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# STUDY IN INTENSIVE FARMING NEAR POONA UNDER THE CANAL IRRIGATION

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## I—INTRODUCTION.

Near Poona a fairly large area is grown under vegetables and sugarcane under canal irrigation but there is no reliable data on the cost of production, the best way of growing different vegetable crops, the pests and diseases that affect these crops and their control, the proper way of marketing vegetables and the probable profits that can be made from such crops or farming.

It invariably happens that the farmer grows the crops he is used to from childhood and in the usual way followed, and in absence of any actual data regarding the economic side of any of these or other likely crops, the farmer is not in a position to decide which are the most profitable crops to grow under Poona conditions.

Besides when a specialised farming like sugarcane farming is fast coming a less profitable business it is necessary to investigate the possibility of growing other intensive but profitable crops under careful business management.

It is extremely difficult or rather impossible to get any reliable data on intensive crops from any farmer and hence such work has special importance.

It is not enough to teach the students methods of growing crops only; it does not give the student any correct idea of (a) the approximate cost of production of any such crop on a business farm, (b) of the profitable yield of such crops if they are grown for profit, (c) of the best way of growing crops for profit, (d) of the proper way of marketing such crops, (e) and finally of the likely profits that can be made by such farming. Without these it is not possible to give sound practical training.

The first author being called upon to reorganise the College Dairy on a commercial line and being fresh from a business management of a Dairy concern at Ahmedabad for three years and the business management of a cotton yarn business in Manchester for nearly a year has been keen to introduce business methods into farming.

With this object in view the work of reorganising the cropping scheme of the College farm on a business line was taken in hand by the first

author as Professor of Agriculture and one block of 13 acres and 16 gunthas of the College farm called C division being well situated for intensive vegetable farming was selected for this work and the management of this block was put under the direct charge of Mr. H. M. Desai, B.Ag., Lecturer in Agriculture who was already studying certain problems of irrigated crops very intensively and who had very good experience of growing intensive vegetable crops. Though there are certain difficulties in carrying out business farming on a central Government farm special efforts were made to get over these difficulties by setting apart the required equipment and permanent labour for such a block and keeping proper accounts of all the farm operations that may be strictly necessary on such a farm run on business lines.

The financial aspect of this type of market—garden farming has been presented in the form of farm—income, that is to say details of cash expenditure and of cash receipts have been recorded and the difference represents the income of the peasant-gardener. This figure covers both the wages of the peasant and family and the profits on the operations. No attempt is made to distribute this lump sum between wages and profits. A statement of all the labour employed is given against each crop so that any one conducting a market garden, as a proprietary concern worked with hired labour, can calculate the profits.

All the details of work done during the three years incorporated in the following pages offer us the first publication of its kind based on actual data regarding production of such vegetable crops in this part of India, and if the publication of this would lead to improvement of vegetable farming near Poona and elsewhere, both the authors would feel amply rewarded.

## II—CROPPING SCHEME.

The scheme consisting of a three years' rotation, was laid down in the year 1923 after taking into account the condition of soil, climate, canal irrigation and the local market.

The whole area was divided into three blocks; each year two of the blocks were under irrigation and the third one under a dry crop. Once in three years each block had a dry crop of fodder jowar (Nilva variety).

The statement showing the total area and the area under each crop in different years is attached herewith.

Out of the crops grown the dry crop of fodder jowar was sown during the rains.

Out of the irrigated crops, Turmeric, Suran, Ginger, Cucurbits, Guvar, Khira, etc., were sown in the hot season, i.e. in the latter half of May.

Brinjals, Garlic, Onions, Cabbage family, Tomato and Mogari (Rat tail Radish) were grown as cold weather crops.

Chillies, Cluster bean (Guvar), Cucumber (Khira), French beans, Peas and Double beans were taken as kharif season crops.

dali (little gourd) was taken as a perennial crop.

ities of crops were included in the scheme as in that case, failure  
me of the crops due to unfavourable weather conditions or  
pests would not cause a heavy loss as some of the others would  
d better and help to make up the loss. Secondly, varieties of  
facilitate marketing because if a small lot of one kind of vegetable  
into the market a better price is realised. A variety of crops also  
s better distribution of labour.

as showing the cropping scheme for different years are given as  
dix I.

*Statement showing the crops and acreage under each during  
the three years.*

Crops.	1923-24		1924-25		1925-26	
	A.	g.	A.	g.	A.	g.
(Dharwar) .. .. .	1	0	0	20	0	20
(Gujarat) .. .. .	0	20	0	0	1	0
(Local) .. .. .	0	20	1	10	0	30
s (Dorli) .. .. .	0	20	0	0	0	0
s (Gujarat) .. .. .	0	20	0	20	0	30
.. .. .	0	10	0	10	0	0
(for seed) .. .. .	0	15	0	10	0	0
(for bulbs) .. .. .	0	25	0	20	0	20
vegetables .. .. .	0	20	0	20	0	0
and Bhendi (Cluster beans and r's fingers) .. .. .	0	20	1	0	0	30
bean (Guwar) .. .. .	0	10	0	0	0	10
(Lady's finger) .. .. .	0	10	0	0	0	0
rio .. .. .	0	20	1	0	0	30
.. .. .	0	20	0	10	0	10
(Elephant's foot) .. .. .	0	10	1	0	1	0
ol .. .. .	0	10	0	0	0	10
its (Pumpkin and bottle gourd) .. .. .	0	10	0	20	0	20
(White small cucumber) .. .. .	0	10	0	10	0	10
beans .. .. .	0	30	0	10	0	20
ge mixture .. .. .	0	20	0	30	0	20
o .. .. .	0	10	0	10	0	10
(for vegetables) .. .. .	0	10	0	0	0	0
(Nilva fodder) .. .. .	5	0	4	0	4	0
aneous .. .. .	0	18	0	18	0	28
li (little gourd) .. .. .	0	8	0	8	0	8
Local green) .. .. .	0	0	0	10	0	30
(Rat tail radish) .. .. .	0	0	0	10	0	10
beans .. .. .	0	0	0	10	0	10
spadi .. .. .	0	0	0	10	0	10
o .. .. .	0	0	0	20	0	0
<b>Total .. .. .</b>	<b>15</b>	<b>6</b>	<b>15</b>	<b>6</b>	<b>15</b>	<b>6</b>
ropped more than once .. .. .	1	30	1	30	1	30
rea cropped .. .. .	13	16	13	16	13	16

## III—SOIL CONDITIONS.

The soil of the whole block of land is medium black (clay loam derived from trap rock).

The depth of the soil varies from 15 inches to 24 inches having a *mur* (decomposed trap rock) layer below, which ensures good drainage.

The land does not slope much and hence there is not much chance of erosion by surface washing.

The following table gives the mechanical analysis of the soil—

Separates.					Per cent
Fine gravel	..	..	..	..	2
Coarse sand	..	..	..	..	3
Medium sand	..	..	..	..	4
Fine sand	..	..	..	..	8
Very fine sand	..	..	..	..	18
Silt	..	..	..	..	40
Clay	..	..	..	..	25
					100

(N.B.—The soil contains from 8 to 10 per cent. pebbles.)

Such a soil is only fairly suitable for irrigation farming. It sets hard and cracks after each irrigation. Care therefore is necessary in the management of such soils so as to maintain aeration and reduce frequent cracking which is unfavourable for plant growth.

To prevent this the following treatments were found beneficial:—

1. To add farm yard manure to the irrigated crop to the extent of 20 cartloads per acre.
2. Timely tillage operations both preparatory and after.
3. To follow a system of irrigation which maintains a friable condition of soil round about the plant.
4. To grow a dry crop once in three years (no farm yard manure is added to this crop) to maintain good physical condition of the soil.

## IV—SEASON.

Average rainfall of Poona is 28·86 inches. The distribution of rainfall is as under:—

January	..	0·09"	May	..	1·42"	September	..	5·07
February	..	0·05"	June	..	5·35"	October	..	4·01
March	..	0·05"	July	..	7·20"	November	..	1·11
April	..	0·60"	August	..	3·68"	December	..	0·23

This shows that the period from June to October constitutes the rainy season. There is however some rain in the month of May but it is usually a local and isolated shower or two. July is the wettest month. There is practically no rain from November to May. The rainfall in the monsoon months is not uniformly distributed and hence crops cannot usually be grown without the help of the irrigation water. The following table shows the mean daily average temperature month by month in the different years :—

Month.	1923-24	1924-25	1925-26
May	85.5° F.	86.6° F.	85.6° F.
June	83.5	81.5	81.8
July	79.5	77.7	76.1
August	75.5	76.7	76.4
September	77.5	76.2	77.3
October	77.0	74.7	78.2
November	71.7	68.0	75.45
December	69.6	65.2	67.7
January	70.5	65.2	70.5
February	73.0	69.6	74.1
March	81.6	78.4	77.9
April	85.1	87.5	80.3

The above figures show that the mean daily average temperature is highest in April and May. From May to October it slowly goes down month by month and there is a sudden drop in the month of November—the beginning of the rabi season. Then again it rises from February and in the month of March and April the rise is rapid.

On the whole kharif season is a good growing season for the different crops such as Suran, Turmeric, Ginger, Cucurbits, Peas, Beans, Chillies, etc. In fact to take full advantage of the full kharif season the crops like Suran, Ginger, Turmeric are planted by about the middle of May so that by the time the growing conditions become favourable, the crop has finished the germination and is ready to grow. These crops require about a month to germinate and if they are sown in the kharif season about that much time is lost from the growing period as these crops stop their growth as soon as the cold weather begins.

Cold weather duration is not the same in different years as can be seen from the temperature statement. When the temperature does not go sufficiently low and the duration is short the crops like Cabbage, Cauliflower, Onions, Garlic, etc., suffer in their growth.

The temperature being high in the hot season soils dry up soon and, unless frequent irrigations at shorter intervals are given none of the garden crops is able to make any real growth. Canal irrigation turns being at the interval of ten days' garden crops cannot be grown successfully though there is a good market for the produce at that

time. The following table shows the distribution of rainfall during the years under study :—

Month.	1923-24	1924-25	1925-26
May	0·66"	....	0·23"
June	0·06	2·38"	2·76
July	5·30	2·30	2·08
August	1·96	8·77	1·96
September	4·22	6·07	3·66
October	....	0·20	0·91
November	....	0·23	0·41
December	....	....	....
January	....	....	1·11
February	....	....	....
March	....	0·45	....
April	1·17	....	....
Total ..	13·37	20·40	14·15

During three years under study, twice there was half the average rainfall and once only 70 per cent. of the average. This shows insufficiency of the total rainfall. The distribution was also bad as will be seen from the rainfall statement.

*1923-24.*—Rains began in July and the sowing conditions were reached in the last week of July. There was a long break in August and the rainfed crops began wilting. But the showers in the middle of September saved the situation.

Cold weather was comparatively of a short duration and due to this Onions, Cabbage and the allied crops suffered very much.

During the year Chillies suffered heavily due to mosaic disease.

*1924-25.*—There was not sufficient moisture for sowing till the end of July. There was a break of about 20 days in August which was favourable for the crops. Rains at the end of August saved the crops from dying. There was another break again which was relieved by the rain at the end of September.

During the year Dharwar Chillies suffered from mosaic disease, Moga (Rat tail radish) from Aphis, Cucurbits from red pumpkin beetle, Peas from mildew and Onions for bulbs and Garlic from thrips. Irregular seasons seem to have increased the pests.

*1925-26.*—Rains began in the third week of June and sowing started in the fourth week of June. There was a long break in the month of August and the rainfed crops suffered. The break continued till the end of September. There was heavy rain on the 27th of September.

The cold season was not of the required intensity and length, and as a result cold weather crops like Cabbage, Cauliflower, etc., suffered considerably.

Cucurbits suffered badly due to red pumpkin beetle and Guvar and Peas due to mildew.



### V—MARKET CONDITIONS.

With the given climate and soil conditions the aim of any business is the maximum money returns. It is the market conditions that decide what crop should be grown to achieve this object.

Market conditions therefore had the final say in fixing the scheme. The most paying crops were included in the scheme as far as they could be grown under Poona conditions of soil, climate and canal irrigation.

Usually vegetables sell dear in the hot season and in the beginning of the rains. Rates are lower during monsoon and during the latter half of the cold weather.

Attempts were made to take crops that could be marketed at a time when prices were high though canal irrigation does not permit of growing some of the vegetable crops that fetch good prices in the beginning of the monsoon as in May and June irrigation—turns are at longer intervals and sometimes irrigation is uncertain due to a late start and uncertain breaks during the monsoon.

New crops like Suran, Ginger and Tondali were introduced slowly as the market developed for them but it may be noted that these crops now pay well. Besides formerly the farm crop was sold in cartloads in the Poona market, which resulted in bad prices and hence this practice was changed by suitable alterations in the cropping scheme; and now a fair amount of produce is sold on the farm daily as production is regulated.

Vegetables are sold either on the *maund*, the *shekada* or the dozen basis. A maund of vegetable is of 32 pounds, but 4 pounds extra has become customary.

A *shekada* is 128 by number and a dozen 12.

Crops like Cluster beans, Chillies, Brinjals, Sweet potatoes, Onions, Garlic, French beans, Peas, etc., are sold wholesale by weight. Cabbage, Knolkhols and Maize cobs are sold by dozen. Leafy vegetable bundles are sold by *shekada*. Bhendi and Cucurbits sold in heaps by auction without any particular reference to weight or measure. Tomatoes are also auctioned by baskets.

Retailers sell all the vegetables by weight except the Cabbages, Knolkhols or Cauliflower which are sold by number. Leafy vegetables are sold by bundles.

### VI—IRRIGATION.

The crops were grown under canal irrigation. The following are the different seasons and the rates\* for irrigation :—

Season.	Rate of irrigation per acre.		
	Rs.	s.	p.
(1) Kharif season—15th June to 14th October .. ..	3	0	0
(2) Rabi season—15th October to 14th February .. ..	5	0	0
(3) Hot season—15th February to 14th June .. ..	7	0	0
(4) Eight months crops .. ..	12	0	0
(5) Perennial crops (Tondali) .. ..	22	8	0

\* Since 1927 the water rates have increased by about 50 per cent.

The usual turn of irrigation comes every 10 days. Owing to such a long interval between irrigations it is difficult to grow vegetable crops in the hot season, which is the best one for realizing good prices in the market. Besides, transplanted crops want sufficient moisture at the roots till they put forth new roots. Canal irrigation comes at regular intervals and is available for a limited time. This makes it very difficult to secure the best conditions for the crops in their early days and therefore in preparing the scheme on canal irrigation certain crops that need frequent watering in the hot season had to be omitted.

The following statement shows the area irrigated in different seasons in different years :—

Season.	1923-24	1924-25	1925-26
	A. g.	A. g.	A. g.
Karif season .. .. .	6 36	6 26	8 18
Rabi season .. .. .	7 26	7 16	7 6
Hot season .. .. .	4 8	6 26	5 11

The area under irrigation in the hot season is due to either extension of the cold weafner crops or necessary early planting of crops like Suran, Turmeric, Ginger, etc.

#### VII—METHOD FOLLOWED FOR GROWING DIFFERENT CROPS.

In the following pages the details regarding the growing of an average crop per acre are given from the following points of view :—

1. Method of raising the crop :

The routine followed on the college farm is given operation by operation.

2. Labour required for different operations :

Men, women and bullock labour required for different operations is given.

For calculating the total units one unit is taken as one man or one bullock or two women.

3. Yields obtained during the different years are given. Distribution of the average outturn is also given week by week.

4. Total cost of production, receipts and the farm income per acre are also given.

*Note.*—Manure applied to the crop is charged against that crop for want of any Scientific data regarding its after effect.

In calculating the cost of production only cash expenditure is shown.

## (1) BRINJALS.

Brinjals are grown all over the Presidency. Brinjals thrive best as a cold weather crop. Generally the crop is planted from August to March. The local variety of Poona is Dorali, fruits of which are small, greenish in colour, thorny and full of seeds. Gujarat variety is tried here with success. Gujarat varieties are of two types; one is round and the other is long. These contain few seeds. Gujarat variety thrives better if planted from August to October. For hot season "Dorali" brinjals are preferred.

*Details of the crop grown in the year 1925-26.*

(Crop being transplanted in the latter half of September.)

*Preparatory tillage.*—Land was ploughed to a depth of 7 to 8 inches and brought to fine tilth by subsequent discing and harrowing.

*Manuring.*—Twenty cartloads of Farm Yard Manure were applied after ploughing and worked into the soil by discing and harrowing. Usually 600 to 800 lbs. of cake is given as a top-dressing in two doses first one, after one month after transplanting and second one at the time of flowering. During this year safflower cake was given at the rate of 800 lbs. per acre.

*Planting.*—Seedlings are raised in the seed bed. 200 to 240 square feet area is required and about 12 ozs. of seed are sown to transplant one acre of land (for details see appendix III).

Land is laid out into ridges and furrows 3' apart and 2 seedlings are planted at the distance of 3' in the rows.

If transplanted in August and if there is sufficient moisture the seedlings are transplanted in flat fields after marking out the land 3' each way.

During the year the crop was transplanted in the latter half of September.

*Irrigation.*—No irrigation is given in monsoon if the crop is planted in August if there is sufficient rain. If there is a long break irrigation is necessary. Regular irrigations start after the close of monsoon, i.e. in the month of October. In other seasons irrigations are given regularly. If planted in the hot season under canal irrigation it becomes difficult to establish the seedlings as the irrigation interval of ten days is too long. If grown under canal irrigation for the hot season the crop is transplanted in February so that it is established before the hot season begins. During the year sixteen irrigations were given; three during the kharif season, nine during the rabi season and four in the hot season.

*After-care.*—Crop is weeded and land stirred as required. The crop is earthed up after about six weeks from planting.

The important pests and diseases are stem borer, fruit-borer, jassides and malformation.

For borers the only remedy is to take out the affected parts and to destroy them. For jassides the spraying of kerosine oil emulsion or fish oil rosin soap is given. Repeated sprayings are necessary to check the pest, nothing is known about the malformation. During the year 4 interculturings and 4 weedings were given. The crop was earthed up at the end of October. Five sprayings were given against jassides. Sprayings checked the pests to a certain extent.

*Harvesting.*—Fruiting starts in about 3 months and lasts for about 3 to 3½ months. Picking is done every other day. Care should be taken that fruits that are ready may not be left unpicked.

*Marketing.*—The average size fruits with good luster have good market. If harvesting is delayed the luster is lost which reduces the quality of the produce. The produce is available throughout the year. The best rates are obtained in the early cold weather. The market is dull in other seasons.

Gujarat variety fetches a better price in the Poona market.

*Labour units for different operations.*

Items.				Labour required per acre.		
				Men.	Women.	Bullocks.
			M. W. B.			
1.	Preparatory tillage—					
	Ploughing .. ..	..	4 0 8			
	Discing .. ..	..	½ 0 1			
	and harrowings ..	..	1 0 2			
			5½ 0 11	5½	0	11
2.	Manuring—					
	Spreading 20 cartloads of F.Y.M.	..	0 2 0			
	Spreading Oil-cake 800 lbs. in two doses.	..	0 4 0			
	Mixing the Oil-cake ..	..	4 0 4			
			4 6 4	4	6	4
3.	Planting—					
	Ridging .. ..	..	2 0 2			
	Repairing ridges ..	..	2 0 0			
	Transplanting .. ..	..	0 8 0			
			4 8 2	4	8	2
4.	Watering (16)			4	8	2
5.	After tillage and care—			22	8	0
	5 Sprayings .. ..	..	8½ 0 0			
	4 Interculturings by tooth cultivator	..	4 0 4			
	Earthing up by Sabul plough ..	..	2 0 2			
	Repairing bunds .. ..	..	2 0 0			
	4 Weedings .. ..	..	0 25 0			
			16½ 25 6	16½	25	6
6.	Harvesting—			0	42	0
	Picking 15,675 lbs.					
				52	89	23
			Total labour..	96½	..	23
			Total units..			

*Outturn per acre.*

Year.	Gujarat variety.		Dorali variety.	
1923-24	..	..	..	13,864 lbs. 1,574 lbs.
1924-25	..	..	..	2,978 ,, ....
1925-26	..	..	..	15,575 ,, ....

NOTE.—The failure of brinjals in the year 1924-25 was due to the occurrence of severe cold when the plants had just started bearing.

The failure of "Dorali" Brinjals in the year 1923-24 was due to malformation. Practically all the plants were affected.)

*Distribution of yield.*

						Approximate per cent.
1st week	..	..	..	..	..	1
2nd "	..	..	..	..	..	4
3rd "	..	..	..	..	..	8
4th "	..	..	..	..	..	12
5th "	..	..	..	..	..	6
6th "	..	..	..	..	..	15
7th "	..	..	..	..	..	18
8th "	..	..	..	..	..	11
9th "	..	..	..	..	..	5
10th "	..	..	..	..	..	2
11th "	..	..	..	..	..	6
12th "	..	..	..	..	..	4
13th "	..	..	..	..	..	3

*Cost of raising the crop.*

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional cash expenditure on bullocks	..	13	6 0
2. 20 cart-loads Farm Yard Manure and 800 lbs. of Cake	..	71	0 0
3. Insecticides	..	13	2 0
4. Irrigation charges	..	15	8 0
5. Octroi duty	..	7	5 0
6. Implement charges	..	8	0 0
7. Interest on Rs. 96 at 9 per cent. for eight months	..	5	12 0

*Receipts per acre.*

		134	1 0
15,575 lbs. of fruits	..	335	8 8
Farm income	..	201	7- 8

**(2) CABBAGE AND ITS MIXTURES.**

The Cabbage is a cold season crop but it is grown throughout the year in Poona except during the rains as it commands a very high price except in January, February and March. The crop is generally not grown alone but with Cauliflower, Beet-root, Knolkhol and Lettuce as mixtures. Lettuce is grown between the Cabbages but not on the sides of the beds, while Knolkhol is planted on one side of the water channel and Cauliflower on the other.

*Details of the crop grown in the year 1923-24.*

(Crop being planted by the middle of September.)

*Preparatory tillage.*—The land was ploughed 7 to 8 inches deep, just after the harvest of the previous crop. It was then brought to a fine tilth by subsequent discing and harrowings.

*Manuring.*—Twenty cart-loads of Farm Yard Manure were applied at the time of the preparation of land. 400 lbs. of cake was given as a top-dressing one month after transplanting.

*Planting.*—Seedlings are raised by raised-seed-bed method, about 8 ounces of seed is sown in 200 to 240 square feet area. Within a month's time seedlings are ready for transplanting. Seedlings suffer from mustard Saw-fly and Diamond back moth grubs. Hand picking early in the morning checks the trouble.

Seedlings were transplanted in beds  $2\frac{1}{2}' \times 2\frac{1}{2}'$  in second week of September. Only one selected seedling was planted at one place. If the main shoot is injured the plant develops a number of small heads, all unmarketable.

*Irrigation.*—Fifteen waterings were given. Three in the kharif season and twelve in the rabi season.

*After-care.*—Land was kept clean of weeds and was stirred after each irrigation to check cracking. During the year four stirrings were given.

The crop was severely attacked by Aphis. Fish Oil rosin soap was used for spraying to check the trouble. Owing to the nature of the growth of the crop thorough spraying is difficult. If frequent sprayings are given the plant loses its vitality and does not grow afterwards, so the crop on the College Farm is as a rule poor.

*Harvesting.*—Compact heads are harvested as they get ready. Heads begin to be ready within three months of planting and harvesting lasts for about two months.

Knolkhol gets ready within two months and the harvesting lasts for about a month.

*Marketing.*—There is a good market for the produce during the whole of the year except in January, February and March. If the crop is grown out of season the heads do not develop well but the grower is compensated by the high market rates. Cauliflower thrives only in the cold season. Knolkhol can be grown at any time of the year.

*Labour units for different operations.*

Items.				Labour required per acre.		
	M.	W.	B.	Men.	Women.	Bullocks.
1. Preparatory tillage—						
Ploughing .. .. .	4	0	8			
Discing .. .. .	$\frac{1}{2}$	0	1			
3 harrowings .. .. .	$1\frac{1}{2}$	0	3			
	6	0	12	6	0	12
2. Manuring—						
Spreading 20 cart-loads F.Y.M. .. .. .	0	2	0			
Spreading safflower cake .. .. .	0	1	0			
	0	3	0	0	3	0
3. Planting—						
Preparing beds .. .. .	6	4	4			
Transplanting .. .. .	2	10	0			
Filling gaps .. .. .	0	6	0			
	8	20	4	8	20	4
4. Waterings (15)				22	8	0
5. After tillage and care—						
4 weedings .. .. .	0	25	0			
3 sprayings .. .. .	6	0	0			
	6	25	0	6	25	0
6. Harvesting—						
3,170 lbs. .. .. .				0	28	0
				42	84	16
				84	—	16

*Yield per acre.*

Year.	Cabbage.		Knolkhol.	
	Lbs.		Lbs.	
1923-24 .. .. .	3,170		276	
1924-25 .. .. .	2,143		629	
1925-26 .. .. .	920		Failure.	

*Distribution of yield.*

					Cabbage.	Knolkhol.
					Approximate per cent.	Approximate per cent.
1st week	..	..	..	..	1	23
2nd "	..	..	..	..	2	39
3rd "	..	..	..	..	12	23
4th "	..	..	..	..	17	15
5th "	..	..	..	..	7	..
6th "	..	..	..	..	23	..
7th "	..	..	..	..	4	..
8th "	..	..	..	..	34	..
					100	100

1923-24.—Ten gunthas were planted in September and another ten gunthas were planted in November. September planting gave 4,260 lbs. per acre while November planting gave 2,080 lbs. per acre.

1924-25.—Twenty gunthas were planted in November and gave 2,416 lbs. per acre; while ten gunthas were planted in December and gave 1,196 lbs. per acre.

1925-26.—Crop was planted in October and gave 920 lbs.

All these years the failure is due to severe attack of Aphis. Repeated spraying of fish oil rosin soap could not check the attack.

*Cost of raising the crop (Cabbage).*

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional expenditure on bullocks	..	13	6 0
2. 20 cart-loads Farm Yard Manure and 400 lbs. of cake	..	75	0 0
3. Cost of seed	..	20	0 0
4. Insecticides	..	7	8 0
5. Irrigation charges (8 months)	..	12	0 0
6. Octroi duty	..	1	8 0
7. Implement charges	..	8	0 0
8. Interest on Rs. 113 for 8 months at 9 per cent.	..	6	12 0
Total	..	144	2 0

*Receipts per acre.*

3,170 lbs. cabbage }	199 15 0
276 lbs. knolkhol }	
Farm income	55 13 0



**(3) CHILLIES.**

In Bombay Presidency many varieties of chillies are grown. The long thin variety is commonly grown in Deccan as a dry crop, and the short thick chillies are grown in Dharwar and Belgaum Districts for sale as green chillies to be used as a vegetable. The latter were tried on the Farm. The former is used both in green as well as dry state as spices. The use of green chillies as spices is very restricted. The latter or Dharwar type is used as a vegetable only and never as a spice as there is very little pungency in them.

*Details of the crop grown in the year 1925-26.*

(Crop being transplanted in the middle of June.)

*Preparatory tillage.*—The land was ploughed after the harvest of the previous crop to a depth of 7 to 8 inches. It was then freely pulverised by discing and harrowing.

*Manuring.*—Twenty cartloads of Farm Yard Manure were applied after ploughing the land and mixed by discing and harrowing. Top-dressing of Safflower cake was given at the rate of 1,200 lbs. per acre in two doses first one, one month after transplanting and the second one at the time of earthing up, i.e., in the first week of August. For Dharwar chillies safflower cake was given at the rate of 1,600 lbs. per acre.

*Planting.*—Seedlings were raised in the nursery in the month of May. Raised-beds were prepared for raising the seedlings. (For details see appendix III.) 240 square feet area was utilized for raising seedlings for one acre. 10 ozs. of seeds were required for planting one acre. For convenience of watering, weeding and controlling pests the width of the seed bed should not be more than about 3 feet. Within one month's time seedlings get ready for transplanting.

The field for transplanting should be laid out into ridges and furrows 2½' apart for local chillies and 3' apart for Dharwar chillies. If the rainy season has set in before transplanting the field is marked out by a marker to the required distance, and two seedlings are planted at each intersection. A cloudy day is preferred for transplanting. If there is no rain, watering is given just after planting and continued till the rains start.

During the year transplanting was done by the middle of June. Ridges and furrows were prepared and seedlings were transplanted on the sides of the ridges.

*Irrigation.*—Irrigation is given if necessary. If the rains set in time and are well distributed no irrigation is given but the crop is taken as

a dry one. During the year eight waterings were given. Six during the kharif season and two during the rabi season. For Dharwar chillies eleven irrigations were given, five in the kharif season and six in the rabi season.

*After-care.*—After-care consists in keeping the land clean of weeds, earthing-up and controlling the pests. Experience on the College Farm indicates that the crop is generally attacked by insects or mosaic disease.

It is observed that if the crop is attacked by mosaic no amount of spraying or dusting revives the crop. The mosaic disease is not yet studied and at any rate for the present it is uncontrollable.

If the crop gets an attack in the early stage, i.e., either in the seedling stage or before flowering the crop is doomed to be a complete failure. If the disease appears after first flowering the picking from that flowering is secured. To prevent the trouble it is essential to reject diseased seedlings for planting and to plant the crop early, i.e., in June. Generally the disease appears in September and hence the crop should be planted early so as to avoid the attack before flowering. June planting fulfils this condition. It is difficult to plant the crop earlier than June as the harvesting of ripe chillies would come during the rains and both picking and drying would be difficult.

For local chillies during the year two interculturings and two weedings were given. Earthing-up was done in the first week of August.

For Dharwar chillies four interculturings and three weedings were given. Earthing-up was done in the first week of August.

*Harvesting.*—In case of local chillies ripe fruits should be picked to get good colour in dry chillies.

In case of Dharwar chillies fruits are picked green when fairly mature but before they change colour.

*Marketing.*—Local chillies are spread in the sun just after harvesting till they are completely dried. Care should be taken at the time of collecting if they have become dry as if collected carelessly the fruits are broken and seeds drop down and thus the quality suffers. The best time to gather to avoid this trouble is early in the morning. Generally the proportion of dried to ripe chillies is about 1 : 3. Dried chillies have a ready market. The fluctuation of price from year to year is not much. Green chillies of the local type has a good market in the hot season and in the beginning of the monsoon.

The Dharwar variety of chillies is new to Poona and it fetches a good price. Merchants import the produce from the Dharwar tract.

*Labour units for different operations (Local chillies).*

Items.				Labour required per acre.		
				Men.	Women.	Bullocks.
1. Preparatory tillage—	M.	W.	B.			
Ploughing .. .. .	4	0	8			
Clod crushing .. .. .	1	0	2			
Diacing .. .. .	½	0	1			
Three harrowings .. .. .	1½	0	3			
	7	0	14	7	0	14
2. Manuring—						
Spreading 20 cart-loads F.Y.M. .. .. .	0	2	0			
Manuring 1,200 lbs.—	0	5½	0			
Safflower cake in two dozens } .. .. .	1	0	1			
Mixing manure once .. .. .	1	7½	1	1	7½	1
3. Planting—						
Opening furrows and ridges .. .. .	2½	0	2½			
Transplanting .. .. .	0	8	0			
	2½	8	2½	2½	8	2½
4. Irrigation (8 Waterings) .. .. .				12½	7	0
5. After care—						
Two interculturings .. .. .	4½	0	4½			
Two weedings .. .. .	0	8	0			
Three sprayings .. .. .	6	4	0			
One dusting .. .. .	½	0	0			
Earthing-up .. .. .	1½	0	1½			
Repairing bunds .. .. .	½	0	0			
	13	12	6	13	12	6
6. Harvesting—						
Picking chillies .. .. .	0	56	0			
Cutting and removing .. .. .	0	7	0			
	0	63	0	0	63	0
Total labour .. .. .				36	97½	23½
Total units .. .. .				84½	—	23½

*Yield per acre (Local chillies).*

Year.	Outturn.	Approximate per cent.
1923-24 .. .. .	634 lbs. dry chillies (Low yield due to Mosaic disease).	42
1924-25 .. .. .	1,427 lbs. dry chillies.	53
1925-26 .. .. .	1,322 lbs. dry chillies.	5

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Items.				Labour required per acre.		
	M.	W.	B.	Men.	Women.	Bullocks
4. Waterings (11) .. .. .				15½	4	0
5. After tillage and care :—						
Two interculturings with Karabdi ..	2½	0	2½			
Three weedings .. .. .	0	28	0			
Two interculturings by grubber ..	2	0	2			
Earthing-up .. .. .	1	1½	1			
Repairing ridges and water channels.	5½	0	0			
Three sprayings .. .. .	6½	0	0			
Three dustings .. .. .	5½	0	0			
	23	29½	5½	23	29½	5½
6. Harvesting :—						
Picking .. .. .	0	44	0			
Uprooting .. .. .	0	4	0			
	0	48	0	0	48	0
Total labour .. .. .				50	95	22½
Total units .. .. .				97½	—	22½

*Yield per acre (Dharwar chillies).*

Year.	Outturn per acre in lbs.
1923-24 .. .. .	4,476 lbs.
1924-25 .. .. .	Failure.
1925-26 .. .. .	7,410

NOTE.—In the year 1924-25 the crop failed completely due to Mosaic disease.

In the year 1923-24 July planting failed while June planting gave 4,476 lbs. per acre.

Week.	Approximate per cent.	
	1923-24	1925-26
1st .. .. .	3	3
2nd .. .. .	3	7
3rd .. .. .	8	8
4th .. .. .	7	4
5th .. .. .	17	5
6th .. .. .	6	3
7th .. .. .	11	..
8th .. .. .	7	3
9th .. .. .	11	..
10th .. .. .	7	16
11th .. .. .	5	9
12th .. .. .	..	5
13th .. .. .	6	3
14th .. .. .	..	5
15th .. .. .	5	..
16th .. .. .	..	8
17th .. .. .	..	11
18th .. .. .	..	5
19th .. .. .	..	5
	100	100

*Cost of raising the crop (Dharwar chillies).*

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional cash expenditure on bullocks ..	13	6	0
2. 20 cart-loads of Farm Yard Manure and 1,600 lbs. of Safflower cake .. .. .	92	0	0
3. Insecticides .. .. .	6	7	0
4. Irrigations (8 months) .. .. .	12	0	0
5. Implements (Depreciation, repairs, etc.) ..	8	0	0
6. Octroi .. .. .	3	9	0
7. Interest at 9 per cent. on Rs. 110 for 8 months, ..	6	9	0
	<hr/>		
	Total	141	15 0
	<i>Receipts per acre.</i>		
7,410 lbs. .. .. .	694	11	0
	<hr/>		
	Farm income	552	12 0

**(4) DOUBLE BEANS.**

Double Beans is a leguminous crop. It occupies the land for a long time, i.e., for 7 to 8 months. The crop is dibbled after the first rains. Green pods are ready after 5 months and are sold as vegetables and have a ready market.

*Details of the crop grown in the year 1924-25.*

(Dibbling being done in the latter half of July.)

*Preparatory tillage.*—The land was ploughed to a depth of 7 to 8 inches by the turnwrest plough as soon as the previous crop was harvested and brought to fine tilth by subsequent discing and harrowings and left in that condition till the rains started.

*Manuring.*—20 Cart-loads of Farm Yard Manure were spread evenly on the land after ploughing and worked in the soil by discing and harrowings.

*Planting.*—After the monsoon starts there is sufficient moisture for sowing and when soil comes to workable condition the land is marked 5' × 5' by a marker both ways. Seeds are dibbled at the intersections at the rate of 2 seeds at each place. The seed rate is 8 lbs. per acre. During the year the sowing condition was reached by the end of July.

*Irrigation.*—Irrigation usually starts at the close of the monsoon season and afterwards it is given at an interval of 10 days. If there is a long break in the monsoon and when plants begin to suffer irrigation is given in the rainy season also. Land is laid out for irrigation by the furrow method, furrows being 5' apart, before the crop is trailed. During the year nine irrigations were given, one in the kharif season and the remaining eight in the rabi season.

*After-care.*—The crop is intercultured by a blade harrow or a tooth cultivator as required during the rainy season till the creepers are supported. One interculturing was given during the year. Support is given when the creepers begin to spread by fixing the bamboos in the soil near the plant and trailing the creepers on the same. During the year support was given in the 1st week of September. After supporting the plants no interculturing is done but if necessary hand weeding is given. During the year only one hand weeding was given.

*Harvesting.*—Harvesting began in the last week of December and continued till the 2nd week of February. Well filled pods are picked as they get ready.

*Marketing.*—Over ripe and unfilled pods should not be sent to the market, as the mixture brings down the price of the stuff. The produce is not available in the market during the rains, for the remaining part of the year it is available in the market and fetches good price.





*Distribution of yield per week during the harvesting.*

Week.						Per cent.
1st	..	..	..	..	..	5
2nd	..	..	..	..	..	6
3rd	..	..	..	..	..	8
4th	..	..	..	..	..	10
5th	..	..	..	..	..	8
6th	..	..	..	..	..	7
7th	..	..	..	..	..	47
8th	..	..	..	..	..	7
9th	..	..	..	..	..	2
						100

*Cost of raising the crop (Double Beans).*

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional cash expenditure on bullocks	..	13	6 0
2. 20 cart-loads Farm Yard Manure	..	50	0 0
3. Irrigation charges (8 months)	..	12	0 0
4. Bamboos for support :— (2,160 Bamboos are required, its cost Rs. 216. These last for three years therefore yearly cost Rs. 72	..	72	0 0
5. Octroi	..	3	9 0
6. Implement charges (Depreciation, interest, repairs, etc.)	..	8	0 0
7. Interest on Rs. 61 for 8 months and Rs. 144 propor- tional yearly expenditure on Bamboos for one year @ 9 per cent.	..	16	12 0
Total	..	175	11 0

*Receipts per acre.*

7,448 lbs. pods and 336 lbs. seeds	..	665	14 0
Farm income	..	490	3 0

## (5) FRENCH BEANS.

This is a short season leguminous crop. It requires 2½ months only. Being a short season crop it is always followed by a second crop in the same year. The variety grown is what is locally known as "Shravan Ghevada."

*Details of the crop grown in the year 1925-26.*

(Sowing being done in the month of June.)

*Preparatory tillage.*—Land was ploughed just after the harvest of the previous crop to a depth of 7 to 8 inches and brought to fine tilth by subsequent operations of discing and harrowing.

*Manuring.*—20 cart-loads of Farm Yard Manure per acre were given after ploughing the land and this was worked into the soil by discing and harrowing. No manure is necessary for the crop following this crop. If the crop be the sole crop on the land during the year, manuring is hardly worth-while.

*Sowing.*—The crop was sown in the monsoon by a drill with coulters 18" apart, seed rate being 40 lbs. per acre. If sown on irrigation in May or early in June for catching the early market or if sown as a cold weather crop it is sown by ridge and furrow method to facilitate irrigation. Sowing is done, in the furrow opened by a ridger or plough. During the year the crop was sown by the middle of June behind the ridger before the rains started.

*Irrigation.*—Watering is given if the crop is grown at any other times than in the rains. During the year two irrigations were given before the rains started.

*After-tillage.*—If the crop is grown as a rainfed crop, interculturing is given by a blade hoe or a tooth cultivator.

If the crop is grown by the ridge and furrow method, only a hand weeding is given before the rains, as working of implements is not possible. During the year two hand weedings were given before the rains started. Afterwards one interculturing was given by bullock hoes.

*Harvesting.*—Pickings began six weeks after sowing and lasted for three weeks. Tender pods are picked every alternate day.

*Marketing.*—Great care is necessary in picking the pods for the market as delay in picking even for a day spoils the quality by making them too fibrous which reduces the price. Picking of too tender pods are also undesirable as it reduces the yield. The produce is available in the market throughout the year, but fetches a very good price in the cold weather.

*Labour units for different operations.*

Items.				Labour required per acre.			
				Men.	Women.	Bullocks.	
		M.	W.	B.			
1. Preparatory tillage—							
Ploughing ..	..	4	0	8			
Dicing ..	..	$\frac{1}{2}$	0	1			
Two harrowings ..	..	1	0	2			
		5 $\frac{1}{2}$	0	11	5 $\frac{1}{2}$	0	11
2. Manuring. (20 cart-loads F.Y.M.) ..	..				0	2	0
3. Planting—							
(Sowing behind the ridge r) ..	..				3	0	2
4. Irrigation (2)							
(No irrigation after rains) ..	..				5	0	0
5. After tillage and care—							
Two weedings ..	..	0	8	0			
One interculturing after the rains ..	..	1	0	1			
		1	8	1	1	8	1
6. Harvesting—							
Picking of green pods 7,878 lbs. ..	..	0	77	0			
Up-rooting ..	..	0	5	0			
		0	82	0	0	82	0
Total labour ..	..	14 $\frac{1}{2}$	92	14	14 $\frac{1}{2}$	92	14
Total units ..	..	60 $\frac{1}{2}$	—	14	60 $\frac{1}{2}$	—	14

*Yield per acre.*

Year.	Outturn per acre.
1923-24 ..	.. 4,076 lbs. pods
1924-25 ..	.. 2,948 lbs. pods (dry crop suffered due to drought).
1925-26 ..	.. 7,878 lbs. pods

NOTE.—In the year 1923-24 the crop was sown in the months of May, June and August; ten gunthas were sown at each time. May sowing gave 7,056 lbs. pods per acre; June sowing gave 4,980 lbs. per acre while August sowing was a total failure, the yield being only 192 lbs. pods per acre. Owing to rains at the time of flowering the crop failed.

1924-25.—Less yield is due to the crop being a rainfed crop and no irrigation being given when there was drought.

1925-26.—The crop was sown in June at the interval of a week, ten gunthas each time. The crop sown in the second week of June gave 9,016 lbs. of pods per acre while that sown in the third week of June gave 6,740 lbs. of pods.

Percentage of yield per week during the harvesting period :—

Week.					Approximate per cent.
First	..	..	..	..	4
Second	..	..	..	..	52
Third	..	..	..	..	37
Fourth	..	..	..	..	7
					100

*Cost of raising the crop (French Beans).*

Items.	Cost per acre.		
	Rs.	s.	p.
1. Proportional cash expenditure on bullocks	..	13	6 0
2. 20 cart-loads Farm Yard Manure	..	50	0 0
3. 40 lbs. Seed	..	5	0 0
4. Irrigation charges	..	3	0 0
5. Octroi duty	..	3	12 0
6. Implement charges	..	8	0 0
7. Interest on Rs. 60 for 3 months at 9 per cent.	..	1	8 0
Total	..	84	10 0

*Receipts per acre.*

7,878 lbs. of pods	..	246	3 0
Farm income	..	161	9 0



Items.	Labour required per acre.		
	Men.	Women.	Bullocks.
	M. W. B.		
2. <i>Manuring</i> —			
Spreading 20 cart-loads of Farm Yard Manure .. ..	0	2	0
Spreading and mixing 400 lbs. cake.	0	8	0
	0	10	0
3. <i>Planting</i> —			
Preparing beds .. ..	6	0	2
Planting .. ..	0	28	0
	6	28	2
4. <i>Waterings</i> (11) .. ..	22	4	..
5. <i>After tillage and care</i> —			
2 sprayings .. ..	4	1	0
4 stirrings .. ..	0	19	0
	4	20	0
6. <i>Harvesting 1,324 lbs.</i> .. ..	0	36	0
	37½	98	13
<b>Total labour</b> ..	37½	98	13
	86½	..	13
<b>Total units</b> ..	86½	..	13

*Cost of raising the crop (Garlic).*

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional cash expenditure on bullocks ..	13	6	0
2. 20 cart-loads Farm Yard Manure and 400 lbs. cake ..	75	0	0
3. Seed charges .. ..	62	0	0
4. Insecticides .. ..	3	11	0
5. Irrigation charges (8 months) .. ..	12	0	0
6. Octroi duty .. ..	0	12	0
7. Implements (Depreciation, repairs, etc.) ..	8	0	0
8. Interest on Rs. 150 for 8 months at 9 per cent. ..	9	0	0
<b>Total</b> ..	183	13	0

*Receipt per acre.*

€ 1,324 lbs. of the produce .. ..	82	12	0
<b>Loss</b> ..	101	1	0

The loss was due to the attack of thrips.

**(7) GINGER.**

Ginger is grown in Gujarat, on the coast lands in Thana District and to a very small extent in Satara District. Except in some part in North Gujarat the crop is sold green. Ginger is a very delicate crop and requires much care in raising. The underground part does not develop fully if the soil sets hard and cracks. On the College Farm on the clay loam type of soil under canal irrigation the crop never developed well and was always a failure due to poor germination and poor growth. During the years 1923-24 and 1924-25 the crop was grown by the bed method and the germination was 42 per cent. and 36 per cent. respectively, during the year 1925-26 the crop was grown by the broad-ridge method and the germination was 82 per cent. The reason was that the soil used to set hard after irrigation. By modifying the method of irrigation so as to prevent hardening a crop of ginger was raised successfully on the College Farm. This method is known as the broad-ridge method and is fully described in the Bulletin No. 135 of the Department of Agriculture, B. P.

*Details of the crop grown in the year 1925-26.*

(The crop was planted by the middle of May.)

*Preparatory tillage.*—The land was ploughed after the harvest of the previous crop to a depth of 7 to 8 inches and brought to fine tilth by subsequent operations of clod crushing, discing and harrowings. If the soil is cloddy it may be necessary to irrigate the field after ploughing and then to bring it to a fine tilth by discing and harrowings. If the clods are hard, breaking them by a clod crusher becomes very expensive and with all the expense the desired tilth may not be obtained. It is absolutely necessary to bring the soil to the finest tilth for a rhizome-crop like the one under discussion.

*Manuring.*—Twenty cart-loads of Farm Yard Manure were added and well mixed with the soil at the time of the preparatory tillage. Top-dressing of cake was given at the rate of 1,600 lbs. per acre in two doses. First dose was given a month and a half after planting and the second dose was given a month and a half after the first dose.

The cake should be finely powdered, uniformly spread and thoroughly mixed with the soil each time.

*Planting.*—The method of laying out the field that has been found successful for this crop under clay loam soil and canal irrigation is known as the broad-ridge method. The land is laid out into ridges and furrows, the furrows being 5' apart and the intermediate soil is occupied by the ridge which is three feet wide. The top of the ridge is levelled and ginger sets are planted on the flat ridge one foot apart each way. For planting,

well developed sprouted and disease free sets are selected. Sprouting is induced by heaping the seed-rhizomes in a cool place. The heap is covered with leaves and is plastered by cow-dung and earth. In about a month and a half sets begin to sprout. Planting is done by about the middle of May. The seed rate required is about 1,200 lbs. During the year 944 lbs. were required.

*Irrigation.*—Irrigation is given just after planting and is repeated every ten days throughout the growing period except during the rains when it is given as required. During the year 17 irrigations were given, 4 in the hot season, 7 during the monsoon and 6 in the rabi season. Watering is done through the furrows, the water being allowed to run in the furrows until the ridges in the middle are sufficiently soaked by percolation.

*After-care.*—After-care consists in only keeping the land clean of weeds, levelling and deepening the furrows to ensure thorough irrigation. During the year 4 weedings were given.

Sets were planted 3 inches deep and the crop was earthed-up by digging the channels, to avoid exposure of rhizomes that grow in upper layers, as if the rhizomes are once exposed they do not grow properly. Earthing-up was done at the time of applying the second dose of cake.

The crop requires about seven to eight months to ripen. When the leaves turn yellow and fall down, the crop shows the signs of ripening. The greatest enemy of the ginger-crop is the rhizome rot. The disease is carried through the sets and therefore great care should be taken in rejecting the sets that are affected by the disease.

*Marketing.*—The crop is marketed either green or cured. In Poona (or near a big city) there is always a demand for the green stuff. Poona merchants import it from Bombay. If to be sold green it should be harvested at any time from November onwards. Harvesting depends upon the prevailing price. If the market is favourable the crop may be harvested early. After harvest the produce can be stored without difficulty to secure a better price later on if the market is expected to rise.

#### *Yield per acre.*

Year.	Outturn.	
	lbs.	
1923-24 .. ..	3,060	(Bed method).
1924-25 .. ..	1,720	(Bed method).
1925-26 .. ..	11,402	(Broad-ridge method).

NOTE.—Poor yield in the years 1923-24 and 1924-25 was due to poor germination and poor plant growth due to this method of planting the crop.



*Labour units for different operations.*

Items.	Labour required per acre.		
	Men.	Women.	Bullocks.
	M. W. B.		
1. <i>Preparatory tillage</i> —			
Ploughing .. .. .	4	0	8
Clod crushing .. .. .	$\frac{1}{2}$	0	1
Digging .. .. .	$\frac{1}{2}$	0	1
2 harrowings .. .. .	1	0	2
	6	0	12
2. <i>Manuring</i> —	6	..	12
Spreading 20 cart-loads Farm Yard Manure .. .. .	0	3	0
Spreading Cake 1,600 lbs. per acre .. .. .	0	12	0
	0	15	0
3. <i>Planting</i> —	..	15	..
Opening water channels .. .. .	2	0	2
Levelling ridges .. .. .	2	8	0
Marking .. .. .	$1\frac{1}{2}$	0	0
Digging holes .. .. .	4	0	0
Preparing sets .. .. .	0	4	0
Planting .. .. .	0	10	0
	$9\frac{1}{2}$	22	2
4. <i>Irrigation</i> (17 waterings) .. .. .	$26\frac{1}{2}$	2	..
5. <i>After-care</i> —			
Levelling ridges .. .. .	4	8	0
4 weedings .. .. .	0	59	0
Earthing-up .. .. .	9	16	0
	13	83	0
6. <i>Harvesting</i> —	13	83	..
Digging .. .. .	25	0	0
Cleaning .. .. .	0	28	0
	25	28	0
<b>Total labour</b> .. .. .	<b>80</b>	<b>150</b>	<b>14</b>
<b>Total units</b> .. .. .	<b>155</b>	<b>..</b>	<b>14</b>

*Cost of raising the crop (Ginger).*

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional cash expenditure on bullocks ..	13	6	0
2. 20 cart-loads of Farm Yard Manure and 1,600 lbs. of Cake .. .. .	92	3	0
3. Seed charges 944 lbs. .. .. .	94	6	0

Items.	Cost per acre.		
	Rs.	a.	p.
4. Irrigation charges (8 months crop <i>plus</i> half the charges of the hot season) ..	15	8	0
5. Octroi .. .. .	5	7	0
6. Implements (Depreciation, repairs, etc.) ..	8	0	0
7. Interest at 9 per cent. on Rs. 200 for one year ..	18	0	0
	<hr/>		
Total ..	246	14	0
<i>Receipts per acre.</i>			
11,402 lbs. of Green ginger .. .. .	1,140	3	0
	<hr/>		
Farm income ..	893	5	0

**(8) GUVAR MIXTURE.**

Guvar-mixture consists of Guvar, Bhindi and Dodka. The crop is grown in all the seasons except during the cold weather. There are different varieties of Guvar, viz., Sotia, Makhania, Pardeshi and Local.

Makhania is the best variety out of the lot both from yield and market point of view.

*Details of the crop grown in the year 1924-25.*

(The crop sown in the 3rd week of July.)

*Preparatory tillage.*—The land was ploughed to a depth of 7 to 8 inches after the harvest of the previous crop. It is brought to a fine tilth by subsequent operations of discing and harrowings.

*Manuring.*—Twenty cart-loads of Farm Yard Manure were given after ploughing and were mixed in the soil by subsequent discing and harrowing.

*Planting.*—Beds were prepared 12' × 6'. Guvar was broad-casted in the bed at the rate of 20 lbs. per acre.

Bhindi was dibbled on all sides of the beds except the water channel side at the rate of 4 lbs. per acre.

Dodaka were dibbled in the centre of the bed in two places 4' apart at the rate of 1 lb. per acre. The only precaution necessary with the Guvar crop is that the seed for sowing should be one year old, or else germination is very poor. The outer skin of the seed is very tough and hence a little rubbing with the brick pieces is necessary to ensure early germination. The rubbing is done by taking the seeds in an iron basket and gently rubbing them with brick-pieces.

*Irrigation.*—Irrigation is given when required during the rains and at regular intervals in other seasons. In the hot season a 10 days' interval of irrigation becomes too long and the crop does not thrive well. The crop grown in the kharif season during the year was given two irrigations.

*After-care.*—The crop was weeded only once during the monsoon season. If the crop becomes thick it should be thinned out to nearly one foot between plants. The only disease troubling Guvar and Bhindi is Mildew.

*Harvesting.*—Guvar took two months to come to harvest and the harvesting lasted for two months.

Bhindi takes about six weeks to come to harvest and the harvesting lasts for about a month.

Dodaka takes about the same time as Bhindi to come to harvest and harvesting lasts for four to five weeks.

All these crops should be harvested every alternate day when they are in the tender stage, otherwise they get too fibrous and useless.

*Marketing.*—Makhania Guvar has got a good market in Poona throughout the year. It always fetches a better price than the local variety.

*Labour units for different operations.*

Items.	Labour required per acre.		
	Men.	Women.	Bullocks.
	M. W. B.		
1. <i>Preparatory tillage</i> —			
Ploughing .. ..	4	0	8
Clod crushing .. ..	1	0	2
2 discings .. ..	1	0	2
Harrowing .. ..	½	0	1
	6½	0	13
2. <i>Manuring</i> —			
Spreading 20 cart-loads Farm Yard Manure .. ..	..	2	..
3. <i>Planting</i> —			
Preparing beds .. ..	8	0	4
Broadcasting .. ..	1	5	0
	9	5	4
4. <i>Waterings (3)</i> —	..	5	..
5. <i>After tillage and care</i> —			
1 weeding .. ..	0	34	0
1 spraying .. ..	4	4	0
	4	38	0
6. <i>Harvesting</i> —			
237 lbs. Dodaka	Picking	..	..
426 lbs. Bhindi			
3,534 lbs. Guvar			
	4	38	..
	24½	149	17
	99	..	17

*Yield per acre.*

Year.	Outturn per acre.		
	Bhindi.	Guvar.	Dodaka.
	lbs.	lbs.	lbs.
1923-24 .. ..	2,896	1,170	....
1924-25 .. ..	426	3,534	237
1925-26 .. ..	278	2,901	84

NOTE.—Low yield of Bhindi in the years 1924-25 and 1925-26 was due to the attack of Mildew.

*Distribution of yield.*

Week.	Approximate per cent.		
	Bhindi.	Guvar.	Dodaka.
	lbs.	lbs.	lbs.
1st .. .. .	3	3	40
2nd .. .. .	22	10	35
3rd .. .. .	26	17	7
4th .. .. .	14	1	7
5th .. .. .	26	24	11
6th .. .. .	9	17	....
7th .. .. .	....	10	....
8th .. .. .	....	12	....
9th .. .. .	....	9	....

*Cost of raising the crop (Guvar Mixture).*

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional cash expenditure on bullocks ..	13	6	0
2. 20 cart-loads of Farm Yard Manure ..	50	0	0
3. Seed charges .. .. .	27	0	0
4. Insecticides .. .. .	3	4	0
5. Irrigation (Kharif season) .. .. .	3	0	0
6. Octroi .. .. .	2	1	0
7. Implements (Depreciation, repairs, etc.) ..	8	0	0
8. Interest at 9 per cent. on Rs. 91 for six months ..	4	1	0
<b>Total</b> ..	<b>110</b>	<b>12</b>	<b>0</b>

*Receipts per acre.*

3,534 lbs. Guvar pods and 30 lbs. seeds ..	}	302	11	0
426 lbs. Bhindi and 10 lbs. seeds ..				
237 lbs. Dodaka and 1½ lbs. seeds ..				
<b>Farm income</b> ..	<b>191</b>	<b>15</b>	<b>0</b>	

**KHIRA (Cucumber white small).**

Khira (cucumber) is a short season crop. It is well fitted for a mixture with cucurbits like Dudhia or Bhopala as it is over before the main crop occupies the land. It is also grown in sugarcane fields as a subordinate crop in the hot season. It can also be grown as a head-land crop on the bunding line of the principal crop. Khira crop as a single crop is always followed by another crop in the same year.

*Details of the crop grown in the year 1924-25.*

(Crop being sown in the 2nd week of May.)

*Preparatory tillage.*—Land was ploughed for the crop to a depth of 7 to 8 inches by the turnwrest plough as soon as the previous crop was harvested. The land was then brought to fine tilth by subsequent operations of discing and harrowing.

*Manuring.*—Twenty cart-loads of Farm Yard Manure were spread evenly after ploughing the land and worked in the soil at the time of discing and harrowing.

*Planting.*—Shallow pits were dug 5' apart both ways. Rubbish was collected and burnt over the pits. Basins were then prepared and seeds were dibbled at the rate of 3 lbs. per acre or 8 to 12 seeds per basin. These are rather numerous but they are necessary as many plants are destroyed by the red pumpkin beetle. After the crop gets established and insect trouble is over plants are thinned out to 3 to 4 per basin. During the year crop was sown by the middle of May.

*Irrigation.*—Watering is given at the time of planting in all seasons except in the monsoon. Subsequent waterings are given at an interval of 10 days.

In monsoon the crop is taken as a rainfed crop. During the year 5 irrigations were given; three in the hot season and two during the rains.

*After-care.*—Basins are weeded as necessary. During the year two weedings were given.

The crop is liable to be badly attacked by the red pumpkin beetle in the early stage of the plant's growth. Fruit borer is also a bad pest and damages the crop to a very great extent.

For red pumpkin beetle stomach poison like Lead arsenate or Paris green is used. Picking and destroying the insects in the morning also checks the attack to a very great extent. For fruit borer the only remedy is to pick out the affected fruits and destroy them. During the year there was no trouble from insect pests.

*Harvesting.*—The crop gets ready within about 6 to 7 weeks' time. The fruits are collected as they become ready. Picking every alternate day is essential. Harvesting continues for about one month. During the year harvesting began by the 4th week of June and lasted for one month.

*Marketing.*—Fruits that are sent to the market should be well cleaned and should not be over-ripe. Over-ripe fruits develop a red colour and the skin becomes thickened, and such fruits are not liked in the market. The market is glutted during the rainy season when the rate is always low. Experience shows that if the crop is planted in May the produce can be put on the market earlier (i.e. before the produce of the general crop, planted during the rains, comes into the market) which means a better price.

*Labour units for different operations.*

Items.				Labour required per acre.		
				Men.	Women.	Bullocks.
M. W. B.						
1. Preparatory tillage—						
Ploughing .. .. .	..	..	4 0 8			
Discing .. .. .	..	..	$\frac{1}{2}$ 0 1			
Harrowing .. .. .	..	..	$\frac{1}{2}$ 0 1			
			5 0 10	5	..	10
2. Manuring—						
Spreading 20 cart-loads Farm Yard Manure .. .. .	..	..	....	..	2	..
3. Planting—						
Digging pits and opening water channel .. .. .	..	..	6 3 1			
Carting and burning material .. .. .	..	..	1 $\frac{1}{2}$ 12 $\frac{1}{2}$ 3			
Dibbling .. .. .	..	..	0 6 0			
Opening channels from basins to water channels .. .. .	..	..	0 4 0			
			7 $\frac{1}{2}$ 25 $\frac{1}{2}$ 4	7 $\frac{1}{2}$	25 $\frac{1}{2}$	4
4. Irrigation (5)—	..	..	....	3 $\frac{1}{2}$	11	..
5. After-care—						
2 weedings .. .. .	..	..	0 7 0			
Repairing rings .. .. .	..	..	5 6 0			
Thinning .. .. .	..	..	0 2 0			
			5 15 0	5	15	..
6. Harvesting—10,704 lbs. .. .. .	..	..	....	..	36	..
			Total labour ..	21	89 $\frac{1}{2}$	14
			Total units ..	67	..	14

*Outturn per acre.*

Year.			Outturn.
			lbs.
1923-24	..	..	11,964
1924-25	..	..	10,704
1925-26	..	..	1,208 (failure due to severe red pumpkin beetle attack in the early stage).

*Approximate percentage of yield per week during the harvesting season.*

			Outturn.
			Per cent.
1st week	..	..	32
2nd week	..	..	36
3rd week	..	..	24
4th week	..	..	8

100

*Cost of raising the crop (Khira).*

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional cash expenditure on bullocks	..	13	6 0
2. Twenty cart-loads of Farm Yard Manure	..	50	0 0
3. Seed charges	..	8	0 0
4. Irrigation charges	..	6	8 0
5. Octroi charges	..	5	1 0
6. Implement charges	..	8	0 0
7. Interest on Rs. 70 for 3 months at 9 per cent.	..	1	9 0
Total	..	92	8 0

*Receipts per acre.*

10,704 lbs. fruits	..	..	..	..	501	12	0
Farm income	..	409	4	0			





Items.	Labour required per acre.		
	Men.	Women.	Bullocks.
	M.	W.	B.
2. <i>Planting</i> —			
Preparing beds ..	8	0	4
Broad-casting and levelling ..	0	10	0
	8	10	4
3. <i>Waterings</i> (5) ..	12	..	..
4. <i>Harvesting</i> —			
2,888 lbs. Methi } ..	..	35	..
1,048 lbs. Coriander }			
Total labour ..	25	45	14
Total units ..	47½	..	14

*Outturn per acre.*

Year.	Methi.	Bundles.	Coriander.	Bundles.
	lbs.		lbs.	
1923-24 ..	2,988	3,116	384	764
1924-25 ..	2,888	3,816	1,048	3,032

*Cost of raising the crop—(Methi mixture).*

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional cash expenditure on bullocks ..	13	6	0
2. Seed ..	6	0	0
3. Irrigation charges (Rabi season) ..	5	0	0
4. Implements (Depreciation, repairs, etc.) ..	8	0	0
5. Interest at 9 per cent. on Rs. 17 for 2 months ..	0	4	0
Total ..	32	10	0

*Receipts per acre.*

2,888 lbs. Methi	} ..	..	52	12	0
1,048 lbs. Coriander		..	..	..	..
Farm income ..	..	20	2	0	0





*Cost of raising the crop—(Moqan)*

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional cash expenditure on bullocks ..	13	6	0
2. Manure 20 cart-loads Farm Yard Manure and 400 lbs. Cake .. .. .	60	8	0
3. Seed charges .. .. .	12	0	0
4. Insecticides .. .. .	22	15	0
5. Irrigation charges (Rabi season) ..	5	0	0
6. Octroi charges .. .. .	3	12	0
7. Implement charges (depreciation, repairs, etc.) ..	8	0	0
8. Interest on Rs. 106 for four months at 9 per cent. . .	3	3	0
	<hr/>		
Total ..	128	12	0
<i>Receipts per acre.</i>			
7,862 lbs. .. .. .	245	11	0
	<hr/>		
Farm income ..	116	15	0



Items.	Labour required per acre.		
	Men.	Women.	Bullocks.
	M. W. B.		
3. <i>After tillage and care—</i> Interculturing by bullock hoe .. .. .	3	..	3
4. <i>Harvesting—</i> Cutting .. .. . 10 0 0 Tying bundles .. .. . 3 0 0			
	13	..	..
Total labour ..	19½	..	12½
Total units ..	19½	..	13 0

*Yield per acre.*

Year.	Outturn in lbs.	Remarks.
	Dry-weight.	
1923-24 .. .. .	10,992	Very high outturn is due to heavy manuring of the previous crops.
1924-25 .. .. .	14,350	
1925-26 .. .. .	15,920	

*Cost of production.*

	Cost per acre.
	Rs. a. p.
1. Proportional cash expenditure on bullocks ..	13 6 0
2. Seed charges .. .. .	3 2 0
3. Implement charges (depreciation, repairs, etc.) ..	8 0 0
4. Interest on Rs. 15 for five months at 9 per cent. ..	0 9 0
Total ..	25 1 0

*Receipts per acre.*

Pro-rata value of fodder as per receipt statement on page 73 .. .. .	88 5 0
Farm income ..	63 4 0

**(13) ONION FOR BULBS.**

This is a winter season crop. It is grown throughout the year if wanted for green use. Bulbs for the monsoon planted crop do not keep well in storage.

*Details of the crop grown in the year 1925-26.*

(Transplanting was done at the end of October.)

*Preparatory tillage.*—This consisted in ploughing 7 to 8 inches deep and bringing the land to a fine tilth by subsequent operations of discing and harrowings.

*Manuring.*—20 cart-loads of Farm Yard Manure were worked into the soil at the time of preparatory tillage. A top-dressing of Safflower cake was given in two doses at the rate of 1,000 lbs. per acre. First dose was given three weeks after planting and the second dose one month after the first dose.

*Planting.*—Seedlings were raised in the seed bed. Ten pounds of onion seeds were sown in  $1\frac{1}{2}$  gunthas to plant one acre. Seedlings took six weeks to reach the transplanting stage. Transplanting was done in the last week of October. Ridges and furrows were prepared 18" apart and seedlings were transplanted on both the sides of the ridges, four inches apart. Transplanting was done while water was standing in the furrows.

*Irrigation.*—The crop was irrigated at regular intervals. During this year twelve waterings were given, ten in the rabi season and two in the hot season.

*After-care.*—The plot was weeded and stirred four times. The necks of the plants were broken by planking the crop when they began to thicken. The flower shoots were removed as they formed. If the necks are not broken and flowering shoots not removed, the bulbs do not develop to the normal size.

The serious pest of the crop is thrips. It is found on the main leaf covered by side leaves at the joint. This does not allow spraying material to reach the pest. Frequent sprayings are therefore necessary to check the pest. The insecticide used is Kerosine emulsion.

During the year the attack of thrips was very mild. Four sprayings were given during the year against thrips.

It has been observed that if the attack is severe the pest is not controlled by sprayings.

*Harvesting.*—The crop took  $5\frac{1}{2}$  months to mature.

*Marketing.*—At harvest time, the price is very low. The best price is realised during the rains and hence it is necessary to store the produce to get a better price if there is sufficient quantity to store.



*Labour units for different operations*

Items.	Labour required per acre.		
	Men.	Women.	Bullocks.
	M.	W.	B.
<i>Preparatory tillage—</i>			
Ploughing .. .. .	4	0	8
Dis'ing .. .. .	$\frac{1}{2}$	0	1
2 harrowings .. .. .	1	0	2
	5 $\frac{1}{2}$	0	11
<i>Manuring—</i>			
Spreading 20 cart-loads of Farm Yard Manure .. .. .	0	2	0
Spreading and mixing Safflower cake .. .. .	0	8	0
	0	10	0
<i>Planting—</i>			
Ridging by B. T. 2 .. .. .	4	0	4
Transplanting .. .. .	0	22	0
	4	22	4
<i>Waterings (12)</i> .. .. .	14	12	4
<i>After tillage and care—</i>			
4 weedings .. .. .	0	25	0
4 sprayings .. .. .	9	0	0
Breaking plants by a plank .. .. .	$\frac{1}{4}$	0	$\frac{1}{2}$
Removing the tops .. .. .	0	4	0
	9 $\frac{1}{4}$	29	$\frac{1}{2}$
<i>Harvesting—</i>			
23,472 lbs. bulbs .. .. .	..	24	..
Total labour .. .. .	32 $\frac{1}{2}$	97	15 $\frac{1}{2}$
Total units .. .. .	81	..	15 $\frac{1}{2}$

*Yield per acre.*

Year.	Outturn per acre.
	lbs.
1923-24 .. .. .	16,160 bulbs.
1924-25 .. .. .	5,554 ..
1925-26 .. .. .	23,472 ..

NOTE.—1923-24. The crop was attacked by thrips 1 $\frac{1}{2}$  months after planting; the attack was not severe.

1924-25. Severe attack of thrips just after transplanting caused failure of the crop.

*Cost of raising the crop (Onion for Bulbs).*

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional cash expenditure on bullocks ..	13	6	0
2. Manure 20 cart-loads Farm Yard Manure and 1,000 lbs. of cake .. ..	75	0	0
3. Seed charges .. ..	10	0	0
4. Insecticides .. ..	6	12	0
5. Irrigation charges .. ..	12	0	0
6. Octroi charges .. ..	11	4	0
7. Implement charges .. ..	8	0	0
8. Interest charges on Rs. 102 for eight months at 9 per cent. .. ..	6	2	0
<b>Total</b> ..	<b>142</b>	<b>8</b>	<b>0</b>

*Receipts per acre.*

23,472 lbs. bulbs .. ..	366	12	0
<b>Farm income</b> ..	<b>224</b>	<b>4</b>	<b>0</b>



Items.	Labour required per acre.		
	Men.	Women.	Bullocks.
	M.	W.	B.
2. <i>Manuring</i> — Spreading 20 cartloads of Farm Yard Manure .. .. .			2
3. <i>Planting</i> — Ridging .. .. . Cutting Onions .. .. . Planting .. .. .	3 0 0	0 3 6	3 0 0
	3	9	3
4. <i>Waterings</i> (14) .. .. .	20	8	..
5. <i>After tillage and care</i> — Earthing-up twice .. .. . Cleaning the soil from the buried plants .. .. .	4 0	0 2	4 0
	4	2	4
6. <i>Harvesting</i> 236 lbs. of seed— Collecting seeds .. .. . Uprooting .. .. . Threshing .. .. .	0 0 0	8 14 8	0 0 0
	0	30	0
Total labour .. .. .	35	51	23
Total units .. .. .	60½	..	23.

*Yield per acre.*

Year.	Output.
	lbs.
1923-24 .. .. .	84 Failure due to severe
1924-25 .. .. .	236 attack of thrips.

*Cost of raising the crop (Onion for seeds).*

Items.	Cost per acre.
	Rs. a. p.
1. Proportional cash expenditure on bullocks ..	13 6 0
2. Manure 20 cartloads of Farm Yard Manure ..	50 0 0
3. Seed charges .. .. .	39 8 0
4. Irrigations (Rabi and hot seasons) .. .. .	12 0 0
5. Implements (Depreciation repairs, etc.) ..	8 0 0
6. Interest at 9 per cent. on Rs. 100 for 7 months ..	5 4 0
Total .. .. .	128 2 0

*Receipts per acre.*

286 lbs. seed .. .. .	472 0 0
Farm income .. .. .	343 14 0

## (15) SURAN (Elephant foot).

The Suran crop is grown extensively near Surat and Baroda in Gujarat on well irrigation and well drained sandy loam types of soil. The crop is not grown in the Deccan and vegetable dealers in Poona order it out from Bombay. This crop has been tried on the College Farm with success and has got a ready sale in the market. The crop has a good future in the Deccan.

The peculiarity of this crop is that (compared with other vegetables) the edible part contains a larger percentage of dry matter and is rich in food ingredients. The analysis\* of the product shows a moisture content of 78 per cent. while the dry matter consists of:—

	Per cent.
Ether extract .. .. .	0·50
Albuminoids* .. .. .	12·18
Soluble carbohydrates .. .. .	76·28
Woody fibre .. .. .	4·07
Ash .. .. .	7·04
*Containing N. .. .. .	1·90
„ Sand .. .. .	0·18

On the dry matter basis the crop yielded 8,600 lbs. of dry matter in the year 1923-24, 8,000 lbs. in the year 1924-25 and 10,600 lbs. in the year 1925-26 and it is thus one of the heaviest yielding food crops and, as such, deserves increased attention.

The Suran was grown on the College Farm according to the bed method. As this is an underground crop, the broad ridge method may prove better but it has not yet been tried.

*Details of the crop grown in the year 1923-24.*

(The crop was planted by the middle of May.)

*Preparatory tillage.*—The land for suran was ploughed after the harvest of the previous crop 7 to 8 inches deep. The soil was then pulverised by a disc harrow to bring about a fine tilth. The soil being cloddy was ploughed a second time to bring about the requisite tilth; discing and harrowing were also given.

*Manuring.*—Twenty cartloads of Farm Yard Manure were given after the first and before the second ploughing. Top-dressing of cake was given at the rate of 1,200 lbs. per acre of Safflower cake in two equal doses. First dose was given after the full germination of the crop, i.e. in the beginning of July and the second dose was given in August.

*Planting.*—The land was then laid out into beds 12' × 6' by the middle of May. Six pits 3 feet apart were then dug in each bed to a depth of 9" to 12".

In the usual course a crop of Suran requires about three to four years to come to the marketing stage. The propagation is begun with small buds from a well developed corm and to complete a cycle it takes about three to four years. The starting bud is about  $\frac{1}{2}$  to 1 oz. in

\* NOTE.—Analysis taken from the Bombay Bulletin No. 124 of 1925.

weight. This ultimately attains an average weight of about 15 lbs. after three years. On the College Farm we have attempted to grow marketable suran, three year old corms being purchased each year from Gujarat for planting.

A good corm of about 2 to 3 lbs. in weight is selected for planting. Corms are artificially germinated by keeping them under the shed in two layers one above the other with the bud upwards for about two months before planting. At the time of planting one good central bud is kept and the rest are removed. This process is absolutely necessary in the growing of this crop. If more than one bud is kept more shoots come out, and each of them produce a small deformed corm which is not liked in the market.

The prepared sets are then planted in the pits already dug in the beds and are covered up with a layer of soil 6 inches deep. San is sprinkled at the rate of 60 to 80 lbs. per acre in the beds and afterwards the beds are levelled over by a rake. The planting operation is done by the middle of May. The seed rate required was 7,236 lbs. of Suran and 60 lbs. of San.

*Irrigation.*—Irrigation is given just after planting and is continued till the rains at intervals of ten days. During the rainy season irrigation is given if necessary. After the monsoon irrigation is given regularly at ten days' interval till the crop is harvested. During the year 14 irrigations were given 4 in the hot season, 7 in the kharif season and three in the rabi season.

*After-care.*—San was cut down by the end of June when it was about three feet high, and was spread in the beds. In all five weedings were given to the crop.

*Harvesting.*—The crop may be harvested any time after the middle of October to the end of February, the rate of harvesting will depend upon the demand and price in the market.

During the year harvesting began in the latter half of November and continued up to the middle of February.

*Marketing.*—The demand is greater and the prices better when there is scarcity of other vegetables in the market and also on fast-days. In the latter half of the hot season and during the monsoon the price is always high because the market has to depend upon stored produce.

The crop should be harvested when and as required as there is always a loss in weight if stored after harvesting. The following figures will show the loss if the produce is stored after harvesting:—

	Weights.			
	lbs.			
At the start .. .. .	100			
After one day .. .. .	96			
"  two days .. .. .	93			
"  four days .. .. .	89			
"  one week .. .. .	81			
"  one month .. .. .	74			

This shows a loss of about 26 per cent, in one month.

*Labour units for different operations.*

Items. <sup>a</sup>				Labour required per acre.		
				Men.	Women.	Bullocks.
		M.	W.	B.		
1	Preparatory tillage—					
	1st ploughing ..	4	0	8		
	2nd ploughing ..	4	0	8		
	Two clod crushings ..	1	0	2		
	Two harrowings ..	1	0	2		
		10	0	20	10	0
2	Manuring—					
	Spreading 20 cartloads F.Y.M.	0	2	0		
	Spreading 1,200 lbs. safflower cake ..	0	4	0		
		0	6	0	0	6
3	Planting—					
	Preparing beds ..	3½	1	3½		
	Digging pits and preparing sets, planting and levelling of beds	26	16	0		
		29½	17	3½	29½	17
4	Irrigations (14) ..				16	24
5	After-care—					
	Breaking Sun ..	0	8	0		
	Five weedings ..	0	32	0		
		0	40	0	0	40
6	Harvesting—					
	Digging ..	40	0	0		
	Cleaning ..	0	53	0		
		40	53	0	40	53
	Total labour ..				95½	140
	Total units ..				165½	23½

*Total yield per acre.*

				Lbs.
1923-24	..	..	..	39,206
1924-25	..	..	..	46,105
1925-26	..	..	..	48,493

*Cost of raising the crop (Suran).*

Items.	Cost per acre.		
	Rs.	s.	p.
1. Proportional cash expenditure on bullocks ..	13	6	0
2. Manure charges .. ..	120	0	0
3. Seed charges .. ..	727	13	0
4. Irrigation charges .. ..	15	8	0
5. Octroi charges .. ..	18	6	0
6. Implements (depreciation, repairs, etc.) ..	8	0	0
7. Interest on Rs. 860 for one year at 9 per cent ..	77	6	0
Total ..	980	7	0
<i>Receipts per acre.</i>			
39,206 lbs. ..	2,451	0	0
Farm income..	1,470	9	0



## (16) TOBACCO.

Tobacco is an important crop of North Gujarat, Satara and Belgaum Districts in Bombay Presidency. In North Gujarat it is grown in the lighter type of soil under irrigation and in Belgaum and Satara Districts it is grown as dry crop. The crop was grown as a dry crop on the College Farm successfully. The variety tried was from Gujarat known as "Gandiu."

*Details of the crop grown during the year 1924-25.*

(Crop being transplanted in the last week of August.)

*Preparatory Tillage.*—The land was ploughed 7 to 8 inches deep and brought to a fine tilth by subsequent operations of discing and harrowing.

*Manuring.*—Twenty cart-loads of Farm Yard Manure were given at the time of preparing the land.

*Planting.*—Seedlings were raised in the nursery in the month of July ; 2 to 3 ozs. of seeds were sown in raised beds 200 to 240 square feet. The seed rate was a little high but it was necessary as many seedlings were destroyed during the rains. About four to six weeks were required for seedlings to come to the transplanting stage.

The field was marked by a Marker 3' × 3' and one seedling was planted at each intersection in the last week of August.

*After-care.*—There were gaps due to damage done by Cut-worms, so filling in of gaps was necessary in the early stage. The land was kept clean by interculturing and weeding. When the plant put out about ten to twelve leaves the main shoot was removed, and one or two bottom leaves which were spoiled were also removed. The plant then threw outside shoots (suckers) which required frequent removal at least once a week.

During the year gaps were filled thrice. Two interculturings and one hand weeding were given. Topping was done seven weeks after planting and suckers were removed ten times during the life of the crop.

*Harvesting.*—When the leaves showed brown spots and attained a golden yellow colour the crop was harvested. The crop was harvested by the end of December during the year 1924-25.

Plants were cut from the bottom and spread on the ground for drying. They were turned over in the morning for uniformity in drying. Plants took about eight days for drying and were turned over twice during the period. When the mid-rib breaks it is taken as a test of proper drying. The stuff after being dried was put into the pit for curing. Pitting was done in the early morning when there was some dew ; otherwise the leaves would have broken in the process of pitting. Bajri straw was spread at the bottom and along the sides of the pit. Dried tobacco plants were then put into the pit, the stem portion being on the side. The pit when filled was covered with bajri straw and a heavy weight was put on. For one acre of the produce a pit 8' × 8', and 4' deep was opened. The stuff was kept in the pit for 3 days ; afterwards it was taken out and the leaves

were stripped off and sorted into three types, i.e., one big with golden yellow colour, 2nd small and half broken leaves and 3rd broken stuff and rubbish. The bundles were tied and heaped under the shade in alternate layers with bajri straw. They were turned over every other day for the first week, twice in the 2nd week and once a week afterwards till they were completely dried.

*Marketing.*—There is a good market for tobacco in Poona. The rate depends upon the thickness of the leaf, strength and colour.

*Yield per acre.*

Year.	Outturn.
1924-25	.. .. 964 lbs. cured leaves.

*Labour units for different operations.*

Items.		Labour required per acre.		
		Men.	Women.	Bullocks.
1	Preparatory tillage—	M.	W.	B.
	Ploughing .. ..	4	0	8
	Clod crushing .. ..	1	0	2
	2 discings .. ..	1	0	2
	5 Harrowings .. ..	2½	0	5
		8½	0	17
2	Manuring—			
	Spreading 20 cart-loads of			
	F.Y.M. per acre.. ..	0	2	0
3	Planting—			
	Marking .. ..	3	0	0
	Transplanting .. ..	0	10	0
	3 times filling gaps .. ..	0	6	0
		3	16	0
4	After tillage—			
	2 Interculturings .. ..	3	0	4
	1 Weeding .. ..	0	2	0
	Topping .. ..	0	1	0
	10 suckerings .. ..	0	36	0
		3	39	4
5	Harvesting—			
	Cutting .. ..	0	4	0
	Spreading .. ..	0	3	0
	Collecting dry leaves .. ..	0	2	0
	Putting into pit .. ..	1½	0	0
	Tying into bundles .. ..	9	15	0
		10½	24	0
	Total labour .. ..	25	81	21
	Total units .. ..	65½	..	21

*Cost of raising the crop (Tobacco).*

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional cash expenditure on bullocks ..	13	6	0
2. Manure 20 cart-loads per acre .. .. .	50	0	0
3. Implement charges .. .. .	8	0	0
4. Interest at 9 per cent. on Rs. 61 for seven months.	3	3	0
Total ..	74	9	0

*Receipts per acre.*

964 lbs. cured leaves .. .. .	241	0	0
Farm income ..	166	7	0

## (17) TOMATO.

The tomato crop has got a market only in the big cities. The Hindu population in Poona has still not taken to ripe tomatoes. If the crop becomes a favourite there will be a lot of demand for the crop. The crop can be grown throughout the year. The variety grown on the farm is the "Bonny Best." The fruit of this variety is round, big, smooth and the colour of the ripened fruit is red. In the market such a type is liked by the customers.

*Details of the crop grown in the year 1923-24.*

(Transplanting was done in the 2nd week of June.)

*Preparatory tillage.*—The land was ploughed to a depth of 7 to 8 inches just after the harvest of the previous crop. It was then brought to a fine tilth by subsequent operations of discing and harrowing.

*Manuring.*—Twenty cart-loads of Farm Yard Manure were applied to the soil after ploughing and worked into the soil by discing and harrowing.

*Planting.*—Seedlings are raised by the raised seed-bed method. Two hundred to 240 sq. feet of area is required for raising the seedlings for one acre. The seed rate used was 10—12 ozs. Seedlings get ready in about one month's time (for details of raising the seedlings see appendix III). If the crop is transplanted in any other season than the monsoon ridges and furrows are prepared. Two seedlings were transplanted on the sides of the ridges and the crop irrigated. If the crop is transplanted during the rains the land is marked 3' × 3' and the seedlings are transplanted at each intersection.

During the year seedlings were raised in the month of May and transplanting was done by the middle of June. As the crop was transplanted before the rains commenced ridges and furrows were opened and seedlings were transplanted on the side of the ridge.

*Irrigation.*—The crop was irrigated as required. When the crop is grown during the monsoon only 4 to 5 irrigations are necessary but if grown during the cold weather about 11 irrigations are given during the life-time of the crop. During the year only 4 irrigations were given during the life time of the crop.

*After-care*—The land should be kept clean of weeds. The crop was earthed up when it was about one foot high. The usual trouble with the crop is mite-mosaic, and fruit-rot. There is no remedy for mosaic and fruit-rot. The only precaution that is possible is to pick all the affected fruits and destroy them. Fruits should not be allowed to come in contact with wet soil. During the year only three weedings were given. Mosaic trouble appeared at the close of the first picking so there was no new flowering and fruiting.

*Harvesting.*—The crop was ready for first picking in about 2½ months after planting and lasted for about another 2½ months. The fruits are picked as they ripen. The picking should be done every 3 or 4 days; if kept longer they become over-ripe.

*Marketing.*—Round, smooth, red fruits are liked in the market. The vegetable is available in the market throughout the year. Fruits are marketed in baskets and whole baskets are auctioned in the wholesale market. Retailers sell by weight.

*Labour units for different operations.*

Items.				Labour required per acre.		
				Men.	Women.	Bullocks.
1	Preparatory tillage—	M.	W.	B.		
	Ploughing .. ..	4	0	8		
	Discing .. ..	½	0	1		
	2 Harrowings .. ..	1	0	2		
		5½	0	11	5½	11
2	Manuring—					
	Spreading 20 cart loads of F.Y.M. .. ..				0	2 0
3	Planting—					
	Ridging .. ..	3	0	3		
	Repairing .. ..	2	0	0		
	Transplanting .. ..	2	8	0		
	Filling gaps .. ..	0	2	0		
		7	10	3	7	10 3
4	Waterings (4) .. ..				6	4 0
5	After-care—					
	3 Weedings .. ..	0	26	0	0	26 0
6	Harvesting—					
	Picking, 6,568 lbs... ..	0	47	0		
	Uprooting .. ..	4	2	0		
	Removing Creepers .. ..	0	2	0		
		4	51	0	4	51 0
	Total labour .. ..	22½				93 14
	Total units .. ..	69				14

*Cost of raising the crop (Tomatoes).*

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional cash expenditure on bullocks .. ..	13	6	0
2. Twenty cart loads of Farm Yard Manure .. ..	50	0	0
3. Irrigation charges (Kharif season) .. ..	3	0	0
4. Octroi charges .. ..	3	3	0
5. Implements (depreciation and repairs, etc.) .. ..	8	0	0
6. Interest on Rs. 61 for 6 months at 9 per cent. .. ..	3	10	0
	Total .. ..	81	3, 0
	<i>Receipts per acre.</i>		
6,568 lbs. of fruits .. ..	205	4	0
	Farm income .. ..	124	1 0

*Yield per acre.*

Year.	Outturn.
1923-24 ..	6,568 lbs.
1924-25 ..	6,108 „
1925-26 ..	11,052 „ The crop was above average.

*Approximate percentage of the distribution of the yield.*

Week.	Approximate per cent.	Week.	Approximate per cent.
1st ..	5	6th ..	2
2nd ..	8	7th ..	4
3rd ..	36	8th ..	5
4th ..	18	9th ..	2
5th ..	19	10th ..	1
			100

## (18) TONDALI.

This is a perennial crop. This crop is generally grown on a small scale in a compound except in the Surat District where the crop is grown extensively in Bhatt's soil near Surat. The plant bears throughout the year but the best bearing season is the monsoon.

*Details of the crop grown.*

(The crop was planted in the 2nd week of November 1922.)

*Preparatory tillage.*—The land was prepared by ploughing it 7 to 8 inches deep and subsequent operations of discing and harrowing were given.

*Manuring.*—In the first year no manuring was done. In the 2nd year, cake at the rate of 500 lbs. per acre was given. In the 3rd year, no manure was applied. In the 4th year, 20 cart-loads of Farm Yard Manure were applied. Farm Yard Manure was given before the monsoon or at the time the creepers began to sprout. Cake manure was given in two doses during the fruiting season. As the area under the crop was fallow for a number of years and as manure and river earth for the Betel (vine) crop was being stored on the plot frequent manuring was not given. Under ordinary conditions it would be advisable to give Farm Yard Manure at the rate of 20 cart-loads per acre and in addition cake at the rate of 400 to 600 lbs. both every year.

*Planting.*—Rings were prepared 10' apart each way. Selected creepers were planted in the rings. Creepers from one year old plants were selected. They should neither be too tender nor too old. The creepers were planted in the 2nd week of November 1922.

*Irrigation.*—Waterings were given in the first year when necessary during the rains and regularly in the cold weather. In the hot season watering is withheld and rest is given to the plants. Usually plants are pruned when the fruiting is over and then rings are dug out. When plants begin to sprout, manure is given; rings are levelled up and irrigation is begun. Irrigation is given until rains start and during the rainy season if necessary. The following table shows the number of irrigations given during the different years:—

1st year	..	..	..	6 waterings.
2nd year	..	..	..	14 "
3rd year	..	..	..	21 "
4th year	..	..	..	13 "

*After-care.*—Plants need support. A mandap is prepared for trailing the plants and this is repaired every year as necessary. The rings were stirred and weeded four times a year. Pruning was done in April and then rest was given to the plants.

Mildew is the common disease of the plants. The plants are dusted with sulphur to check the disease. There was no serious trouble to the crop from the disease during the years under study. Fruit borer is also common. Remedy is to pick the affected fruits and to destroy them.

*Harvesting.*—Generally the plants bear throughout the year. Experience shows that the fruiting during the rains is the best. The crop was planted in the month of November 1922 and the fruiting started during the rainy season of the next year. The crop yielded well during the monsoon seasons in all the years.

*Marketing.*—There is a good market throughout the year in Poona. Fruits are picked every other day. Fruits should not be too mature nor too tender.

Year.	Outturn per acre in lbs.
1922-23 .. ..	Planted
1923-24 .. ..	1,882½
1924-25 .. ..	9,050
1925-26 .. ..	7,267½
1926-27 .. ..	9,857

*Approximate percentage of distribution of yield.*

1st week .. 1	7th week .. 11
2nd ,, .. 6	8th ,, .. 25
3rd ,, .. 8	9th ,, .. 12
4th ,, .. 7	10th ,, .. 5
5th ,, .. 6	11th ,, .. 7
6th ,, .. 12	
	100

*Labour units for different operations per acre.*

Items.	Labour required per acre.		
	Men.	Women.	Bullocks.
<i>First year.</i>			
	M.	W.	B.
1 Preparatory tillage—			
Ploughing .. ..	5	0	10
Two harrowings .. ..	1	0	2
" .. ..	6	0	12
2 Planting—			
Preparing rings .. ..	2½	0	0
Opening water channel .. ..	1½	0	1
Planting .. ..	5	5	0
" .. ..	9	5	1
3 Waterings (6) .. ..	4	6	0
4 After-care—			
Preparing mandap .. ..	17½	0	0
Two weedings .. ..	0	8	0
" .. ..	17½	8	0
Total labour .. ..	36½	19	13
Total units .. ..	46	0	13



Items.				Labour required per acre.			
				Men.	Women.	Bullocks.	
<i>Second year.</i>							
		M.	W.	B.			
	Manuring .. ..				2½	7½	0
	Planting—						
	Preparing rings .. ..	10½	0	0			
	Planting .. ..	1	3½	0			
		11½	3½	0	11½	3½	0
3	Waterings (14) .. ..				19½	7	0
4	After-care—						
	Supporting creepers .. ..	1½	1½	0			
	Weedings .. ..	0	27½	0			
	Pruning .. ..	10	0	0			
	Preparing mandap .. ..	112½	0	0			
	Repairing mandap .. ..	14	15	0			
	Repairing rings .. ..	2½	2½	0			
		140	46	0	140	46	0
5	Harvesting 1,882 lbs. .. ..				20	0	0
					173½	84	0
					215½	0	0
<i>Third year.</i>							
1	Waterings (21) .. ..				14	34	0
2	After-care—						
	Ploughing .. ..	2	0	4			
	Harrowings .. ..	5½	0	5			
	Weedings .. ..	0	52½	0			
	Breaking mandap .. ..	21	21	0			
	Preparing mandap .. ..	124	37½	0			
	Repairing mandap .. ..	56	10	0			
	Repairing rings .. ..	27	4½	0			
	Supporting creepers .. ..	10	17½	0			
	Pruning .. ..	4	0	0			
	Spraying B. M. .. ..	2½	2½	0			
		252	145½	9	252	145½	9
3	Harvesting 9,050 lbs. .. ..				125½	0	0
					266	305	9
					418½	0	9
<i>Fourth year.</i>							
1	Manuring .. ..				0	5	0
2	Waterings (13) .. ..				11½	18	0
3	After-care—						
	Weedings .. ..	0	74½	0			
	Repairing mandap .. ..	46½	45	0			
	Harrowing .. ..	4	0	4			
	Repairing rings .. ..	2½	27½	0			
	Two sprayings B. M. .. ..	8	0	0			
		61	147	4	61	147	4
4	Harvesting 7,267 lbs. .. ..				0	85½	0
					72½	255½	4
					202½	0	4

*Cost of raising the crop.*

## First Year.

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional cash expenditure on bullocks ..	13	6	0
2. Seed charges .. .. .	6	0	0
3. Material for erecting a mandap .. .. .	102	0	0
4. Irrigation (perennial) .. .. .	22	8	0
5. Implements (depreciation, repairs, etc.) ..	8	0	0
6. Interest on Rs. 120 for 6 months at 9 per cent. ..	5	6	0
<b>Total</b> ..	<b>157</b>	<b>4</b>	<b>0</b>

## Second year.

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional cash expenditure on bullocks ..	13	6	0
2. Manure 500 lbs. cake .. .. .	31	4	0
3. Irrigation (perennial) .. .. .	22	8	0
4. Implements (depreciation, repairs, etc.) ..	8	0	0
5. Interest at 9 per cent. on Rs. 42 for 1 year plus interest on Rs. 155-4-0 for 1 year as there is no return in the first year .. .. .	17	13	0
<b>Total</b> ..	<b>92</b>	<b>15</b>	<b>0</b>

*Receipts per acre.*

1,882½ lbs. .. .. . 117 10 6

**Farm income** .. 24 11 6

## Third year.

Items.	Cost per acre.		
	Rs.	a.	p.
1. Proportional cash expenditure on bullocks ..	13	6	0
2. Insecticides .. .. .	2	10	6
3. Irrigation (perennial) .. .. .	22	8	0
4. Octroi .. .. .	4	5	0
5. Implements (depreciation, repairs, etc.) ..	8	0	0
6. Interest on Rs. 14 for 1 year at 9 per cent. ..	1	4	0
7. Interest on previous 2 years' investment after deducting the receipts of Rs. 117-10-6 for the 2nd year, i.e. on Rs. 130 .. .. .	11	10	6
<b>Total</b> ..	<b>63</b>	<b>12</b>	<b>0</b>

*Receipts per acre.*

9,050 lbs. of produce .. .. . 848 7 0

**Farm income** .. 784 11 0

## Fourth Year.

Items.	Cost per acre.		
	Rs.	a.	p.
Proportional cash expenditure on bullocks ..	13	6	0
Manure 20 cart-loads of farm yard manure ..	50	0	0
Insecticides .. .. .	3	0	0
Irrigation (perennial) .. .. .	22	8	0
Octroi .. .. .	3	6	0
Implements (depreciation, repairs, etc.) ..	8	0	0
Interest on Rs. 64 at 9 per cent. for 1 year ..	5	12	0
Total ..	106	0	0

*Receipts per acre.*

7,267 lbs. of produce .. .. .	681	5	3
Farm income ..	575	5	3

*Expenses and receipts for four years.*

	Rs.	a.	p.	Rs.	a.	p.	
1st year ..	157	4	0	.....			
2nd year ..	92	15	0	117	10	6	
3rd year ..	63	12	0	848	7	0	
4th year ..	106	0	0	908	7	0	
	<hr/>			1,874	8	6	Total income.
	419	15	0	419	15	0	Total expenditure.
	<hr/>			1,454	9	6	Difference.

i.e., average farm income Rs. 363-10-0 per acre per year.

## (19) TURMERIC.

Turmeric is an important crop in Gujarat and in Satara District in the Deccan. The economic product is the rhizome which develops underground. In the cultivation of Turmeric therefore soil condition is one of the important factors of plant growth. If the soil is light there is no difficulty for rhizomes to develop but if it is heavy the development of the rhizomes is obstructed. In the Deccan the soils set hard under irrigation on the surface and therefore require such management as to keep them open to facilitate free development of the rhizomes. The best management of the soil has been worked out under Poona conditions and the results are published in Bulletin No. 135 of the Department of Agriculture, Bombay.

*Details of the crop grown during the year 1924-25.*

(The crop being planted by the middle of May.)

*Preparatory tillage.*—The land was ploughed after the harvest of the previous crop 7 to 8 inches deep, and brought to a fine tilth by subsequent operation of clod crushing and pulverizing. If the land is cloddy it may be necessary to stir up the soil again to bring up the buried clods and break them. It may be necessary to irrigate the field if the clods are hard and difficult to pulverize by clod crushing and discing alone. It is absolutely necessary to bring the soil to a very fine tilth for what are commonly called the root crops like Turmeric, Ginger and Suran.

*Manuring.*—Twenty cartloads of Farm Yard Manure were added and well mixed in the soil at the time of the preparatory tillage. A top-dressing of Safflower Cake was given at the rate of 1,200 lbs. per acre in two doses. The first dose was given in the month of July when the crop had fully germinated and the second dose in the first week of September, when the crop was rapidly developing. The Cake was finely powdered, uniformly spread and worked into the soil by means of a weeding hook (khurpi) each time.

*Planting.*—The method known as the Broad-ridge method has been found to be the best method for this crop on the College Farm. The land is laid out into ridges and furrows. The furrows are 5 feet apart and the intermediate space forms the flat ridge 3 feet in width. The top of the ridge is levelled and the turmeric sets are planted on this at a distance of one foot apart both ways. For planting, well developed and sprouted sets were selected. Planting was done by the middle of May. The seed-rate required was 1,676 lbs.

*Irrigation.*—Irrigation was given just after planting and was continued at intervals of 10 days throughout the growing period except during the rains when irrigation was given as required. In all 20 irrigations were given, 4 in the hot season, 6 in the kharif season and the remaining 10 during the rabi season. Watering was given in the furrows by

owing the water to run until the ridges were sufficiently soaked by irrigation.

*After-care.*—During the year five weedings were given. Furrows were dug out and were shaped so as to ensure thorough irrigation. This operation varies with the slope of the land.

*Harvesting.*—The crop requires about 7 to 8 months to mature. When the leaves yellow and fall down the crop has reached maturity.

*Marketing.*—The crop is marketed either green or cured. In Poona there is no market for the green stuff and hence the produce requires to be cured before marketing.

After harvesting, the fingers and mother sets are separated, mother sets are reserved for planting as they do not produce good turmeric for market. If mother sets are numerous they are cured and mixed with the cured fingers for marketing.

Rhizomes after harvesting are prepared for the market as follows.

The pan that is used for gul-making is used for turmeric cooking. Turmeric rhizomes are then put into the pan and water is poured into it to about two-thirds the depth of the pan. Rhizomes are then covered by green turmeric leaves moistened with water. Cooking is then commenced, cotton stalks, pachat, meggas, etc., are used as fuel. It takes about 1½ hours for thorough cooking. The test for complete cooking is to take out some rhizomes and press them between the fingers and if they are well cooked they will feel soft. An alternative is to take a thin match stick like a match stick and thrust it into the rhizomes, if it penetrates easily the stuff is ready. This test is applied to rhizomes from all sides and from the top of the pan, generally the top part takes a little longer to cook and therefore the operation of cooking has to be continued until the top portion is well cooked. Immediately the pan is emptied the cooked rhizomes are dried in the sun. It takes about a week to dry them. These cooked and dried rhizomes are polished by rubbing under the feet of men or in a turmeric polishing drum.

One thousand and four hundred lbs. of green turmeric was put in the pan each time for cooking; after cooking, drying and polishing, 245 lbs. (17.5 per cent.) of cured turmeric was obtained—

*Yield per acre.*

Year.	Broad-ridge method.			
	Outturn in lbs.			
1923-24	..	..	..	24,372
1924-25	..	.	..	24,536
1925-26	..	..	..	30,464

*Labour units for different operations.*

Items	M. W. B.	Labour required per acre		
		Men	Women	Bullocks
1 Preparatory tillage—				
Ploughing .. ..	4 0 8			
Clod crushing .. ..	1 0 2			
Discing .. ..	½ 0 1			
Two harrowings .. ..	1 0 2			
	6½ 0 13	6½	0	13
2 Manuring—				
Twenty cartloads F. Y. M. ..	0 2 0			
Top-dressing cake 1,200 lbs. ..	0 6 0			
	0 8 0	0	8	0
3 Planting—				
Opening ridges 5' apart .. ..	2 0 2			
Levelling do. .. ..	4 8 0			
Marking .. ..	1½ 0 0			
Planting .. ..	0 14 0			
	7½ 22 2	7½	22	2
4 Irrigation (20) .. ..		29	4	0
5 After tillage and care—				
Five weedings .. ..	0 51 0			
Levelling furrows .. ..	4 12 0			
Deepening furrows .. ..	4 24 0			
	8 87 0	8	87	0
6 Harvesting—				
Cutting leaves .. ..	0 8 0			
Removing leaves .. ..	0 2 0			
Digging .. ..	12 0 0			
Clearing rhizomes .. ..	0 66 0			
	12 76 0	12	76	0
Total labour .. ..		63	197	15
Total units .. ..		161½	..	15

*Cost of raising the crop (Turmeric).*

Items.	Cost per acre. Rs. a. p.
1. Proportional cash expenditure on bullocks ..	13 6 0
2. Twenty cartloads F. Y. M. and 1,200 lbs. of cake .. ..	125 0 0
3. Seed charges .. ..	139 10 6
4. Irrigation charges .. ..	15 8 0
5. Octroi charges .. ..	1 5 0
6. Implements (depreciation, repairs, etc.) ..	8 0 0
7. Interest on Rs. 276 at 9 per cent. for 1 year ..	24 14 0
Total .. ..	327 11 6

*Receipts per acre.*

4,153 lbs. of cured turmeric .. ..	} 724 2 0
2,225 lbs. seed .. ..	
Farm income .. ..	396 6 6

## VIII—FARM MANAGEMENT.

*Area.*—Area of the block is 13 acres and 16 gunthas.

*Equipment*—

## A. Dead-stock:

The following implements and hand tools were maintained on the Farm:—

*Implements.*

(1) C.T.2 plough .. .. .	1
(2) Plough (Victory) for opening ridges and furrows.	1
(3) Disc-harrow .. .. .	1
(4) Norwegian Harrow .. .. .	1
(5) Blade Harrow .. .. .	1
(6) Plank .. .. .	1
(7) Country Drill .. .. .	1
(8) Pair of hoes .. .. .	1
(9) Tooth cultivator .. .. .	1
(10) Showel cultivator .. .. .	1
(11) Cart .. .. .	1
(12) Sprayer .. .. .	1

*Hand tools.*

(1) Spades .. .. .	4
(2) Pick-axes .. .. .	2
(3) Sickles .. .. .	4
(4) Weeding hooks .. .. .	6
(5) Iron baskets .. .. .	4
(6) Yokes .. .. .	2
(7) Chain 8' long .. .. .	1
(8) Chain 16' long .. .. .	1
(9) Trowels .. .. .	4
(10) Rakes .. .. .	2
(11) Water cans .. .. .	2
(12) Crowbar .. .. .	1
(13) Small Kudalis .. .. .	2

For price see appendix No. VI.

## B. Live-stock :

One pair of bullocks was maintained for the block.

## C. Labour requirements and its distribution.

The following permanent labour was set apart for the area under cultivation:—

3 men.

4 women.

2 bullocks.

The following table shows the number of working days for men and women in different years under study :—

1923-24	..	..	303 days.
1924-25	..	..	301 "
1925-26	..	..	310 "

The following table shows the total labour units required during different years :—

Year.	Men.	Women.	Bullocks.
1923-24 ..	870	1,345	506
1924-25 ..	857	1,431	403
1925-26 ..	822	1,324	483

Several times during the year extra labour over and above the permanent labour was required.

The following statement shows the extra labour required during different years month by month :—

Month	1923-24			1924-25			1925-26		
	Men	Women	Bullocks	Men	Women	Bullocks	Men	Women	Bullocks
1	2	3	4	5	6	7	8	9	10
May	32	..	9	29½	9	..	..	25½	..
June	..	6	..	..	23½	..	..	27½	..
July	..	27½	..	..	61	..	..	23½	4
August	..	12½	..	..	32	..	..	14	..
September	10½	35½	..	..	20½	..	..	9	..
October	3½	30½	..	1½	26½	..	..	25½	..
November	3	10½	..	3½	20½	..	..	14½	..
December	1½	11	46½	..	..	..	..	½	..
January	..	..	..	..	1	..	..	9½	..
February	..	31½	..	..	..	..	..	6½	..
March	..	..	5½	..	23	..	..	..	6
April	..	..	..	..	14½	48½	3½	..	44
Total	51½	165	60½	34½	231½	48½	3½	155½	54

Usually extra men were required in the month of May, i.e. during the planting time of the crops like Suran, Turmeric, Ginger, etc. In the year 1925-26, however, very little extra man labour was required due to spreading the work of planting over a longer period. Much of the extra woman labour was required during the rainy season when practically the whole area was under crops and a great deal of weeding was necessary and required to be done during a limited time, in addition to the pressure of harvesting of the crops like guvar, beans, bhindi, khira, cucurbits, etc.

Extra bullock labour was required at the time of ploughing and preparing the land for the next year's cropping.



The following figures show the labour required for raising individual crops out of the total labour required for the management of the whole farm during the different years :—

Year.	Men.	Women.	Bullocks.
1923-24	664	1,158	482
1924-25	613	1,189	320
1925-26	566	1,180	327

The following table gives the percentage of the total labour used in the crop production in different years :—

Year.	Men. Per cent.	Women. Per cent.	Bullocks. Per cent.
23-24	75	85	95
24-25	71	83	80
25-26	69	70	70
Average	70	85.6	81.6

The remaining labour out of the total was used on general work such as working in order bunds, water channels, etc., such operations improve the soil if spent in a way that increases the productive capacity of the land and prevents waste. As a rule whenever there is surplus labour it has to be used on such works which can be done at any time. The total cost of labour however is distributed over the cropped area.

## EXPENDITURE AND RECEIPT STATEMENTS.

### EXPENDITURE STATEMENT.

In working out the expenditure only the following items which involved cash expenditure are included :—

1. Upkeep and maintenance of a pair of bullocks. Charges on bullocks fed to bullocks are not included as the same was grown on the Farm.
2. Manure charges.
3. Seed charges.
4. Charges on insecticides and fungicides.
5. Charges for implements used.
6. Irrigation charges (canal rates).
7. Interest on capital :—Interest at 9 per cent. is calculated on the cash expenditure for a year. The amount is not locked up for the whole year but for a few months (taken at six) after planting, as receipts thereafter slowly come in which can be utilized to meet the expenditure. Interest on sunk capital is provided for against the appropriate headings, e.g., cost of bullock labour covers the capital invested in bullocks. Charges on labour, rent, etc., are not included in the expenditure statement as the bulk of the farming

is carried on by the farmers themselves on their own land or hired land. Whatever the farmer gets after deducting the cash expenditure from the receipts is the farm income. From the farm income the cost for extra labour (if at all employed) rent and assessment should be deducted according to the prevailing rates and the balance after meeting all these extra charges is the family income, covering wages, profits and rent.

If the farming is carried on by the managerial system the charges on permanent labour \* and the extra labour \* employed in addition to the permanent labour, and the rental charges or the assessment as the case may be, may be worked out at the current rates and deducted from the farm income, by referring to the labour units recorded on page 69 and 70.

### *Statement of Cash Expenditure.*

On the whole holding—13 acres and 16 gunthas.

Items.	1923-24	1924-25	1925-26
	Rs. a. p.	Rs. a. p.	Rs. a. p.
1. Cash expenditure incurred in maintaining a pair of bullocks..	202 12 0	202 12 0	202 12 0
2. Extra bullock labour at Re. 1 per pair per day .. .. .	30 6 0	24 4 0	27 0 0
3. Manure charges .. .. .	778 2 0	1,119 10 0	794 3 0
4. Seed charges .. .. .	848 2 0	749 4 0	1,093 3 0
5. Insecticides and fungicide .. .. .	28 11 0	33 14 0	38 1 0
6. Implement charges .. .. .	120 4 0	120 4 0	120 4 0
7. Irrigation charges .. .. .	115 2 0	118 8 0	103 4 0
8. Octroi duty .. .. .	15 0 0	22 8 0	23 8 0
9. Interest charges at 9 per cent. on half the working capital .. .. .	90 0 0	99 0 0	99 0 0
<b>Total expenditure ..</b>	<b>2,228 7 0</b>	<b>2,490 0 0</b>	<b>2,501 3 0</b>

### RECEIPT STATEMENT.

The receipt statement shows the money value realised for the different crops grown during the different years on the Farm. Some of the produce was sold on the Farm and the remainder was sent to Poona Market.

The value of Nilva Jowar fodder is estimated at the rate of Rs. 10 per 1,000 lbs. of dry fodder, after deducting the requirement for a pair of bullocks.

The receipts in 1924-25 and 1925-26 are more than those of 1923-24 by Rs. 1,057 and Rs. 1,549 respectively. This increase in receipts is mostly due to the increased area under Suran which has increased the returns

\* See chapter on Farm management.

under that head by about Rs. 970 and Rs. 1,500 in the two years respectively.

*Statement showing the Money Receipts.*

Serial No.	Crop	1923-24		1924-25		1925-26	
		Area in gunthas.	Amount	Area in gunthas.	Amount	Area in gunthas.	Amount
1	2	3	4	5	6	7	8
			Rs. a. p.		Rs. a. p.		Rs. a. p.
1	Chillies (Dharwar) ..	40	203 14 0	20	4 2 3	20	347 5 6
2	Do. (Local) ..	20	63 13 9	50	404 13 0	30	209 8 0
3	Do. (Other Varieties) ..	20	1 1 3	..	....	40	169 3 3
4	Brinjals (Dorali) ..	20	36 14 3	..	....	..	....
5	Do. (Gujarat) ..	20	325 2 9	20	114 10 0	30	251 10 9
6	Garlic ..	10	44 4 0	10	20 11 0	..	....
7	Onions for seed ..	15	85 1 3	10	118 0 0	..	....
8	Onions for bulbs ..	25	253 11 3	20	65 1 3	20	183 6 0
9	Leafy Vegetables ..	20	24 9 6	20	27 1 3	..	....
10	Guwar Mixture ..	30	82 1 9	40	302 11 0	40	283 10 3
11	Turmeric ..	20	366 8 0	40	724 2 0	30	428 0 0
12	Ginger ..	20	607 12 6	10	164 8 0	10	285 0 9
13	Suran ..	10	612 12 0	40	1,583 7 0	40	2,296 1 6
14	Cucurbits ..	10	314 4 0	20	334 13 0	20	61 10 9
15	French Beans ..	30	97 0 0	10	16 6 6	20	123 1 6
16	Khira ..	10	186 7 0	10	125 7 0	10	9 7 0
17	Tomatoes ..	10	51 5 0	10	40 2 6	10	43 15 0
18	Cabbage ..	20	99 15 6	30	101 11 0	20	34 4 6
19	Nilwa Fodder ..	200	441 9 0	160	466 0 0	160	528 13 0
20	Miscellaneous ..	18	104 8 6	18	41 4 6	28	47 10 9
21	Peas ..	..	....	10	3 1 3	30	5 1 9
22	Mogari ..	..	....	10	28 6 9	10	61 6 9
23	Double beans ..	..	....	10	166 7 6	10	77 0 6
24	Wal Papadi ..	..	....	10	0 2 3	10	35 10 6
25	Tobacco ..	..	....	20	120 8 0	..	....
26	Tondali ..	8	23 8 6	8	169 11 0	8	136 4 3
27	Kneelkhol ..	10	37 15 6	..	....	10	17 10 0
28	Onions for Leafy Vegetables.	10	22 11 9	..	....	..	....
	Total ..	..	4,086 15 0	..	5,143 4 0	..	5,635 14 0

\* Estimated value after deducting the requirement for a pair of bullocks.

## IX—RETURNS FROM FARMING.

The following statement shows the expenditure and receipts during the year under study :—

Year.	Expenditure.			Receipts.		
	Rs.	a.	p.	Rs.	a.	p.
1923-24 ..	2,228	7	0	4,086	15	0
1924-25 ..	2,490	0	0	5,143	4	0
1925-26 ..	2,501	3	0	5,635	14	0
Total ..	7,219	10	0	14,866	1	0
Average per year ..	2,406	8	0	4,955	6	0

2. The average Farm income comes to Rs. 2,548-14-0 per year.

3. Such a holding will provide work for three families each consisting of a man, a woman and two children.

4. Each family will get Rs. 849-10-0 as the Farm income which shall have to be divided up among wages, profits, rent and assessment.

5. If the farming is carried on by the managerial system the permanent labour that will be necessary are three men and four women, at certain times of the year there would be a rush of work and some additional labour bill on this basis for the different years is given below at the following wages rate :—

Unit.				Wages in annas.		
Man .. ..	..	..	..	0	12	0
Woman .. ..	..	..	..	0	6	0
				Rs.	a.	p.
1923-24 ..	..	..	..	1,297	0	0
1924-25 ..	..	..	..	1,331	0	0
1925-26 ..	..	..	..	1,336	0	0
Total ..				3,964	0	0
Average per year ..				1,321	6	0

Under the managerial system therefore out of the Farm income of Rs. 2,548-14-0 the labour bill of Rs. 1,321-6-0 shall have to be paid. That will leave Rs. 1,227 as balance from which profits, rent and assessment shall have to be paid.

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**APPENDICES.**

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APPENDIX I.

Cropping Scheme for the year 1923-24.

(Each plot is of 10 gunthas.)

Nilwa Fodder. (571)	Nilwa Fodder. (554)	● Nilwa Fodder (528)	Brinjal. (501)				
Nilwa Fodder. (572)	Nilwa Fodder. (555)	Nilwa Fodder (529)	Brinjal. (502)				
● Nilwa Fodder. (573)	Nilwa Fodder. (556)	Nilwa Fodder. (530)	Brinjal. (503)				
	Nilwa Fodder. (557)	Nilwa Fodder. (531)	Brinjal. (504)				
	Nilwa Fodder. (558)	Nilwa Fodder (532)	Cabbage. (505)				
		Nilwa Fodder. (533)	Bhindi Guwar. (506)	Dharwar Chillies. (476)	Jowar Fodder (443)	Jowar Fodder. (406)	Jowar Fodder. (368)
		Nilwa Fodder. (534)	Beans Bhindi. (507)	Dharwar Chillies. (477)	Suran. (444)	Onion for seeds. (407)	Onions. (369)
		Nilwa Fodder. (535)	Beans and Guwar (508)	Dharwar Chillies. (478)	Ginger. (445)	Onions. (408)	Garlic. (370)
		Nilwa Fodder. (536)	Chillies. (509)	Dharwar Chillies. (479)	Turmeric. (446)	Onions. (409)	Tomatoes. (371)
			Chillies. (510)	Chillies. (480)	Turmeric. (447)	Cucurbits. (410)	Turmeric and Guwar. (372)
			Chillies. (511)	Chillies. (481)	Ginger. (448)	Khira and leafy vegetables. (411)	
			Tondall. (512)	Onions and Beans. (482)			

*Cropping Scheme for the year 1924-25.*

(Each plot is of 10 gunthas.)

		Dharwar Chillies. (528)	Onion for seed. (501)				
		Dharwar Chillies. (529)	Peas and Garlic. (502)				
Guvar mixture. (571)	Guvar mixture and Cucurbit. (554)	Tobacco. (530)	Onions. (503)				
Guvar mixture. (572)	Brinjal. (555)	Tobacco. (531)	Onions. (504)				
Guvar mixture. (573)	Brinjal. (556)	Chillies. (532)	Beans and Mogari (505)				
	Brinjal and Cabbage. (557)	Chillies. (533)	Cucurbit. (506)				
	Wal-papdi (558)	Chillies. (534)	Cucurbit. (507)	Suran. (476)	Jowar Fodder. (443)	Jowar Fodder. (406)	Jowar Fodder. (368)
		Chillies. (535)	Khira and Cabbage. (508)	Suran. (477)	Nilwa Fodder. (444)	Nilwa Fodder. (407)	Nilwa Fodder. (369)
		Chillies. (536)	Double Beans. (509)	Suran. (478)	Nilwa Fodder. (445)	Nilwa Fodder. (408)	Nilwa Fodder. (370)
			Chillies. (510)	Suran. (479)	Nilwa Fodder. (446)	Nilwa Fodder. (409)	Nilwa Fodder. (371)
			Chillies. (511)	Turmeric. (480)	Nilwa Fodder. (447)	Nilwa Fodder. (410)	Nilwa Fodder. (372)
			Tondali. (512)	Turmeric. (481)	Nilwa Fodder. (448)	Nilwa Fodder. (411)	
				Ginger. (482)			

*Cropping Scheme for the year 1925-26.*

(Each plot is of 10 gunthas.)

Tomatoes. (571)	Cucurbit and Khol Khol. (564)	Guvar. (528)	Nilwa Fodder. (501)				
Guvar mixture. (572)	Cucurbit. (565)	Suran. (529)	Nilwa Fodder. (502)				
Wal-papadi. (573)	Khira and Cabbage. (566)	Suran. (530)	Nilwa Fodder. (503)				
	Double Beans. (567)	Suran. (531)	Nilwa Fodder. (504)				
	Peas. (568)	Suran. (532)	Nilwa Fodder. (505)				
		Ginger. (533)	Nilwa Fodder. (506)	Nilwa Fodder. (476)	Seasamum (443)	Seasamum. (406)	Seasamun. (368)
		Turmeric. (534)	Nilwa Fodder. (507)	Nilwa Fodder. (471)	Beans and Brinjal. (444)	Beans and Brinjals. (407)	Mogari. (369)
		Turmeric. (535)	Nilwa Fodder. (508)	Nilwa Fodder. (478)	Peas and Onions. (445)	Dharwar Chillies. (408)	Chillies. (370)
		Turmeric. (536)	Nilwa Fodder. (509)	Nilwa Fodder. (479)	Onions. (446)	Dharwar Chillies. (409)	Chillies. (371)
			Nilwa Fodder. (510)	Nilwa Fodder. (480)	Peas and Onions. (447)	Local Chillies. (410)	Yams. (372)
			Nilwa Fodder. (511)	Nilwa Fodder. (481)	Local Chillies. (448)	Local Chillies. (411)	
			Tondali. (512)	Brinjal (482).	Local Chillies. (449)		



## APPENDIX II.

*Crops and their botanical names.*

Crops.	Botanical names.
Chillies . . . . .	Capsicum annum.
Brijal (Dorali Poona Local).	Solanum melongena.
Garlic .. .. .	Allium sativum.
Onions .. .. .	Allium cepa.
Methi (Fenugreek) .. .. .	Trigonella fœnum-græcum.
Coriander .. .. .	Coriandrum sativum.
Bhendri (Lady's finger) .. .. .	Hibiscus esculentus.
Guvar (Cluster-beans) .. .. .	Cyamopsis psoralioides.
Yam .. .. .	Dioscores sativa.
Turmeric .. .. .	Curcuma longa.
Ginger .. .. .	Zingiber officinale.
Suran (Elephant foot) .. .. .	Amorphophallus campanulatus.
Cabbage .. .. .	Brassica oleracea.
Knolkhol .. .. .	Brassica oleracea or caulocarpa.
French-beans .. .. .	Phaseolus vulgaris.
Tomato .. .. .	Lycopersicon esculenturæ.
Khira (Cucumber) .. .. .	Cucumis sativus.
Dudhya (Bottle gourd) .. .. .	Lagenaria vulgaris.
Bhopla (Red pumpkin) .. .. .	Cucurbita maxima.
Tondali .. .. .	Cocceinia cordifolia.
Fodder (Jowar) .. .. .	Andropogon sorghum.
Peas .. .. .	Pisum sativum.
Mogari .. .. .	Raphanus sativus var. caudatus.
Double beans .. .. .	Phaseolus lunatus.
Tobacco .. .. .	Nicotiana tobacum.
Sweat potato .. .. .	Ipomœa batatas.
Dodka .. .. .	Luffa acutangula.
Wal papdi .. .. .	Dolichos lablab.
Maize .. .. .	Zea mays.
Lettuce .. .. .	Lactuca sativa.
Radish .. .. .	Raphanus salivus.
Cauliflower .. .. .	Brassica oleracea var. botrytis.
Beet .. .. .	Beta vulgaris.

## APPENDIX III.

*Raising Seedlings.*—The usual method of raising seedlings is to prepare ordinary beds and broad cast the seeds in the beds. On the heavier soils like what we have at Poona such a method does not give good seedlings. Soil being heavier, it hardens, cracks by wetting and drying and causes bad aeration and disturbs the root system of the growing seedlings. To avoid these troubles raised-beds are prepared and the seeds are sown on the top of these and water is given by percolation. Such a method provides a good home for seedlings to develop in. The method of preparing raised beds for growing the seedlings is given below:—

*Preparatory tillage.*—The area reserved for growing seedlings should be on a high level and near the water source. The land is ploughed to

the depth of 7" to 8" and well pulverized by subsequent discings and harrowings. If the same area is used for growing seedlings year after year it is better to burn the area to destroy insects or fungus that may have infested the land.

*Manuring.*—Manure is given to the seed-bed area at the rate of 40 cart-loads per acre. Manure should be spread evenly and should be thoroughly mixed with the soil. It is advantageous also to apply river earth (silt soil) at the rate of 40 cart-loads per acre if the soil is heavy. The addition of silt soil lightens the heavy soil mechanically and inhibits the cracking.

*Preparing the seed-beds.*—Raised beds are prepared 4' apart from centre to centre and of any convenient length. The raised part of the bed is 2½' wide and the remaining space is occupied by the water channel. The channel should be about 6"—7" deep. The top portion of the bed should be uniformly levelled.

*Sowing seed.*—On the top of the bed lines are opened 4" apart. Seeds are sown in the furrows at the rate of about 3—4 seeds per inch. Immediately afterwards the furrows are covered and pressed lightly by hand. The depth of the furrow when seeds are sown is about ½" to ¾".

*Irrigation.*—The seed-bed should be watered immediately preferably by a rose can. If watering is given carelessly the soil on the top of the seeds will be washed out and the seeds will be exposed. To avoid this it is better to spread old gunny bags on the bed before watering or to spread grass thinly. Light watering should be given morning and evening for a few days or until seeds germinate. The gunny bag or grass should be taken out after the seeds germinate. Subsequent waterings should be given in the furrows and water should be allowed to percolate through the raised beds. This should be done once in four days according to the season.

*After-care.*—Beds should be kept free from weeds and should be stirred after each irrigation. If there is insect attack, spraying, dusting or hand picking should be done to check the trouble.

*Preparation for uprooting.*—When the seedlings come to 4 to 6 leaf-stage or about 4" to 5" high they should be transplanted. A day previous to uprooting, the beds should be watered to facilitate the taking out of the seedlings. Seedlings usually should not be uprooted as in doing so the roots get injured. The best way to take out the seedlings is to use the fork to lift up the soil containing the seedlings. While the seedlings are being removed for transplanting they should not be exposed to sun or wind or allowed to become dry.

The areas required for growing seedlings for one acre of different crops are as follow :—

• Chillies, Brinjals, Tomatoes, Cabbage, etc ..	200 to 240 sq. feet,
Onions .. .. .	1½ gunthas.
• Knolkhol as a whole crop • .. •	• .. 800 sq. feet,



Nature of operation.	Crop or implements.	Labour in units per acre.			Remarks.
		Men.	Wo-men.	Bullocks.	
1	2	3	4	5	6
Earthing up ..	By plough ..	4	..	4	
Spraying ..	Double beans ..	2	..	..	
Supporting ..	Tobacco ..	16	..	..	
Nipping and Suckering	Chillies ..	..	1	..	80 lbs. per day.
	Brinjals ..	..	1	..	400 " " "
	Tomatoes ..	..	1	..	300 " " "
	F. Beans ..	..	1	..	80 " " "
	Cabbage ..	..	1	..	400 " " "
	Knolkhol ..	..	1	..	250 " " "
Harvesting ..	Jowar Fodder ..	..	12	..	
	Double beans ..	..	1	..	70 " " "
	Onions ..	..	1	..	400 " " "
	Onion seeds ..	..	1	..	100 " " "
	Khira ..	..	1	..	500 " " "
	Gubar ..	..	1	..	50 " " "
	Bhindi ..	..	1	..	200 " " "
	Tondali ..	..	1	..	100 " " "
	Leafy vegetables ..	..	1	..	80 " " "
	Garlic ..	..	1	..	50 " " "
	Turmeric ..	..	1	..	Uprooting and cleaning.
	Ginger ..	..	1	..	400 " " "
	Turmeric ..	20	..	..	cleaning.
	Ginger ..	16	..	..	150 " " "
	Suran ..	22	..	..	Digging per acre.
	" ..	..	22	..	" " "
	Tobacco ..	..	4	..	" " "
	Mogari ..	..	1	..	Cleaning.
Tying bundles ..	Tobacco leaves ..	12	..	..	Cutting leaves.
" ..	Jowar Fodder ..	3	..	..	200 lbs. per day.

## APPENDIX V.

*Annual cost of upkeep of one pair of bullocks excluding home produced fodder.*

	Rs.	a.	p.
1. Concentrates 2,880 lbs. at Rs. 6 per 100 lbs. ..	172	12	0
2. Average yearly interest on Rs. 200 at 9 per cent. ..	10	0	0
3. Depreciation at 10 per cent. ..	20	0	0

Total .. 202 12 0

On this basis the average charge per acre of the cultivated area comes to Rs. 13-6-0.

*N.B.*—Shoeing charges, medicine, etc., may be covered by the manure produced and hence, not calculated. The value of the manure has not been taken as receipts.

## APPENDIX VI.

Statement showing the list of implements used.

No.	Name.	Price.		
		Rs.	a.	p.
1	CT2 Plough	67	12	0
2	Victory Plough	64	0	0
3	Disc-harrow	60	0	0
4	Norwegian harrow	120	0	0
5	Blade	15	0	0
6	Plank	9	0	0
7	Country Drill	20	0	0
8	Country hoes (2)	8	0	0
9	Tooth Cultivator	35	0	0
10	Grubber	30	0	0
11	Cart	150	0	0
12	Sprayer	35	0	0
<i>Miscellaneous.</i>				
1	Spades (4)	6	0	0
2	Pick axes (2)	5	0	0
3	Sickles (4)	4	0	0
4	Weeding hooks (6)	1	12	0
5	Iron Baskets (4)	4	0	0
6	Bamboo baskets (2)	3	0	0
7	Improved yokes	8	9	0
8	Yoke	5	0	0
9	Chains 8' and 16' long	12	0	0
10	Trowels (4)	4	0	0
11	Rakes (2)	3	0	0
12	Water cans (2)	2	0	0
13	Crow bar (1)	1	8	0
14	Small Kudalis (2)	2	0	0
Total		675	0	0
		Rs. a. p.		
Depreciation at 10 per cent. on Rs. 675		67	8	0
Interest at 9 per cent. on Rs. 675		33	8	9
Repair charges and replacing of the hand tools at 3 per cent.		20	4	0
Total		120	4	0

Average charge per acre of cropped area will come to Rs. 8 per year.

## APPENDIX VII.

The following table shows the pests and diseases on different crops and remedial measure followed for each:—

Crop.	Pest or disease.	Remedy.
1. Chillies and Tomatoes.	Mosaic .. ..	No remedy.
	Thrips .. ..	Kerosine oil emulsion
	Mites .. ..	Lime sulphur dusting.
2. C a b b a g e family.	Aphis .. ..	Fish oil rosin soap.
	Mustard saw fly caterpillar .. ..	Lead arsenate or Paris green.
	Diamond moth caterpillar .. ..	Do. do.
3. Brinjals ..	Eel worm .. ..	No remedy.
	Malformation .. ..	Do.
	Fruit borer .. ..	Affected fruits to be picked up and destroyed.
	Shoot borer .. ..	Affected shoots with the caterpillar to be removed and destroyed.
4. Onions and Garlic.	Jassides .. ..	Fish oil rosin soap.
	Thrips .. ..	Kerosine oil emulsion.
5. Guvar ..	Mildew .. ..	Sulphur dusting.
6. Cucurbits ..	Red pumpkin beetle .. ..	Picking of beetles and destroying the same or lead arsenate or Paris green spraying.
	Mildew .. ..	Sulphur dusting.
	Fruit borer .. ..	Affected fruits to be removed.
7. Tondali ..	Mildew .. ..	Sulphur dusting
	Aphis .. ..	Fish oil rosin soap.
8. Ginger ..	Ginger rot .. ..	Selections of the sets and avoid growing of the crop in the affected soil.

*Method of preparing the insecticides and fungicides.*

1. *Fish oil rosin soap.*—Dissolve half a pound of the stuff in four gallons of water and mix thoroughly. Sixty gallons of the stuff was required to spray on an acre of Mogari, Cabbage, etc.

2. *Kerosine oil emulsion.*—Take one pound of bar-soap and make it into fine sticks and put the same in one gallon of water. Heat it well and keep stirring. Remove the stuff from the fire and add two gallons of kerosine and mix it thoroughly by churning. The success of preparing the medicine depends upon its thorough mixing. If kerosine remains floating it destroys the crop in spraying. This is the stock solution. At the time of spraying dilute it to 6 or 8 times with water. 32 gallons of the stuff was required to spray one acre of chillies.

3. *Lead arsenate.*—Dissolve one ounce of well powdered lead arsenate in four gallons of water. Add one ounce of quick lime. Sixty gallons of the stuff was required to spray Cabbage, Mogari and Cucurbits.

4. *Paris Green.*—Dissolve half ounce of the stuff in four gallons of water; add one ounce of quick lime. Sixty gallons of the stuff is required to spray one acre.

5. *Lime Sulphur Dusting.*—Mix slacked lime and Sulphur well powdered in equal proportion. 16 lbs. of Sulphur was required to dust Chillies crop in the early stage.

## APPENDIX VIII.

*Glossary of Works.*

Aeration	..	..	Circulation of air.
After-tillage	..	..	Tillage given after sowing or planting of the crop.
Basin	..	..	A circular pit of about two feet diameter and about 6 or 7 inches deep for planting cucurbits.
Dibble	..	..	Putting seeds in the soil by hand.
Discing	..	..	Working with a disc harrow.
Drainage	..	..	Removal of excess of water.
Dry crops	..	..	Crops grown on rain water only.
Erosion	..	..	Washing away of the soil.
Earthing up	..	..	Throwing soil on both the sides of the plant.
Friable	..	..	Loose.
Farm income	..	..	Returns from a farm, after deducting all the cash expenditure.
Harrowing	..	..	Working with a blade harrow.
Insecticide	..	..	Medicine used for killing or preventing insects.
Kharif season	..	..	Monsoon season or rainy season.
Perennial	..	..	Growing for more than a year.
Physical condition of the soil.			Condition of the soil as regards its looseness, circulation of water and air.
Preparatory tillage	..	..	Tillage given before sowing or planting of a crop.
Pulverise	..	..	Making fine.
Suckers	..	..	Side shoots.
Top-dressing	..	..	Applying manure when the crop is growing.
Topping	..	..	Removing the top-most growing part.
Transplanting	..	..	Transferring seedlings from the nursery to the field.