).

19.8.3. There are two different views about the water bearing potential of basalts. According to Ground Water Survey and Development Agency, ground water in the lava flows occurs as water table under confined condition and they act as multi-acquifer system including both productive and un-productive zones. The Agency holds that productive zones in the flows constitute between 20 per cent to 50 per cent of total thickness of flows in any section, which can deliver low water yields of few thousand gallon per hour.

An altogether different view is held by other geologists. They hold that all basalts are basically non-porous and the only possibility of getting water in basalts is from open joints and conditions become more favourable for ground-water storage when basalts are in the intermediate stage of weathering. This is a feature, we have to make best use of in our schemes for development of ground water resource. It is also contended by these geologists that over large areas, the basalts are generally thin and irregular and do not have extensive lateral spread.

Further experimentation and field results will alone confirm the assumption regarding water bearing potential and correctly assess the availability of ground water (Paras. 9.3.1 to 9.3.7).

19.8.4. Most of the water in the Deccan Trap areas is stored and held in the sub-strata and weathered rock below and is generally in a continuous process of being drained away towards the natural drainage channel by gravitational movement resulting into springs and wet spots. The water found in local unconnected cups gets its replenishment from rain water. The source of all ground water is rain water (Paras. 9.4 to 9.6).

19.8.5. The recharge of ground water has been assumed at 10 per cent of total precipitation by the Agency. The manner of recharging is however not clearly set out in the above assumption. The ground water can be recharged by precipitation seeping through porous open textured material on the plane tract through the soils, also through the method of back feed from the river bed on a falling gradient and by contribution from neighbouring catchments. The chances of natural deep percolation of ground water are limited on account of climate and geological setting. Hence measures for artificial recharge of ground water will have to be adopted. Extraction of ground water is therefore limited to the potential of the area for annual recharge and hence the imperative need for water budgetting. Water budgetting will require a clear idea about the extent of recharge. Further surveys and collection of data in different areas is essential as minor change in the assumption of percentage recharge will make a substantial difference in potential in term of wells (R. 47) (Paras. 9.7.1. to 9.7.8).

19.8.6. The emphasis will necessarily have to be on dug wells for tapping ground water stored in the sub-strata and weathered rock on earth's crust. The number of wells will have to be so regulated that withdrawal does not exceed recharge. Indiscriminate increase in number of wells will bring about division of the same storage over a large number of wells. In the absence of sustained water table in the drought areas, the water level in the wells is subject to seasonal fluctuation and irrigation from wells is limited to dry spell in kharif season and to the rabi season. But the insurance cover which the wells provide is significant (Paras. 9.8.1 to 9.9).

19.8.7. Sinking of wells in the command of irrigation projects is most beneficial because of the sustained long period of application of water through canal system and through the fields in command. Hence the areas where irrigation projects are likely to be taken up even after 10 years, should be given priority in the future programmes for well sinking. In respect of bore wells, we are still at an exploration stage and their development will require further research and extensive studies (R. 48) (Paras. 9.11.1 to 9.11.4).

19.8.8. Whenever any large scale programme of ground water exploitation is thought of a supporting programme of recharge works has to be taken up as an integral part, otherwise, excessive exploitation of ground water without adequate recharge may make investment in ground water works unfruitful. Following five measures of recharge are suggested (i) Bunding ; (ii) Afforestation ; (iii) Trenches ; (iv) Injection through wells ; and (v) Percolation tanks (R. 47). Bunding aiming at a longer stay of water in the filed increases recharge. Afforestation also develops recharge potential. Trenches along the contour also increase the recharge potential of the area. Further trenching is labour intensive activity. Technique of trenching needs to be developed on scientific lines. Some experiments on injection of water into the ground through wells by pumping in and diverting surplus water from the rivers and the canals in the monsoon period are being undertaken by the Irrigation and Power Department.

A more bold and forceful approach to recharge is through percolation tanks. The technique of percolation tank however needs to be rationalised and brought on more scientific and sound footing. The success of percolation tank depends on the percolating nature of ground. It is necessary that water from the percolation tanks goes into ground before February and is stored under ground for exploitation in the rest of the hot weather months. Down stream area on which effect is felt is found to be limited to 3/4 kms. wide belt along the nalla and about 6 km. distance on down stream. Additional wells have to be located within the belt. One indication of the ground capacity for ground water development indicated by study Team of Irrigation and Power Department (1964) is the level of existing working wells in the valley. In the studies made by the Committee it was clearly observed that ground water potential of area benefitted by percolation tanks increased about three-fold (Paras. 9.12 to 9.17).

19.8.9. Every ground water development programme should start with systematic geological studies to demarcate areas with ground water potential (R. 49). In the areas with ground water potential, programme of new wells may be undertaken and in areas where potential has been exhausted the programme should aim at mechanisation of dug wells and creation of a large number of small surface storages by constructing bunds across nalla. The material intermediate between the soils and the rock which has not received adequate attention so far should be given more attention. Studies on ground water movement will have to be undertaken (R. 50) (Paras. 9.18.1 to 9.18.4).

19.8.10. The development of ground water resources should aim at bringing about 25 per cent. of culturable area under protective cover of irrigation from the ground water (R. 51) (Para. 9.18.5).

19.9. *Agriculture.*

19.9.1. The percentage of culturable area to geographical area in the drought Prone areas is as high as 81 per cent as against the State average of 60 per cent presumably because of meagre area under forests and cultivation of marginal and sub-marginal lands. The cropping pattern of these areas is dominated by cereals as is evident from 65 per cent of the net sown area being under cereals as against the State average of 56 per cent. As the density of population in these areas is low, per capita cultivable area is 0·71 hectare as against the State average of 0·62 hactare. The soils vary from very shallow soils to medium deep blackk soils (Paras. 16.6.1 to 10.6.5.).

19.9.2. In the agricultural development in the dry farming areas a three pronged strategy of development should be adopted for counteracting twin problems of very low and uncertain rainfall, as follows :—

(*i*) Adoption of suitable crops which would suit the type of soil and withstand moisture stress ;

(*ii*) Reorientation of methods of cultivation so as to conserve the moisture in the cultivated land ;

(*iii*) Integrated programme of water harvesting and land management (R. 51) (Para. 10.7).

19.9.3. In addition to the type of soil there are three essential criteria for selection of crops and their varieties namely short duration, photo insensitivity and strong root system. Short duration crops are less exposed to longer periods of stress. Photo insensitivity overcomes variation in availability of required sun-light due to uncertain weather conditions in these areas. Plants with strong root system are able to extract moisture from lower layers of the soil. Type of soil and its moisture retentivity govern the type of crop. Very shallow soils are unfit for cultivation and can be put under grass. Shallow soils are suitable for kharif crops like bajra, groundnut, sunflower, tur and other pulses by following the method of strip cropping. If the distribution of rainfall is proper both kharif and rabi cropping is possible in medium deep soils. Kharif crops like bajra, groundnut, sunflower, tur, mung, udid and rabi crops like jowar, gram, sunflower and saffiower can be grown. Deep soils are suited for rabi crops like gram saflower and sunflower.

Improved varieties of crops recommended for different soil types, for different seasons based on the research studies at Dry Farming Research Station, Mulegaon of Sholapur will have to be adopted. The experiments in the research station indicate that sunflower is good substitute for oil-seeds crop. The research to evolve photo insensitive varieties is in progress and major break through is expected when the experiments succeed in evolving suitable varieties (Para. 10.9).

19.9.4. The said crops can be adopted in various parts of drought prone areas with suitable modification. The improved varieties of crops will have to be popularised through suitable incentives in the form of subsidies, guaranteed remunerative prices, extension work through guaranteed demonstration village schemes and credit policy (R. 53) (Paras. 10.10 to 10.11).

19.9.5. According to the recent concept, the definition of "Soil conservation" is not "bunding" alone but the use of land within the limits of economic practicability according to its capability and its needs in order to keep it permanently productive. Soil and water conservation is accomplished by using adoptable soil conservation practices both agronomic and engineering together. Bunding work in dry areas can add to substantial production if it is accompanied by recommended agronomical practices. The latter aspect is generally ignored. The emphasis therefore should be laid on popularising these methods (R. 54) (Paras. 10.12 to 10.13).

19.9.6. It is necessary to consider setting of the additional research centres, in dry farming areas to make research more broad based (R. 55) (Para. 10.13.2).

19.9.7. A more rational approach towards soil and water conservation measures is to treat the whole watershed and sub-watershed with suitable soil and moisture conservation measure as already successfully adopted in the Pilot Project at Mandrup in Sholapur. According to land capability lands have been classified into eight categories. The protection is to be planned according to land use capabilities and classification of land. Class I and Class II lands (with 0 per cent to 1 per cent and 1 per cent to 3 per cent slopes) do not require any engineering measures. Agronomical practice such as contour cultivation, strip cropping and good rotations are sufficient to prevent erosion and conserve moisture. Class III and Class IV lands (with 3 per cent to 5 per cent and 8 per cent to 15 per cent slopes respectively) require both agronomical and engineering measures for soil and water conservation. Lands of other classes are not suitable for arable farming and should be left to permanent vegetation (R. 56) (Paras. 10.13.3. to 10.13.9).

19.9.8. People's education in the matter of soil and water conservation should be given a proper place in the scheme of watershed treatment (R. 57) (Para. 10.13.4).

19.9.9. The personal in the soil and water conservation should be trained in forestry, agronomy, agriculture and engineering (R. 58) (Para. 10.13.5).

19.9.10. Planning cells should be created to plan these soil and water conservation measures at state and divisional level (R. 59) (Para. 10.13.6).

19.10. *Afforestation.*

19.10.1. Apart from ecological effects which forests produce, forests have important economic significance. The scope for commercialisation of the forest activities, in the drought prone areas is limited. But the significance of forests in the drought prone area is due to its ecological effects like prevention of soil erosion and recharge of ground water, amelioration of climate and protection of agricultural lands.

19.10.2. The area under forest in the State as a whole (21 per cent of geographical area) is much below the accepted national minimum of $33\frac{1}{3}$ per cent of geographical area. In the twelve drought prone districts the percentage of forest area to geographical area is only 11·13 per cent. Therein also the areas in the districts of Nasik, Poona, Satara and Jalgaon, major part of the area under forests is in the non-drought prone talukas. Particularly in three districts of Marathwada forest is negligible. Efforts to restore the forest cover in these districts are imperative (R. 60). A large part of the forest lands is low in quality as well as quantity from productive as well as protective point of view. In addition to the forests under Government management 8,985 sq. km. are under private management which is in a very bad state of regression. It is necessary to consider the acquisition of private forests which are situated on the slopes of Satpudas and Sahyadris to protect the strategic watersheds of rivers which are the source of water to the drought prone areas (R. 61) (Paras. 11.3.1. to 11.3.4).

19.10.3. The Government has already undertaken steps to evolve uniform grazing policy to prevent the degradation of forests by protecting them against illicit grazing. The work of grazing settlement which is in progress, should be expeditiously completed in the drought prone areas in particular because of shortage of availability of pasture lands. Another related factor to be considered in grazing policy is that useless cattle should not be permitted to graze. It is, therefore, essential to enforce system of controlled and rotational grazing (R. 61).

The problem of illicit grazing requires to be tackled boldly by stricter enforcement of existing provisions, imposition of severe penalties by making it cognisable offence, and having mobile courts for trying offences (R. 63). Another effort towards protection will be to provide incentive by giving rewards to informants and rewards to villagers protecting nearby forest. (R. 64).

It is necessary to implement Maharashtra Felling of Trees Regulation Act (1964) strictly in consonance with the spirit of the legislation (R. 65) (Paras. 11.4.1. to 11.4.6.).

19.10.4. The land hunger has made tall demands on lands under forests. Even though safeguards to prevent disafforestation of forest lands which are incapable of being cultivated were laid down by government, it appears that decisions regarding disafforestation of lands were biased in favour of releasing lands for cultivation as is evident from the fact that most of the disafforested lands have not been brought under plough. The approach towards disafforestation should be more realistic, and no land should be released for cultivation unless its land capability definitely shows that it is capable of being cultivated.

The disafforested lands which cannot be brought under cultivation should be handed back to the forest department after resumption (R. 66) (Paras 11.5.1 to 11.5.3).

19.10.5. Soil conservation measures coupled with afforestation are some of the important ingredients of any water management policy specially in the drought prone region and the Western Ghat regions supporting the rainshadow region on the East, as the life of reservoir depends upon the protection afforded to their catchment. The government has recently sanctioned some schemes of afforestation in the catchment of irrigation projects and their preparation is in progress. As far as the drought prone areas are concerned, afforestation schemes for catchment areas of minor irrigation schemes also should be sanctioned as the benefits of such schemes will be realised early on account of relatively small catchments of these schemes. (R. 67) (Paras 11.6.1 to 11.6.3).

10.10.6. It is necessary to strike desirable balance between the demand of land for cultivation and afforestation, the latter being of vital importance for successful cultivation. The government waste lands should be surveyed and those unfit for cultivation, should be transferred to Forest Department for management (R. 68). (Para. 11.8.2).

19.10.7. The forest in drought prone areas can be classified as follows :—

(1) Southern Tropical Forests	...	Sangli, Sholapur, Osmanabad, Bhir, Aurangabad, Ahmednagar, Parts of Poona and Satara districts.
(2) Southern Tropical Dry Deciduous Forests.		Dhulia, Jalgaon, Poona and Satara.

Soil and moisture conservation measures in the southern tropical forests are essential to restore soil cover before any meaningful programme of forestry is undertaken. In the dry deciduous forests which provide hinter-land for agricultural development and industrial base, the forest area should be augmented by transfer of waste lands (R. 69) (Paras 11.8.3 to 11.8.5).

19.10.8. Following species should be considered for planting in drought prone areas :—

(1) Drought resistent trees	...	Nimb, Maharukh, Anjan, Siras, Ber and Khashid.
(2) Fruit trees	...	Sitaphal.
(3) Fodder species	...	Dhavda, Chinch, Vilayati Chinch.

Agave is multipurpose species which arrests soil erosion, provides a live hedge against cattle and raw material for the industry and its plantation have to be encouraged on a large scale (R. 70) (Para. 11.8.6).

19.10.9. Afforestation of Ghat zones which provides fodder during scarcity and has important watersheds which are principal source of water supply to drought prone areas should not be ignored (R. 71) (Para. 11.8.9).

19.11. *Animal Husbandry.*

19.11.1. Animal Husbandry sector will have to play an important role in bringing about a diversification of economy by augmenting employment opportunities in order to enhance the level of income.

19.11.2. The pattern of rainfall in drought prone areas and their proximity to the hilly areas make them more suitable for sheep rearing which is nomadic. Hardly any sheep development worth the name is possible unless the goats which are destructive of vegetation and competitor of the sheep in consuming fodder are eliminated. The grazing habits of sheep are complementary to those of cattle while goats compete with cattle for scarce fodder. In veterinary programme, stress should be laid on the training of shepherds in simple operation like drenching. Veterinary aid centres on the routes of the migration will provide necessary veterinary cover throughout the year. Like other agricultural produce, wool should be sold only in market yards supervised by market committees. Location of abattoires, hides and skin processing centres, blood and bone meal plants has to be an integral part of the market yard. A more rational planning demands the location of abattoires at central places in the areas where livestock is reared and near the rail-road. Such infrastructure will facilitate development of processing units of hides and skins and industries based on leather and wool (R. 72) (Paras 12.2.1 to 12.2.4).

19.11.3. Dairying is an established livestock activity in the region. A recent study of comparative economics of grain *versus* fodder cultivation with a buffalo undertaken in Sirur shows that the dairying is able to stabilise the income of farmers at higher level. Dairying is intrinsically connected with the growing of fodder. To counteract shortage of fodder, the grass of Blue Panic and Marvel-8 variety which can withstand longer dry spells should be grown on very shallow soils. The government forest land may be used for production of fodder permitting farmers to cut dry or green fodder. There are potential dairy pockets in the drought prone areas which should be identified and this activity should be encouraged. Replacement of non-descript breed by improved or cross breed will improve potential of dairy development (Rs. 73) (Paras 12.2.5.1 to 12.2.5.4).

19.11.4. Cattle breeding appears to be another established activity as the existence of breeds like Khillar in this region indicates. It is necessary to encourage the breeding by offering suitable incentives. (R. 74) (Para 12.4.1).

19.11.5. A large number of undernourished and scrub cattle exists in the drought prone areas. One view, therefore suggests that proper stock management technique for elimination of uneconomic cattle by weeding them out should be followed. The opinion of the people's representatives as expressed before the Committee seems to be changing in favour of slaughter of cattle including cow. Therefore the view recommends intensive study of the public opinion by appropriate social authority, revision of export policy in favour of export of all types of beef and establishment of complex market yards. These measures will have salutary effect in improving animal husbandry in the drought prone areas. (R-75-A). Other view holds that cow and bullocks are an integral part of our farm organism. The view fears that measures promoting export of beef will set in the process of cattle drain to earn remunerative prices in the export market. Such process will damage the farm economy. This view, therefore, recommends that instead of the promotional measures for beef measures for encouragement of fodder production, control on stray cattle to avoid multiplication of non-descript breed, selective production of better breeds, and establishment of market facilities for dairy products should be undertaken. (R. 75-B). (Paras. 12.4.7.).

19.11.6. Poultry is another subsidiary livestock activity of this region. The backyard open range poultry of traditional type with a slightly improved type of birds and addition to meatmeal is likely to succeed. Removal of sub-standard cockrels, substitution of hybrid cocks, cheap poultry mash to supplement the natural feed and efficient marketing and storage facilities can make it a viable supplementary occupation for the farmer. (R. 76). (Paras. 12.5.1. to 12.5.3.).

19.12. *Industries.*

19.12.1. The measures designed to stabilise agriculture in the drought prone areas have limitation which have been pointed out earlier. The existence of large scale disguised unemployment and annual addition to labour force create problem of such alarming proportions as to threaten the disruption of economy during the period of drought. Rural works programme can at best provide temporary solution. Effective long term solution lies in diversification of economy by augmenting employment opportunities in industrial and animal husbandry sector. The main object of industrial dispersion should be a permanent increase in employment potential. Drought prone areas offer certain advantages in the terms of low land values and availability of labour. (Paras. 13.1. to 13.3.).

19.12.2. Development of appropriate industrial, commercial, social, administrative and communication infrastructure is a pre-condition for industrial development. For the development of industries, it will be essential to increase the railway facilities available to drought prone areas. Selection of growth centres on the availability of proper industrial infrastructure for concentration of investment and effort is essential pre-requisite for development programme. (R. 77). (Paras. 13.4.1. to 13.4.2.).

19.12.3. The types of industries to be taken up in drought prone areas should have low water requirement, high labour-capital ratio, proximity of markets and sources of raw material and finished product capable of bearing high cost of transport in the absence of such proximity. Engineering industry, electronic industries are some of the propulsive type of industries which can be considered for location in these areas Agro-based industries related to supply of inputs of agriculture such as harrows etc. is another type of industry. Processing industries can also be established in the drought prone areas contiguous to irrigated tracts. Industries based on traditional skills, forest based industries, market oriented industries such as furniture, brick, kilns, bidi industry are some of the types of industries which can be considered. Techno-economic survey will high-light the full scope of industrial development. (R. 78). (Paras. 13.5.1. to 13.5.6.).

19.12.4. Scheme of incentives is essential to induce entrepreneurs for establishment of industries where high recurring costs and limited market are inhibiting factors. Package scheme of incentives introduced by the Government mainly pertains to sharing of the recurring costs and part of capital expenditure. Suitable incentive system has to be evolved for inducing entrepreneurs to adopt labour intensive technique by sharing part of the labour cost. All incentives available to industrially backward areas should be extended to drought prone areas. (R. 79). (Paras. 13.6.1. to 13.6.3.).

19.12.5. Industrial estate has been one of the effective way of attracting modern small scale industry to the country-town. But there are very few industrial estates in drought prone areas. Many feasible sites exist for the location of estates in the drought prone areas. The location of industrial estates in this area should, however, be preceded by techno-economic survey. (R. 80). (Paras. 13.7.1. to 13.7.4.).

19.12.6. Technical training facilities in specific skills should be provided to youngsters which will not only provide skilled labour to industries but also diversify employment opportunities. (R. 81). (Para. 13.8.1.).

19.12.7. The objective of diversifying economy should be at least to find employment opportunity to 50 per cent of the annual addition to labour force. (R. 82). (Para. 13.9.).

19.13. *Drinking Water.*

19.13.1. Drinking water is one of the basic necessities of human and cattle life and perhaps ranks second to the air we breathe. Frequent droughts occuring in the drought prone areas lend severity to the problem of drinking water in the drought areas. (Para. 14.1.).

19.13.2. A detailed investigation regarding the nature and the extent of problem was made during Third Five-Year Plan period. Specific criteria were laid down to identify difficult villages, to fix priorities in the programme according to definite principle and to lay down pattern of financial assistance to local bodies (Para. 14.3.1. to 14.3.6.).

19.13.3. Out of total rural population in drought prone districts, 70 per cent. of the population is living in difficult villages of drinking water supply (Para. 14.6.1.).

19.13.4. The difficult villages located in the drought prone areas should be given priority over other villages when the curtailment of programme is likely due to paucity of funds or other reasons. (R. 83). (Para. 14.9.1.).

19.13.5. The scheme of drinking water supply to the villages should be considered as part of infrastructure in the drought prone areas and the entire cost of schemes, should be met through Government funds. (R. 84). (Para. 14.9.2.).

19.13.6. The maintenance of the schemes should be streamlined. In this connection, it is suggested that instead of public contribution, the local bodies may be asked to pay an annual depreciation of the scheme every year. As regards, regional rural water supply schemes, the government should take over the maintenance of the schemes on payment of actual maintenance charges. (R. 85). (Para. 14.9.3.).

19.13.7. Under the programme of simple measures, revitalisation of wells should also receive priority. (R. 82). (Para. 14.9.4.).

19.13.8. Since the present limit of cost of determining executive agency is arbitrary, there should be one unified agency for execution of piped water supply schemes irrespective of costs. (R. 86). (Para. 14.9.5.).

19.13.9. The requirement of cattle in a village is not considered at present while designing the schemes. It is suggested that the requirement of cattle should be considered. For this purpose, series of village tanks or succession of Kolhapur type of weirs be constructed on the nallas and rivers so that the monsoon or post-monsoon flows can be stored for use of cattle during the summer season. (R. 87). (Para. 14.9.6.).

19.13.10. Reservoir capacities of storages should be designed to accommodate extra storage by carry-over studies. Reliability of well water schemes will have to be increased by increasing the facilities for ground water recharge. In fact, an approach integrated with the development of general water resources of the drought areas has to be adopted particularly so in the case of difficult villages. (R. 88). (Para. 14.9.7.).

19.13.11. Bore wells may at best serve very small population of 500 and can be only supplementary source of water supply to large villages. Detailed observation on the yields available from these bores over a period of years, should be made to assess the reliability of bore wells. (R. 89). (Para. 14.9.8.).

19.13.12. In the drought prone areas, the urban centres suffering from recurrent shortage of drinking water have to be identified. After investigating their needs and assessing the financial position of local bodies, the responsibility of schemes for supply of drinking water, should be assumed by the Government. (R. 90). (Para. 14.9.9.).

19.13.13. During the period of drought, the priority for drawing water for drinking from the canals and reserviors should be ruthlessly observed by prohibiting the use of water for irrigation. (R. 91). (Para. 14.9.10.).

19.14. *Rural Credit.*

19.14.1. The phenomenal growth in demand for credit has brought about rapid expansion of co-operatives in the State of Maharashtra. Co-operative credit in the State, however, depicts a duel picture of rapid expansion of credit per member on the one hand and overdues on the other. (Paras. 15.1. to 15.2.).

19.14.2. An analysis of the position of overdues shows that overdues do not appear to be a peculiarity of drought prone district but the general resistence prevalent and mounting against the recoveries is one of the significant causes of present malaise. Nevertheless, there is no escape from the conclusion that wide spread crop failures have impaired the capacity of cultivator to repay loans so much that the stage has come to consider the proposal of write-off of these dues.

There are two considerations in examining the arrangements of rural credit during the period of scarcity, namely to ensure healthy growth of co-operative movement and to make credit available to sufferers of natural calamities. (Paras. 15.4. to 15.8.).

19.14.3. According to existing rules, the cultivator on an application is granted the facility of conversion of loan, whenever a natural calamity occurs. There is however, possibility of a number of cultivators not being given the facility of conversion on account of their failure to apply for such facility or default of the society. Re-examination of such cases from 1970-71, onwards is therefore recommended. (R. 92.). (Paras. 15.10. to 15.11.).

19.14.4. The position of cultivators who have availed of such conversion facilities will not be less distressing as in future years, major part of their produce will have to be utilised towards repayment of overdues. Some method will have to be thought of for channelising the credit to these cultivators. Write off of these dues will be against the healthy growth of co-operative movement. Write off also can not be considered until sufficient balance is built up in Relief and Guarantee Fund. Write off should only be considered after all avenues of rehabilitation are exhausted. It is, therefore, suggested that overdues may be rephased in such a manner that the cultivator has not to bear in any subsequent year an additional burden, exceeding 1/3rd of his normal entitlement or crop loans. (R. 93). (Paras. 13.15. to 13.18.).

19.14.5. Rephasing of loan suggested in above paragraph should be done after adjusting excess share capital paid by the members. (R. 94). (Para. 15.15.).

19.14.6. The role of Tagai in credit structure should be complementary to the institutional credit. The tagai will have to play a significant role during the period of scarcity and post scarcity years to supplement the institutional credit. (R. 95). (Paras. 15.20. to 15.21.).

19.14.7. Tagai overdues also should be rephased in such manner that the additional burden on the repayment should not be more than 1/3rd of his normal entitlement of new credit under the crop loans system. (R. 96). (Para. 15.22.).

19.14.8. One of the significant lacuna in the credit system is that the credit needs of artisans are not properly taken care of during the period of scarcity. The government should accept the responsibility of extending credit coverage to the artisans as institutional credit, may not be forthcoming to this class during the period of scarcity. (R. 97) (Paras. 15.23. to 19.16.).

19.15. *Finance.*

19.15.1. Till drought prone areas become scarcity resistent through various long terms measures, the short terms measures will have to be undertaken during the period of drought. Both these aspects of relief measures, namely, short term and long term have to be kept in mind while considering the question of finances for the relief measures. In a federal polity, the relief to sufferers of natural calamities, is the joint responsibility of the Central and State Government. Successive finance Commissions have fixed the normal relief expenditure which every state has to meet during the period of scarcity. The Central Government bears 75 per cent. of the expenditure over and above this margin. (Paras. 16.1. to 16.2.).

19.15.2. One of the effective arrangements of meeting unforeseen expenditure on normal calamities is to create a fund and contribute to it in the normal years. The Famine Relief Fund has been in existence in Maharashtra, even prior to Independence. After reorganisation of States, the said fund was reconstituted in 1958 and again in 1960 after the formation of State of Maharashtra. Even though the balance in the fund amounted to Rs. 4·76 crores on 31st March 1972, the said fund has not been used on a single occasion after 1958, even when wide-spread scarcity conditions prevailed more than thrice during the last decade. A more positive approach is required in respect of utilisation of this fund. Two important changes in the existing legislation, are suggested. The corpus of Rs. 4 crores fixed in 1958, should be revised taking into consideration the relief expenditure in the recent years of scarcity and size of contingency plan. The provisions regarding utilisation should be more specific. The expenditure up to certain financial limit may be met from normal budget provisions while the expenditure in excess of this limit should necessarily be met from the Fund. (R. 98). (Paras. 16.3. to 16.7.).

19.15.3. As regards financing of long term programme creation of fund is not considered desirable. It is necessary to guarantee that resources earmarked for the drought prone areas programme are not diverted to some other areas. In the financial allocation, the drought prone areas should be given due weightage. The priority should be given to schemes for development of water resources, production oriented scheme and schemes which will bring diversification of economy by augmenting employment opportunities. The state legislature should be regularly informed of the financial allocation made for these areas and performance of this programme at the time of submission of budget proposals. (R. 99). (Paras 16.8 to 16.9.).

19.16. *Organisation.*

19.16.1. An organisation for the development of drought prone areas will have to carry out in the normal years the task of building up assets which will help in making areas scarcity resistent and in the period of scarcity relieving immediate distress. The organisation will have to fulfill following functions :—

1. Planning and Direction of the programme.
2. Implementation of the programme.
3. Supervision of the programme. (Para. 17.2.).

19.16.2. Agency for planning and directing the programme will have to prepare a perspective plan for the area, dovetail it with the state-plan and evaluate the performance of the programme. It is necessary to entrust the planning of relief measures and long term programme to a single agency. A cell should be created under the Development Commissioner to discharge the above function. (R. 100) (Paras. 17.3.1. and 17.3.4.).

19.16.3. At the district level, same unified approach will have to be adopted of entrusting the planning of relief measures and the long term programme. The proposed planning Boards can discharge this function at the district levels. The implementation of the plan, however, will be done by various departments at the district level. The co-ordination of the activities in the programme should be entrusted to a senior and responsible officer in the district, who will be able to give full time and concentrated attention to this. (R. 101). (Paras. 17.4.1. to 17.4.3.).

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19.16.4. The supervision over implementation of the drought prone areas programme may be entrusted to the Divisional Commissioners in their respective divisions. (R. 102). (Para. 17.8.1.).

19.17. *Drought Prone Areas Programme—(Centrally Sponsored Scheme).*

19.17.1. Under the centrally sponsored scheme of Drought Prone Areas Programme, a special programme for development of drought prone areas was to be framed to include schemes of lasting benefit and for stepping up of conventional measures for moisture conservation, minor and medium irrigation works, more efficient untilisation of the land combining agriculture with forestry and fodder, and providing other types of employment based on subsidiary agricultural occupation and village small industries. The immediate object of development was the creation of minimum foundation of security in the selected drought prone areas. This programme was to be regarded as additional to and integrated with the normal plan programme of development. Talukas of promising resources were to be given priority over equally vulnerable talukas with less promising resources. The programme was to centre round small areas so as to make visible impact. The size of the plan was fixed at Rs. 2 crores for every district. The entire programme was financed as a centrally sponsored scheme. (Paras. 18.1 to 18.2).

19.17.2. But the programme was sanctioned only for the six drought prone districts in Maharashtra. Out of the nine drought prone districts formally recognised by the state government as drought prone. Master plans were prepared for each of these six distrcits to facilitate framing of the yearwise programmes and schemes. Major and medium irrigation priojects were ruled out because of financial constraints, as it would have meant concentration of all the programme at only few places. The programme had its major emplasis on the minor irrigation works, though it also included some works of afforestation, ground water surveys and soil conservation. In all 34 talukas were covered by the programme. (Paras. 18.3 to 18.7).

19.17.3. Large number of works in the programme are still in progress and their impact will be visible only after completion. Moreover, it is not possible to assess the impact of the programme because three years of implementation of the programme synchronised with the years of acute scarcity. (Para. 18.8.1.).

19.17.4. Overall financial constraint and its essential supplementary character seem to have influenced the schematic pattern of the programme as is evident in its emphasis on the minor irrigation schemes. Inadequacy of these works to relieve the drought situation when total precipitation is inadequate has been overlooked. The emphasis in the drought prone areas programme has to be on the speeding up of major irrigation projects which store water lying in high rainfall zone and transport it through a network of canals to the drought prone tracts rather than overemphasising minor irrigation scheme. Moreover, some of the important sectors such as animal husbandry and village small scale industry were not even touched at all in this programme. (R. 103). (Para. 18.8.2.).

19.17.5. Inclusion of a large number of talukas resulted in spreading out the meagre resources over a large area than originally conceived of. If the programme would have centred around small areas the impact could have been very significant. (R. 104). (Para. 18.8.4.).

19.17.6. Inadequacy of programme which only contains schemes in agricultural sector has been already pointed out. The basic approach to the land should be to aim at its utilisation according to land use capability. The analysis of behaviour of sectoral and per capita incomes, examination of occupational distribution in the area and capacity of agriculture to sustain the population at fairly stable level of income are some of the basic pre-requisites of drawing up a suitable programme. Instead of operating small additive programme, a comprehensive long term programme with a perspective plan covering schemes in all the sectors will have to be drawn up. The magnitude of such a programme will be so large that centre's assistance over and aobve plan ceiling will be essential. Such central assistance should bear some definite proportion to toal financial commitment of the programme. (R. 105.) (Paras. 18.8.5. to 18.8.6.).

19.17.6. Need for reorientation of the 'area programme', has been since recognised by Planning Commission also which has laid down in their approach to the Fifth-Plan, that such programme will have to be integrated with the overall development measures. (Para. 18.7.8.).

S. E. SUKTHANKAR,
Chairman.

B. A. KULKARNI,
Member.

M. A. TELANG,
Member.

M. A. CHITALE,
Member.

S. P. PIMPLIKAR,
Member.

B. S. SHESHGIRI,
Member.

V. H. SAKHALKAR,
Member Secretary.

Bombay :

Dated :

Note.—" R " in the bracket indicates recommendation.

ANNEXURES

ANNEXURE I

Fact Finding Committee for Survey of Scarcity areas in the State—
Appointment of —

GOVERNMENT OF MAHARASHTRA

REVENUE AND FORESTS DEPARTMENT

Resolution No. SCY-5672/77052-J

Sachivalaya, Bombay-32 (BR), dated the 23rd August 1972

RESOLUTION

The Government of Bombay had appointed a Fact Finding Committee under the Chairmanship of Shri N. S. Paradasani to examine the economic conditions in all the areas in the Bombay State with a view to assessing the facts of recurrent famine and scarcity conditions, to survey the relief measures undertaken in the precarious areas in the past during the famine and scarcity conditions, and to make recommendations as to the future preventive and ameliorative measures to deal with similar threats. The Fact Finding Committee was required to work as a Study Group under the Committee of Secretaries on Scarcity Enquiry which was constituted by Government Resolution No. SCY-5659/47650-Q, dated the 30th March 1959. The Fact Finding Committee submitted its report on 21st April 1960.

2. Conditions in Maharashtra State during the 12 years since the Committee submitted its report have changed very considerably. The existence of scarcity conditions in a greater or lesser degree has been noticed in many areas not been mentioned by the Paradasani Committee. The year 1966-67 witnessed the emergence of scarcity conditions in large parts of Maharashtra State. During the year 1970-71 and 1971-72 scarcity conditions of a severity and magnitude not witness before in this State during the last 50 years or more exhibited themselves. The annewari in 19,050 villages and in 10,393 villages was below 4 annas and it was between 4 and 6 annas in 4,011 and 4,294 villages in the year 1970-71 and 1971-72 respectively. Relief had to be provided to the agriculturists and agricultural labourers who were affected by this distress and employment had to be found in these areas for several lakhs of people. At the peak of the scarcity season in the year 1970-71, Government was charged with the responsibility of providing employment to nearly 15 lakhs persons.

3. The year 1972-73 which has just commenced forebodes distress in large parts of Maharashtra for the third year in succession. Acute scarcity of drinking water and diminution of the water table have also been the inevitable consequence of scarcity conditions for the last two years.

4. The problems of the chronically drought affected areas have also now been engaging the attention of the Government of India and detailed schemes for the permanent amelioration of the scarcity in the worst affected areas have been formulated by the State Government with the approval of the Government of India. These schemes have been in existence for the last two years and the Government has every reason to hope that the implementation of these schemes will go a long way in the substantial reduction of the distress in these parts of Maharashtra.

5. Nevertheless in the circumstances mentioned above, Government feels that the time has now come for a fresh detailed enquiry into the conditions of the areas permanently affected by scarcity with a view to assessing—

(*a*) preventive measures that can be taken up to alleviate and if possible eliminate scarcity;

(*b*) the policy with regard to the taking up of irrigation (major, medium and minor) and other productive works in these areas; and

(*c*) measures of relief and rehabilitation with a view to preventing the gradual impoverishment of the population in these areas and providing them not only with employment but also ensuring the supply of essential articles of food at reasonable rates.

6. Government is, therefore, pleased to appoint a Committee to go into all these matters. The names of the members of the Committee will be announced separately in due course.

7. The terms of reference of the Committee shall be as follows:—

(1) To review the conditions obtaining in Maharashtra State subsequent to the submission of the report by the Paradasani Committee with particular reference to the question of the improvement or the deterioration in the economic conditions in these areas, the reduction or disappearance of scarcity in these areas and the emergence of conditions of distress in the areas other than those in which such conditions were noticed in the past.

(2) In the light of the changed circumtaces since the Committee submitted its report, to identify those areas of the Maharashtra State in which conditions of scarcity have become frequent but which do not appear in the report of that Committee.

(3) To survey the relief measures undertaken in the affected areas during the conditions of scarcity, to assess their effectiveness in relieving distress as well as to report on the potentiality of these measures for the permanent rehabilitation of these areas.

(4) To assess the working of the rehabilitation schemes undertaken by the State Government with the approval of the Central Government in the drought prone areas, to report on their utility and to suggest modifications, if any, in these measures.

(5) To consider and report on the question whether there is any need for dividing the affected areas into groups depending upon the frequency with which they are affected.

(6) To consider whether the present criteria i.e. annewari, rainfall etc. for determining the areas affected by scarcity are adequate and if not to suggest other criteria which may be adopted for the identification of such areas.

(7) To make recommendations as to future preventive and amelioration measures to deal with similar facts.

(8) To suggest modifications, if any, required in the organisation, administrative and financial procedures etc. in order to implement relief measures with the utmost of expedition and efficiency.

(9) To make such other recommendations of a long-term nature as may be necessary for the reduction or elimination of scarcity and other short-term measures for the effective combatting of scarcity conditions as the Committee may deem necessary.

8. The Committee shall submit its report to Government by the 31st December 1972.

9. This Resolution issues with the concurrence of the Finance Department, *vide* its un-official reference No. F. D./11798, dated the 2nd August 1972.

By order and in the name of the Governor of Maharashtra,

(Signed) W. G. RANADIVE,
Under Secretary to Government.

Facts Finding Committee—

For Survey of Scarcity areas in the State—
appointment of—

GOVERNMENT OF MAHARASHTRA

REVENUE AND FORESTS DEPARTMENT

Resolution No. SCY-5672/77052-J,

Sachivalaya, Bombay-32 (BR), dated 19th October 1972

Read—Government Resolution, Revenue and Forests Department, No. SCY-5672/77052-J, dated 23rd August 1972.

RESOLUTION.—Under the Government Resolution, mentioned above, Government has appointed a Committee for a fresh detailed enquiry into the conditions of the areas permanently affected by scarcity with a view to assessing:—

(*a*) Preventive measures that can be taken up to alleviate and if possible, eliminate scarcity;

(*b*) The policy with regard to the taking up of irrigation (major, medium and minor) works and other productive works in these areas and

(*c*) measures o f relief and rehabilitation with a view to preventing the gradual-impoverishment of the population in these areas and providing them not only with employment but also ensuring the supply of essential articles of food at reasonable rates. In para 6 of the said Government

Resolution, it is stated that the names of the members of the Committee will be announced in due course. Government is now pleased to constitute the Committee of the following persons :—

(1) Shri S. E. Sukthankar, Secretary, Agriculture and Co-operation Department.	Chairman.
(2) Shri M. A. Telang, Director of Bureau of Economics and Statistics.	Member.
(3) Shri M. A. Chitale, Superintending Engineer, Central Designs Organisation.	Member.
(4) Shri S. P. Pimplikar, Superintending Agriculture Officer, Amravati.	Member.
(5) Shri B. S. Sheshgiri, Retired Director of Civil Supplies.	Member.
(6) Shri V. H. Sakhalkar, Officer on Special Duty, Revenue and Forests Department.	Member-Secretary.

2. All the members of the Committee (except the Chairman and the Member-Secretary) will serve on the Committee in an honorary capacity.

The official members shall work on the Committee in addition to carrying out the duties of their respective posts. Shri B. S. Sheshgiri, the non-official member shall be eligible to draw Travelling Allowance/Daily Allowance in accordance with the scale I laid down in Rule I (1) (1) in section I of Appendix XLII-A of Bombay Civil Services Rules, Volume II.

3. The expenditure on account of the Committee should be debited to the budget head "Demand No. 29-19-General Administration-C-Secretariat and Attached Offices-K-Civil Secretariat-K-5, Revenue and Forests Department" and met from the grants sanctioned thereunder during the current financial year.

4. All Commissioners of Divisions, the Settlement Commissioner and Director of Land Records, the Director of Agriculture, all Collectors and concerned Departments of Sachivalaya are requested to ensure that necessary assistance and co-operation are rendered to the members of the Committee and that information called for on behalf of the Committee is supplied to it with all possible expedition.

5. This Government Resloution issues with the concurrence of the Finance Department, *vide* that Department un-official reference No. 15686/2098-F-8, dated 18th October 1972.

By order and in the name of the Governor of Maharashtra,

(Signed) W. G. RANADIVE,
Under Secretary to Government.

Facts Finding Committee—
For Survey of Scarcity areas in the State—
appointment of—

GOVERNMENT OF MAHARASHTRA

REVENUE AND FORESTS DEPARTMENT

Resolution No. SCY-5672/77052-J,

Sachivalaya, Bombay-32, dated 5th December 1972.

Read Government Resolution, Revenue and Forests Department, No. SCY-5672/77052-J, dated 23rd August 1972.

Government Resolution, Revenue and Forests Department, No. SCY-5672/77052-J, dated 19th October 1972.

RESOLUTION.—Government is pleased to appoint Shri B. A. Kulkarni, Secretary to Government, Irrigation and Power Department as an additional member on the Fact Finding Committee constituted under Government Resolution, Revenue and Forests Department of even number, dated 19th October 1972, for making a fresh detailed enquiry into the conditions of the areas permanently affected by scarcity, in the State.

By order and in the name of the Governor of Maharashtra,

(Signed) D. V. MATHURE,
Under Secretary to Government.

ANNEXURE II

FACT FINDING COMMITTEE FOR SURVEY OF SCARCITY AREAS IN MAHARASHTRA STATE

QUESTIONNAIRE

I. Criteria for identification of chronically drought affected areas

(1) The Fact Finding Committee for survey of scarcity areas in Bombay State (Pardasani Committee) in its report in 1960 had adopted the following criteria for identifying chronically scarcity affected areas—

(*i*) Rainfall ;

(*ii*) Annewari and suspension of land revenue ;

(*iii*) Declaration of scarcity in the past.

Would you like to suggest any other criteria ? Or would you consider above mentioned criteria as adequate ?

(2) The Indian Meteorological Department has defined drought as a situation occurring in any area when the annual rainfall is less than 75 per cent of the normal.

On the basis of above definition a recent study has identified the areas as drought affected where the above phenomenon has a probability of occurrence of 20 per cent or more.

What are your views on this ?

(3) Several factors such as precipitation, temperature, wind velocity, sunshine, soil texture, soil moisture and antecedent rainfall interact to produce drought situation. However, the key role is played by rainfall and the crucial variables are its distribution, its variability and its capacity to meet evapo-transpiration needs. In what manner could the distribution of rainfall be used as criteria for identification of drought affected areas ?

II. Gradation of chronically drought affected areas

The Pardasani Committee considered it necessary to grade scarcity areas so that those which suffered intensely due to failures of rainfall at frequent intervals and had, therefore, little power of resistance could be distinguished from others where the failures were less frequent or less severe. The Committee had graded such areas as follows:—

Category of area	*Description*
A	Total or almost total failure of crops once in three years.
B	Total or almost total failure of crops once in six years.
C	Total or almost total failure of crops once in ten years.

Would you consider the criteria adopted by the Pardasani Committee as adequate for the gradation ? Or would you like to suggest any other criteria ?

III. Influencing factors

(*i*) Some areas, which were recurrently affected by scarcity conditions in the past, are said to have developed over a period of time into scarcity resistent areas. Have you come across any such phenomenon? What factors you consider have contributed for such a development ?

(*ii*) Scarcity conditions are said to have become manifest in recent years in some areas which were free from scarcity conditions in the past. Have you come across any such areas? What factors in your opinion are responsible for such a change ?

IV. Relief measures

(1) As soon as scarcity conditions become manifest in any region, test scarcity or relief works are required to be started in the affected areas according to the standing instructions of the Government. Does this happen? Or, is there any appreciable time lag in starting such works ?

(2) The purpose of the scarcity relief works is to relieve immediate distress and also help in permanent rehabilitation of the affected areas. What are your suggestions with reference to the following aspects of the relief works :—

(*a*) Adequacy and scope of relief works.

(*b*) Priority in the types of relief works to be undertaken.

(*c*) Short term and long term measures for making the areas scarcity resistant ?

(3) Have you any suggestions regarding the implementation and organisation of relief works more specifically on—

(*a*) Procedure for selection of works.

(*b*) Agency for implementation and execution of relief works at various levels.

(*c*) Co-ordination of relief works, *inter se* and with normal works in the affected areas ?

(4) What are your views on the level of wages (during the scarcity period and return to normal conditions) and method of payment of wages ?

V. Drought Prone Areas Programme (Centrally Sponsored Scheme)

(1) Have you any suggestions in respect of priorities in a master plan for the development of drought prone areas ?

(2) What are your views for implementation of drought prone area programmes with specific reference to—

(*a*) content of the programme for permanent improvement of land ;

(*b*) integration of the programme with the rest of the development activities ;

(*c*) employment ?

VI. Irrigation

(1) What do you think should be the priority in the various types of irrigation works to be undertaken in the drought prone areas?

(2) Have you any suggestions regarding the pattern of crops to be grown in the irrigated lands in the drought prone areas and differential irrigation rates to promote such cropping pattern ?

VII. Soil Conservation

(1) Do you feel that the Soil Conservation works presently being carried out in drought prone areas are adequate in reducing the intensity of scarcity conditions? If not, what other measures can you suggest for inclusion in the Soil Conservation Programme ?

(2) At present the Soil Conservation Schemes are required to be processed through the provisions of Land Improvement Scheme Act (1942), which requires minimum period of about 4 months to start the actual field work. Would you like to suggest any improvement in the present procedure?

(3) Do you agree that the Soil Conservation measures, such as contour/graded bunding, nalla bunding etc. help in reducing the intensity of scarcity conditions ?

(4) What is your experience about the rise in the water table on account of bunding works undertaken in the drought prone areas?

(5) Have you any suggestion regarding the improvement in dry farming methods to make them more effective ?

VIII. Afforestation

May we have your views on the effectiveness of afforestation measures in relieving scarcity conditions ?

IX. Drinking water

What types of permanent measures would you like to suggest to ensure minimum supply of drinking water even in the scarcity period?

X. Credit

May we have your views on the existing system of rural credit (short term, medium term and long term) with particular reference to the following aspects :—

(*a*) Adequacy ;
(*b*) Timeliness ;
(*c*) Need for a different policy in chronically drought affected areas ;
(*d*) Credit policy as an instrument in making areas scarcity resistant ?

XI. Finance

During the period of scarcity there is a considerable strain on the financial resources of the Government. Can you suggest any method of financing the relief measures and the development programmes in drought affected areas ?

XII. General

(1) It has been suggested that in drought prone areas the emphasis should be on the development of non-agricultural activities rather than on agricultural activities. Do you subscribe to this view ? Have you any suggestion on the types of non-agricultural activities ?

(2) Have you any suggestion for the optimum utilization of water resources (rainfall, surface water and ground water) in drought prone areas ?

(3) Have you any suggestions in respect of priorities for drought prone areas programme with reference to water utilisation for—

(*a*) drinking water ;
(*b*) industrial use ;
(*c*) raising of crops/pastures/trees ;
(*d*) animal husbandry ;
(*e*) any other uses ?

(4) Have you any suggestions regarding problem of development of scarcity areas which, in your opinion, are not adequately covered by replies to the foregoing questions ?

महाराष्ट्रातील टंचाईग्रस्त क्षेत्रांच्या सर्वेक्षणासाठी वस्तुस्थिती अन्वेषण समिती

प्रश्नावली

एक. सातत्याने अवर्षणग्रस्त क्षेत्रे निश्चित करण्याचे निकष

(१) मुंबई राज्यातील टंचाईग्रस्त क्षेत्रांचे सर्वेक्षण करणाऱ्या वस्तुस्थिती अन्वेषण समितीने (पारदासानी समिती) १९६०, मध्ये आपल्या अहवालात सातत्याने अवर्षणग्रस्त क्षेत्रे निश्चित करण्यासाठी पुढील निकष लावले होते :—

(एक) पाऊस;

(दोन) आणेवारी व जमीनमहसुलाचे निलंबन;

(तीन) तो प्रदेश पूर्वी टंचाईग्रस्त म्हणून घोषित केलेला असणे.

आपण आणखी इतर निकष सुचवू इच्छिता काय ? की वरील निकष आपणास पुरेसे वाटतात?

(२) भारतीय हवामानशास्त्र विभागाने अवर्षणाची व्याख्या अशी केली आहे—

जेव्हा नेहमीच्या वार्षिक पावसाच्या ७५ टक्क्यापेक्षा कमी पाऊस एखाद्या वर्षी कोणत्याही क्षेत्रात पडतो तेव्हा तेथे निर्माण होणारी परिस्थिती म्हणजे अवर्षण.

वरील व्याख्येच्या आधारे अलीकडे झालेल्या अभ्यासानुसार जेथे वरील घटना घडण्याची संभाव्यता २० टक्के किंवा त्याहून अधिक आहे, अशा क्षेत्रांची अवर्षण क्षेत्रे म्हणून निश्चिती करण्यात आली आहे.

यासंबंधी आपले विचार काय आहेत?

(३) अवक्षेपण (Precipitation), तपमान, वाऱ्याची गती, ऊन, मातीची प्रत, मातीतील आर्द्रता आणि पूर्वीचे पर्जन्यमान यासारख्या कित्येक घटकांच्या परस्पर क्रियेमुळे अवर्षणाची परिस्थिती निर्माण होते. तथापि यातील अत्यंत महत्वाचे कारण पाऊस हेच असते. आणि त्याचे निर्णायक व चल घटक म्हणजे पावसाचे वितरण, परिवर्तनशीलता व बाष्प निष्कासनविषयक गरजा भागवण्याची क्षमता हे होत. अवर्षणग्रस्त क्षेत्राची निश्चिती करण्याचा निकष म्हणून " पावसाचे वितरण " या घटकाचा उपयोग कशा प्रकारे करून घेता येईल ?

दोन. सातत्याने अवर्षणग्रस्त क्षेत्राची प्रतवारी

वरचेवर झालेल्या अवर्षणामुळे अतिशय त्रास सोसावा लागलेली व म्हणून प्रतिकाराची शक्ती नसलेली क्षेत्रे, अवर्षणाची वारंवारता कमी प्रमाणात व कमी तीव्र स्वरुपात असणाऱ्या इतर क्षेत्रापासून वेगळी करता यावी यासाठी टंचाईग्रस्त क्षेत्रांची प्रतवारी करणे पारदासानी समितीला आवश्यक वाटले. त्या समितीने या क्षेत्रांची प्रतवारी पुढीलप्रमाणे केली होती :—

क्षेत्राचा प्रवर्ग	वर्णन
क	.. दर तीन वर्षातून एकदा पिकांचे संपूर्ण किंवा जवळजवळ संपूर्ण नुकसान.
ख	.. दर सहा वर्षातून एकदा पिकांचे संपूर्ण किंवा जवळजवळ संपूर्ण नुकसान.
ग	.. दर दहा वर्षातून एकदा पिकांचे संपूर्ण किंवा जवळजवळ संपूर्ण नुकसान.

पारदासानी समितीने या प्रतवारीसाठी अंगिकारलेला निकष पुरेसा आहे असे आपणास वाटते काय ? की काही वेगळे निकष आपण सुचवू इच्छिता ?

तीन. प्रभावकारी घटक

(१) पूर्वी वारंवार टंचाईग्रस्त राहाणारी क्षेत्रे कालांतराने टंचाई प्रतिकारक्षम क्षेत्रे बनली असल्याचे म्हटले जाते आपणास कोठे असे घडल्याचे माहित आहे काय? त्यासाठी कोणत्या गोष्टी कारणीभूत आहेत असे आपणास वाटते ?

(२) पूर्वी टंचाईग्रस्त असणाऱ्या क्षेत्रात अलीकडे टंचाईची परिस्थिती निर्माण झाल्याचे सांगण्यात येते. आपणास असे काही प्रदेश माहीत आहेत काय? अशा बदलाची आपल्या मते कोणती कारणे असावीत ?

चार. निवारक उपाय

(१) कोणत्याही प्रदेशामध्ये टंचाईची परिस्थिती दिसू लागताच शासनाच्या स्थायी आदेशानुसार त्या टंचाईग्रस्त क्षेत्रामध्ये टंचाई चाचणीची किंवा निवारणाची कामे तात्काळ सुरू करणे आवश्यक असते. तसे करण्यात येते काय? की, ही कामे सुरू करण्यास बराच विलंब लागतो ?

(२) टंचाई निवारणाच्या कामांचा उद्देश, तात्कालिक आपत्ती दूर करणे, तसेच टंचाईग्रस्त क्षेत्राचे कायम स्वरुपाचे पुनर्वसन करणे हा आहे. निवारक कामांच्या पुढील घटकाबाबत आपल्या काय सूचना आहेत.—

(क) निवारक कामांची पर्याप्तता व व्याप्ती.

(ख) हाती घ्यावयाच्या निवारक कामांमधील प्राथम्यक्रम.

(ग) टंचाईग्रस्त प्रदेश टंचाईरोधक करण्यासाठी अल्पकालीन व दीर्घकालीन उपाययोजना.

(३) निवारक कामांची अंमलबजावणी व संयोजन याबाबत विशेषेकरून पुढील मुद्यांवर आपणास काही सूचना करावयाच्या आहेत काय :—

(क) कामाच्या निवडीची कार्यपद्धती.

(ख) निवारक कामांच्या अंमलबजावणीसाठी व कार्यान्वियनासाठी विविध पातळ्यांवरील अभिकरण संस्था.

(ग) निवारक कामांचा परस्पर व टंचाईग्रस्त भागातील नेहमीच्या कामांशी समन्वय.

(४) टंचाईच्या काळातील आणि त्यानंतर परिस्थिती पूर्ववत झाल्यानंतरच्या काळातील मजुरीच्या प्रमाणाबाबत तसेच मजुरी देण्याच्या पद्धतीबाबत आपले काय मत आहे ?

पाच. अवर्षणग्रस्त क्षेत्रातील कार्यक्रम (केंद्र पुरस्कृत योजना)

(१) अवर्षणग्रस्त क्षेत्राच्या विकासासाठी बृहत् योजनेमध्ये प्राथम्यक्रम देण्याबाबत आपल्या काही सूचना आहेत काय ?

(२) अवर्षणग्रस्त क्षेत्रामधील कार्यक्रमाचे कार्यान्वियन करण्याबाबत विशेषेकरून पुढील मुद्यासंबंधी आपले काय मत आहे :—

(क) जमिनीची कायम स्वरूपाची सुधारणा करण्यासंबंधीच्या कार्यक्रमाचा गाभा.

(ख) या कार्यक्रमाचा इतर विकासकार्याशी समन्वय.

(ग) सेवायोजन.

सहा. पाटबंधारे

(१) अवर्षणग्रस्त क्षेत्रामध्ये हाती घ्यावयाच्या विविध प्रकारच्या पाटबंधाऱ्यांच्या कामांमध्ये आपल्या मते कोणत्या गोष्टीस प्राथम्य द्यावे ?

(२) अवर्षणग्रस्त क्षेत्रातील जलसिंचत जमिनीमध्ये पेरावयाच्या पिकांच्या बाबतीत आणि त्या पिकांच्या वाढीस चालना देण्यासाठी जलसिंचनाचे वेगळे दर ठेवण्यासंबंधी आपणास काही सूचना करावयाच्या आहेत काय ?

सात. मृद्-संधारण

(१) अवर्षणग्रस्त भागात सध्या चालू असलेली मृद-संधारणाची कामे टंचाईच्या परिस्थितीची तीव्रता कमी करण्यासाठी पुरेशी आहेत, असे आपणास वाटते काय? तसे वाटत नसल्यास, मृद-संधारण कार्यक्रमात समाविष्ट करण्यासाठी आपण आणखी कोणते उपाय सूचवू शकता ?

(२) सध्या मृद-संधारण योजना, भू-सुधार योजना अधिनियम (१९४२) च्या उपबंधांनुसार कार्यान्वित कराव्या लागतात व त्यानुसार प्रत्यक्ष क्षेत्रकार्य सुरू करण्याकरिता किमान ४ महिन्यांचा कालवधी लागतो. विद्यमान कार्यपद्धतीत आपण काही सुधारणा सूचवू इच्छिता काय ?

(३) समोच्च/क्रमोच्च बांधबंदिस्ती, नाल्यांची बांधबंदिस्ती इत्यादीसारख्या मृद-संधारणाच्या उपायामुळे टंचाईच्या परिस्थितीची तीव्रता कमी होते, हे आपणास पटते काय ?

(४) अवर्षणग्रस्त क्षेत्रात हाती घेतलेल्या बांधबंदिस्तीच्या कामामुळे पाणीपुरवठयाच्या तक्त्यात झालेल्या वाढीबाबत आपला अनुभव काय आहे ?

(५) कोरडवाहू शेतीच्या पद्धती अधिक परिणामकारक करण्यासाठी त्यांत करावयाच्या सुधारणांसंबंधी आपल्या काही सूचना आहेत काय ?

आठ. वनरोपण

टंचाईची परिस्थिती दूर करण्याचा एक उपाय म्हणून वनरोपणाच्या परिणामकारकतेवरील आपले मत कळवाल काय ?

नऊ. पिण्याचे पाणी

टंचाईच्या काळातसुद्धा पिण्याच्या पाण्याचा किमान आवश्यक पुरवठा खात्रीने करता यावा यासाठी आपण कोणते कायम स्वरुपाचे उपाय सुचवाल?

दहा. कर्ज

विशेषत: पुढील मुद्यांच्या संदर्भात (अल्प मुदतीच्या, मध्यम मुदतीच्या व दीर्घ मुदतीच्या) विद्यमान ग्रामीण कर्ज व्यवस्थेवर आपली मते कळवाल काय :—

(क) पर्याप्तता ;
(ख) समयोचितता ;
(ग) सातत्याने अवर्षणग्रस्त क्षेत्रामध्ये वेगळ्या धोरणाची आवश्यकता ;
(घ) ही क्षेत्रे प्रतिकारक्षम बनवण्याचे एक साधन म्हणून कर्जविषयक धोरण.

अकरा. वित्तव्यवस्था

टंचाईच्या काळात शासनाच्या वित्तीय साधन संपत्तीवर बराच मोठा बोजा पडतो. अवर्षणग्रस्त क्षेत्रामध्ये निवारक उपाययोजनेची व विकास कार्यक्रमाची वित्तव्यवस्था करण्याची एखादी पद्धत आपण सूचवू शकता काय ?

बारा. सर्वसाधारण

(१) अवर्षणग्रस्त क्षेत्रामध्ये कृषिविषयक कार्यक्रमांपेक्षा कृषीतर कार्यक्रमांच्या विकासावर अधिक भर द्यावा असे सूचविण्यात आले आहे. आपण या मताशी सहमत आहात काय? कृषीतर कार्यक्रमांच्या प्रकारांबाबत आपली काही सूचना आहे काय ?

(२) अवर्षणग्रस्त क्षेत्रामधील जलसंपत्तीचा (पाऊस भू-पृष्ठावरील व भूगर्भातील पाणी) इष्टतम वापर करण्यासंबंधी आपल्या काही सूचना आहेत काय ?

(३) पुढील गोष्टीसाठी पाण्याच्या वापराच्या संदर्भात अवर्षणग्रस्त क्षेत्रातील कार्यक्रमांच्या प्राथम्यक्रमाबाबत आपल्या काही सूचना आहेत काय :—

(क) पिण्याचे पाणी;
(ख) औद्योगिक वापराकरिता ;
(ग) पिकांच्या लागवडीकरिता/कुरणासाठी/झाडे लावण्याकरिता ;
(घ) पशु संवर्धनासाठी ;
(च) इतर कोणत्याही वापरासाठी.

(४) टंचाईग्रस्त क्षेत्रांच्या विकासाबाबतच्या वरील प्रश्नांच्या उत्तरात आपल्या मते पूर्णपणे समाविष्ट न झालेल्या एखाद्या समस्येविषयी आपल्या काही सूचना आहेत काय ?

ANNEXURE III

Tour Programme

Date	District
13th November 1972	Aurangabad.
14th November 1972	Bhir.
15th November 1972	Osmanabad.
16th November 1972	Sholapur.
20th November 1972	Jalgaon.
21st November 1972	Dhulia.
22nd November 1972	Nasik.
23rd November 1972	Ahmednagar
24th November 1972	Poona.
27th November 1972	Poona.
4th December 1972	Nagpur/Bhandara.
5th December 1972	Nagpur/Chandrapur.
6th December 1972	Nagpur/Wardha.
7th December 1972	Yeotmal/Amravati.
11th December 1972	Poona/Satara.
12th December 1972	Sangli.
13th December 1972	Kolhapur.
14th December 1972	Ratnagiri.
15th December 1972	Kolaba.
22nd December 1972	Poona.
27th December 1972	Buldhana/Akola.
28th December 1972	Nanded/Parbhani.
29th December 1972	Aurangabad.
5th January 1973	Thana.

ANNEXURE IV

Officers who assisted the Committee

Dr. L. V. Agashe	Chairman Board of Technical Examination, Bombay.
Shri K. N. Ambike	Superintending Agriculture Officer, Aurangabad.
Shri S. S. Buit	Chief Conservator of Forests, Poona.
Shri W. D. Bhide	Superintending Engineer, (P.H.) Deputy Secretary, I. & P. D.
Dr. S. A. Chopde	Director of Agriculture.
Shri C. N. Chari	Director of Geology and Mining.
Shri S. M. Dahat	Superintending Agriculture Officer (Soil Conservation) in Director of Agriculture.
Dr. R. B. Gupte	Prof. of Goology, Engineering College, Aurangabad.
Shri S. G. Katdare	Deputy Director of Agriculture in Director of Agriculture.
Shri Kamat	Chief Soil Specialist in Director of Agriculture.
Shri V. V. Kale	Deputy Director of Industries.
Shri S. T. Khare	Chief Engineer, (P. H.), Joint Secretary, I. & P. D.

ANNEXURE VI—*Contd*

Shri I. M. Koreshi	..	Assistant Chief Conservator of Forests.
Shri C. G. Kundalkar	..	Statistician Director of Agriculture.
Shri R. S. Muzumdar	..	Deputy Secretary, Revenue and Forest Department.
Shri P. B. Morje	..	Deputy Engineer, Central Designs Organisation, Bombay.
Shri R. J. Oak	..	Joint Director of Agriculture.
Dr. H. S. Pawar	..	Vice-Chancellor of Mahatma Phule Krishi Vidyapeeth, Rahuri.
Dr. K. S. Pharande	..	Principal, Agricultural College, Poona.
Shri D. D. Ranadive	..	Director of Animal Husbandry.
Shri W. G. Ranadive	..	Under Secretary, Revenue and Forests Depaıtmentnt.
Shri G. R. Shirpurkar	..	Superintending Agriculture Officer, Nasik.
Shri V. Subramanian	..	Secretary, I, Revenue and Forest Department.
Shri M. Subramanian	..	Director of Industries.
Shrl S. B. Sane	..	Deputy Engineer, Central Designs Organisation, Bombay
Shri D. G. Tungare	..	Deputy Secretary, Planning Department.
Shri S. S. Tinaikar	..	Director of Transport.
Shri K. K. Uppal	..	Secretary II, Revenue and Forest Department.
Shri Venkatraman	..	Director Ground Water Survey Agency.