

REPORT  
ON  
MINOR IRRIGATION WORKS  
IN  
HIMACHAL PRADESH



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COMMITTEE ON PLAN PROJECTS  
IRRIGATION TEAM  
NEW DELHI

*December, 1965*

M. Thirumala Rao, M.P.  
Leader,  
Irrigation Team.

of India  
ommission  
n Projects.  
une, 1966.

My dear NANDA JI,

I have pleasure in forwarding herewith Irrigation Team's report on the study of irrigation works in Himachal Pradesh.

Himachal Pradesh is almost wholly mountainous and usually has heavy annual rainfall. Necessity of irrigation is however felt because of uneven distribution of precipitation. There are practically no possibilities of any large irrigation scheme, but small irrigation works seem feasible in many areas and can prove highly useful to sustain non-monsoon period agricultural operations.

The team made field studies of several small irrigation schemes—old as well as new—in different regions of the territory. Adequate utilisation of potential created on these schemes has not yet been achieved, in spite of there being no assessment of water rates for irrigation done.

Main suggestions as emerge out of the study are:—

- (i) Small irrigation schemes could be handed over to panchayats for operation, maintenance and repairs and local irrigation cess for the purpose could be levied by the panchayats who should have statutory backing for the same.
- (ii) Priority attention needs to be given by the extension staff to areas receiving irrigation.
- (iii) Micro hydel schemes need to be encouraged and power from the schemes could be used for lifting water, for irrigation purposes during off peak hours.
- (iv) A master plan for agro-irrigational development in the State with priorities for various schemes needs to be framed to accelerate development in the region.

The magnitude of irrigation works being relatively small, they do not receive due attention at the hands of P.W.D. officers in whose charge they lie along with roads and building works.

Only one Irrigation Executive Engineer as at present attached to the Chief Engineer cannot exercise the required check and control on the investigation and execution of irrigation works all over the Pradesh resulting in avoidable delays and under utilisations. It would be advantageous if this post is upgraded to that of Superintending Engineer for irrigation works in the State.

I take this opportunity of expressing our thanks to the State P.W.D. for their cooperation in our studies.

Shri G. L. Nanda,  
Minister for Home Affairs,  
Government of India,  
NEW DELHI.

Yours sincerely,

M. THIRUMALA RAO

## PREFACE

Study of Minor Irrigation Works in Himachal Pradesh was taken up by the Irrigation Team, Committee on Plan Projects, Planning Commission in accordance with the Terms of Reference communicated *vide* Committee on Plan Projects Memorandum No. COPP/(4)/17/58 dated the 4th August 1958 given as Appendix I of this report.

The Team comprised Shri M. Thirumala Rao, M.P., Leader, Shri Baleshwar Nath (Chief Engineer) and Dr. Arjan Singh (Retd. Director of Agriculture, Punjab) Members and Shri Mahavir Prasad (Irrigation Advisor, Ministry of Food and Agriculture) Member (*Exofficio*).

After preliminary discussions on July 4, 1964 at Simla, proceedings of which appear in Appendix II, field study tours were made by the Team in different parts of the State with a view to get general appraisal of planning, organisation, maintenance and performance of minor irrigation works in the Pradesh.

Discussions were held concurrently with the State authorities at appropriate levels as also with irrigators themselves. Recommendations as emerge out of the study have been summarised in a separate chapter and bring to light the main policy matters that need attention apart from special items pertaining to individual works referred to in the report.

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## CHAPTER I

### GENERAL

1.1. Himachal Pradesh is a hilly region in Himalayan territory of the Indian Union. Its latitude ranges between 30.3° and 33.3° North and the longitude ranges between 75.8° and 79.0° East. The territory is bordered by the States of Jammu and Kashmir, Punjab and Uttar Pradesh. For some length its eastern boundary adjoins Tibet as shown on the key map at figure 1.1.

1.2. Himachal Pradesh is cut off into two portions by a corridor of Punjab State, isolating the Chamba district from the remaining five districts. Pathankot, which is situated at a distance of more than a hundred miles, is the nearest rail-head for the Chamba area.

1.3. Himachal Pradesh was constituted by bringing together 31 small Princely States. For administrative purposes it is divided into six districts. Among its main roads is the one connecting Tibetan territory to India. Sutlej, Chenab, Ravi and Beas rivers pass through Himachal Pradesh but they are of little economic importance because of hilly terrain through which they flow.

1.4. Himachal Pradesh has a geographical area of 10,885 square miles. The area is mostly hilly and the altitudes range between 1,500 feet and 22,000 feet. More than one-third of the area is situated at an altitude of 10,000 feet and above. A relief map of Himachal Pradesh is shown in figure 1.2.

### PHYSICAL ZONES

1.5. The State can be divided into three physical zones: (i) Outer Himalayan, (ii) Inner Himalayan and (iii) Alpine Pasture. The outer Himalayan Zone has altitudes below 10,000 feet and has a rainfall between 60 to 70 inches. The Inner Himalayan zone lies above 10,000 feet and experiences a rainfall between 30 to 40 inches. The Alpine Pastures comprise areas which remain covered under snow for five to six months in a year. The inhabitants of this zone are compelled to become migratory.

1.6. The climate of the territory is governed by the altitudes and rainfall. The areas lying on the snow-covered peaks of the mountains have a very inhospitable and unbearable climate and the land can be put to little productive use. The climate of the inner Himalayan zone is cold with heavy rainfall and occasional snowfalls. The hill slopes are terraced and cultivation of foodgrains, potato, etc. as well as temperate fruits is practised. The Outer Himalayan zone is at a lower level, where the lands are undulating. Cultivation is done on terraces. The important towns of the territory are also mostly situated in this zone.



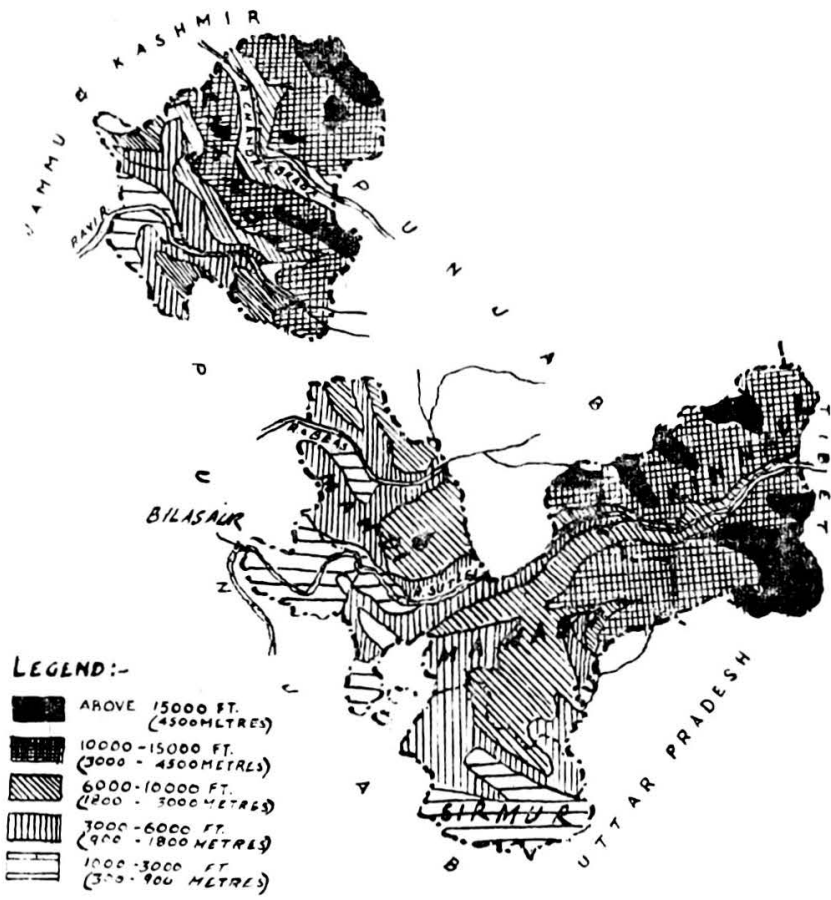


FIG. 1.2.—Relief Map of Himachal Pradesh.



## RAINFALL

1.7. The average annual rainfall is 56.1 inches. A statement of rainfall for six years from 1957 to 1962 for the six districts of the State is tabulated below:—

*Annual District-wise rainfall in inches*

District	Years						Normal rainfall
	1957	1958	1959	1960	1961	1962	
Kinnaur	47.7	47.4	49.4	22.0	27.1	32.8	33.6
Mahasu	56.2	49.4	47.8	43.5	57.4	51.7	52.2
Mandi	68.4	63.3	64.7	62.8	76.5	62.0	66.2
Chamba	77.3	64.8	77.7	42.7	63.7	55.5	56.3
Sirmur	63.7	70.8	84.5	64.8	81.5	87.2	69.5
Bilaspur	60.5	46.7	54.1	47.1	58.5	51.5	50.6
Average Himachal Pradesh	63.5	57.6	61.5	48.3	69.5	56.9	56.1

1.8. A perusal of the same would reveal that Sirmur district has the highest normal rainfall of 69.5" and Kinnaur the lowest of 33.6". The rainfall has been quite steady in Mahasu, Mandi and Sirmur districts where variations from the normal rainfall are about 15 per cent either side. In case of Kinnaur, Chamba and Bilaspur districts, the variations from the normal have gone upto 30 to 35 per cent. Isohyetal Map of Himachal Pradesh is shown in the figure 1.3.

1.9. Taking the year 1962 as a typical rainfall year, it would be observed that the total average rainfall has been normal, but the monthly distribution has not been favourable for farming. Although there has been some rainfall every month yet April, May and October had very little share. Absence of rainfall, specially in October has been responsible for low yields of paddy in this year. Monthly rainfall figures and the number of rainy days for the six districts for the year 1962 is given in *Appendix IV*.

## SOILS

1.10. There is no rigid agricultural classification of soils and no rigid cropping pattern depending on soil types in the State. There are, however, the following five broad zones: —

### *Low-Hill-Soil Zone*

1.11. This zone covers area upto the altitudes of 3,000 feet. The soils are sandy loam to loam in texture and light grey to brown in colour, not very deep, embedded with shingles and boulders and mostly situated in the narrow valleys on the banks of rivers or streams. These soils are well drained. They are most suitable for raising crops like wheat, maize, sugarcane, ginger, paddy and citrus fruits. Such soils are

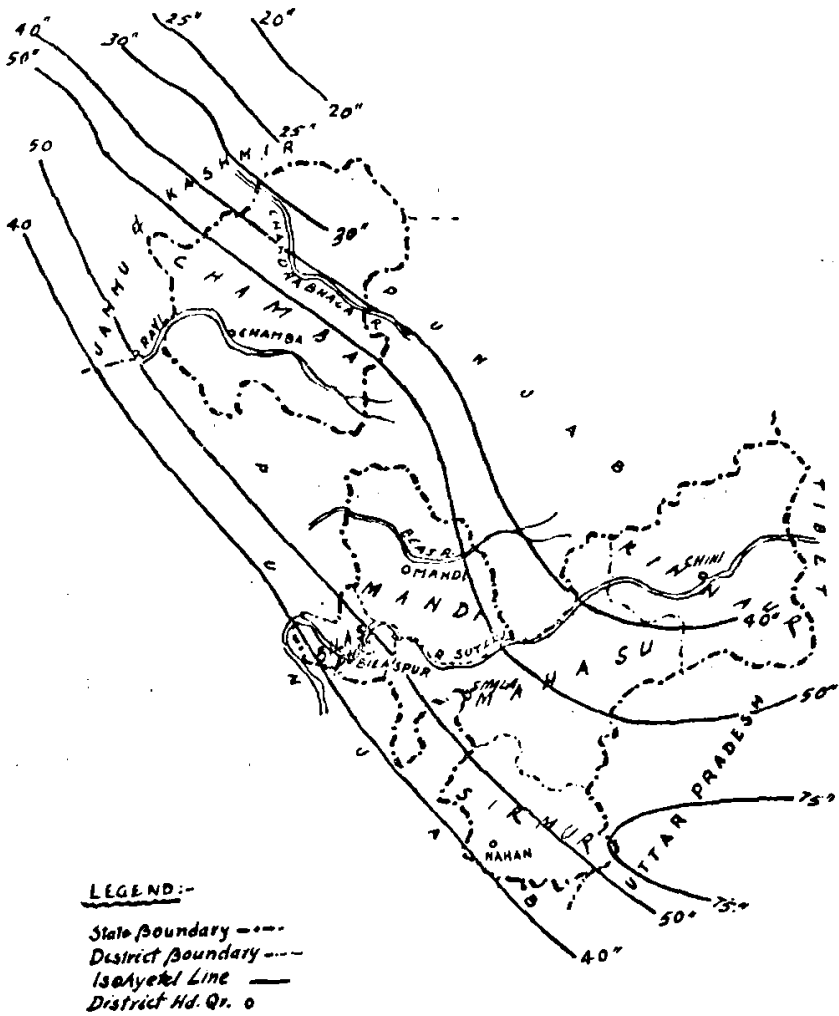


FIG. 1.3.—Isohyetal Map of Himachal Pradesh.

located in the Paonta Tehsil of Sirmur, the Balh area of Mandi, the Bhattiyat Tehsil of Chamba, the Kunihar area of Mahasu and the larger portion of Bilaspur.

#### *Mid-Hill-Soil Zone*

1.12. This zone ranges between altitudes of 3,000 to 5,000 feet, mostly situated on hill slopes. The soil texture is medium fine, varying from loam to silt loam. The colour is greenish to brown. The depth varies from place to place and so does the proportion of stones. They are well drained and susceptible to severe drought effects. They are suitable for table potatoes, wheat, maize and stone fruits. Such soils are located in Nahan and Pachhad, parts of Chamba and Churah Tehsils, Jogindernagar and Sarkaghat Tehsils of Mandi and Rampur, Kasampti, Solan and Kotkhai Tehsils of Mahasu.

#### *High-Hill-Soil Zone*

1.13. This zone is found between altitudes of 5,000 to 7,000 feet and are located in Theog, Jubbal, Chopal and Rohru Tehsils of Mahasu, Rainka Tehsil of Sirmur, Chachiot and Karsog Tehsils of Mandi and parts of Bharmour and Churah sub-tehsils and around Dalhousie in Chamba. They are mostly situated on steep slopes and are of fine texture, varying from silt loam to clay loam and are light to dark brown. They are often deep. They have good drainage and fertility. They are generally good for seed potatoes and temperate fruits.

#### *Mountainous Soil Zone*

1.14. This zone comprises the soils on high peaks, at altitudes of 7,000 to 10,000 feet and are found in parts of Bharmour, Churah and Chamba Tehsils of Chamba and Karsog and Chachiot Tehsils of Mandi. They are not much suitable for agricultural purposes and are mostly under forests and summer grazing lands. In some areas potatoes and temperate fruits are also raised. These soils are silt loam to loam in texture and dark brown in colour. They are well draining soils and are generally shallow in depth.

#### *Dry-Hill-Soil Zone*

1.15. The dry hill soil area with negligible rainfall but heavy snowfall is found in the Chini Tehsil of Kinnaur and Pangi Sub-Tehsil of Chamba. These soils are ideally suited for 'dry-fruit' cultivation.

### POPULATION

1.16. According to 1961 census the population of this territory is 13.51 lacs, out of which 12.87 lacs (95 per cent) is rural, the density being 124 per square mile or 48 per square kilometre.

1.17. There are about 10,000 villages and 11 towns. Few towns have a population of over 4,000. The villages very often comprise huts perched here and there on hill sides surrounded by terraced fields. The average population of a village is only 127.

## LAND UTILIZATION

1.18. The land utilisation statistics for the year 1961-62 are tabulated below:—

TABLE 1.1

*Land utilisation in Himachal Pradesh for the year 1961-62 compared to All-India*

(Area in '000 acres)

S. No.	Particulars	Himachal Pradesh	All-India	Percentage of Total area	
				Himachal Pradesh	All-India
1.	Total Geographical area.	6966.40	—	—	—
2.	(By Professional survey).				
	(By Village papers).	4035.92	7,38,398	100	100
3.	Forest	1286.37	1,37,737	31.8	18.6
4.	Unculturable land.	241.53	1,20,826	6.0	16.3
5.	Culturable Waste pastures.	1787.04	93,171	44.3	12.6
6.	Fallows	44.84	52,578	1.1	7.1
7.	Net area sown	676.15	3,34,066	16.8	45.4
8.	Total cropped area.	1046.42	3,84,611	—	—
9.	Area sown more than once.	410.27	50,545	—	—

District-wise break-up of the land utilisation for 1962-63 are given in *Appendix V*, a perusal of which would show the extent of land utilised for agriculture in each district.

1.19. So far only 67 per cent of the geographical area has been recorded in the village papers by cadastral survey. There is however, a marked progress in the so called "girdawri" viz. Cadastral Survey. The area which was recorded as 2.3 million acres in 1952-53 had gone up to 3.8 million acres in 1957-58 and 4.01 million acres in 1960-61. In 1961-62 alone 20,260 acres more area had been recorded.

1.20. Even though only 67% of the total area has been cadastrally surveyed so far, yet the net area sown forms only 17% of the area recorded. The forest area is 32%. The area under waste land and pastures etc. forms 44%.

1.21. In Himachal Pradesh forest wealth and animal husbandry are as important as agriculture itself. The patterns of utilisation of land and the problems of development are, therefore, typical. Climatic conditions combined with the nature of soil more or less determine utilisation of land. Parts of the territory have so severe winter and heavy snowfall that the cropping season is restricted only to two or three months in a year. The mountainous tracts of Mahasu and Chamba are not suited to farming whereas Sirmur, Bilaspur and Mandi areas are mostly suitable for the cultivation of seasonal crops.

## AGRICULTURE

1.22. Agriculture, the all important occupation in Himachal Pradesh has the following peculiar features:—

- (i) Most of the territory is covered by hills. Only a small part of the land is in the plains.
- (ii) Holdings are small and scattered. There is great pressure on land and per capita holding of cultivated land is only about 2/3rd of an acre.
- (iii) Due to terraced and scattered cultivation, large irrigation works are not feasible.
- (iv) Due to soil erosion, fertility goes on decreasing.

1.23. The main cereal crops grown in Himachal Pradesh are rice, wheat, *ragi*, maize, barley and millets. Other food crops include gram and other pulses. The main commercial crops of the territory are potatoes, ginger, chillies and sugarcane. Oilseeds such as sesame, rape, mustard and linseed as well as cotton, tea and tobacco are also grown. The areas under various crops and yield per acre for the year 1962-63 are tabulated below:—

TABLE 1.2.

*Area under principal crops, production and yield per acre for the year 1962-63*

Crop	Area	Production	Average yield/acre	
			Himachal Pradesh	All-India
			(Production '000 tons)	(Area in '000 acres)
			(Yield in lbs./acre)	
Rice	114	35	687	821
Maize	289	154	1195	881
<i>Ragi</i>	37	7	424	793
Small Millets	61	10	367	351
Wheat	387	95	596	738
Barly	71	14	442	727
TOTAL	929	315	760	655
Gram	17	2	264	556
Other pulses	54	7	290	335
Total pulses	71	9	284	447
Total				
Food grains	1000	324	726	613
Oil seeds	12	1	187	422
Sugarcane	4	19	10640	35636
Gur		2	1008	3735

1.24. Wheat with 3,87,000 acres is the most important food crop grown in the State. Maize and rice having 2,89,000 and 1,14,000 acres respectively are next in importance, barley and millets with 71,000 and 61,000 acres come next.

## HORTICULTURE

1.25. Himachal Pradesh has a more prosperous tradition in horticulture than any other part of India. Its physical climatic and traditional factors facilitate the cultivation of a variety of fruits. Quality apples of Kotgarh in Mahasu district are the most famous. Efforts are also being made to popularise citrus fruit orchards in Paonta valley in Sirmur district.

## COMMUNICATIONS

1.26. The inadequacy of communication facilities and the means of transport presents great handicaps in the development and planning of the territory. In Himachal Pradesh only two towns, Solan and Joginderanagar are connected by rail. Roads in the State are also inadequate and so far only district and Tehsil headquarters are connected by them. They are mostly only fair weather ones. Poor communications retard investigation, construction and proper maintenance more particularly of the small minor irrigation works, which may otherwise be feasible in the interior of the hilly areas. This also hampers scientific development of agriculture and optimum use of water on existing schemes.

## IRRIGATION

1.27. The total area under crops during the year 1961-62 was 10,87,000 acres against which the gross area irrigated was 1,66,000 which works out to about 15 per cent, against the 18 per cent average for the country as a whole. Normally the rainfall is ample and well distributed for raising good paddy and wheat crops without artificial irrigation. In drought years, however, the crops suffer for want of soil moisture.

1.28. As the area is mostly hilly, big irrigation schemes are not feasible although big perennial rivers flow through the territory. Possibilities of taking out small canals from hill streams, some of which are perennial, exist. There is a practice of constructing temporary diversion works across the small hill streams locally known as "Khads" and taking out contour channels locally known as "Kuhls" for irrigation purposes.

1.29. Such works have been constructed by the villagers from time immemorial. Any other type of irrigation is neither possible nor practised on any appreciable scale. Small patches of land in Paonta valley in the Sirmur district are however irrigated by wells at a few places. A few tube-wells have also been bored there.

1.30. The net area irrigated in the territory in the pre-plan period was about a lac acres. The irrigation works constructed by the villagers, being of temporary nature, used to get damaged by floods and land-slides during the monsoons and become ineffective for the rest of the season. Their reliability at the time of need was therefore questionable.

1.31. New schemes along with some of the existing kuhls, which required remodelling works like strengthening, renovation, lining of kuhls in pervious reaches etc. have been taken up by the Government

during the plans, generally, on the request of the beneficiaries. A table showing the number of schemes constructed and the acreage anticipated to be benefited during each plan is given below:—

Period	No. of works constructed	C. C. A. (Acres)	Cost in lacs/ (Rs.)
First Plan . . . . .	81	11698	10.72
Second Plan . . . . .	76	19753	52.30
Third Plan (First two years) . . . . .	14	4187	10.64
TOTAL . . . . .	171	35,637	73.86

1.32. The following table shows the annual net area irrigated in Himachal Pradesh during the years 1951-52 to 1961-62:—

*Source-wise distribution of the irrigated acreage (Net area)*

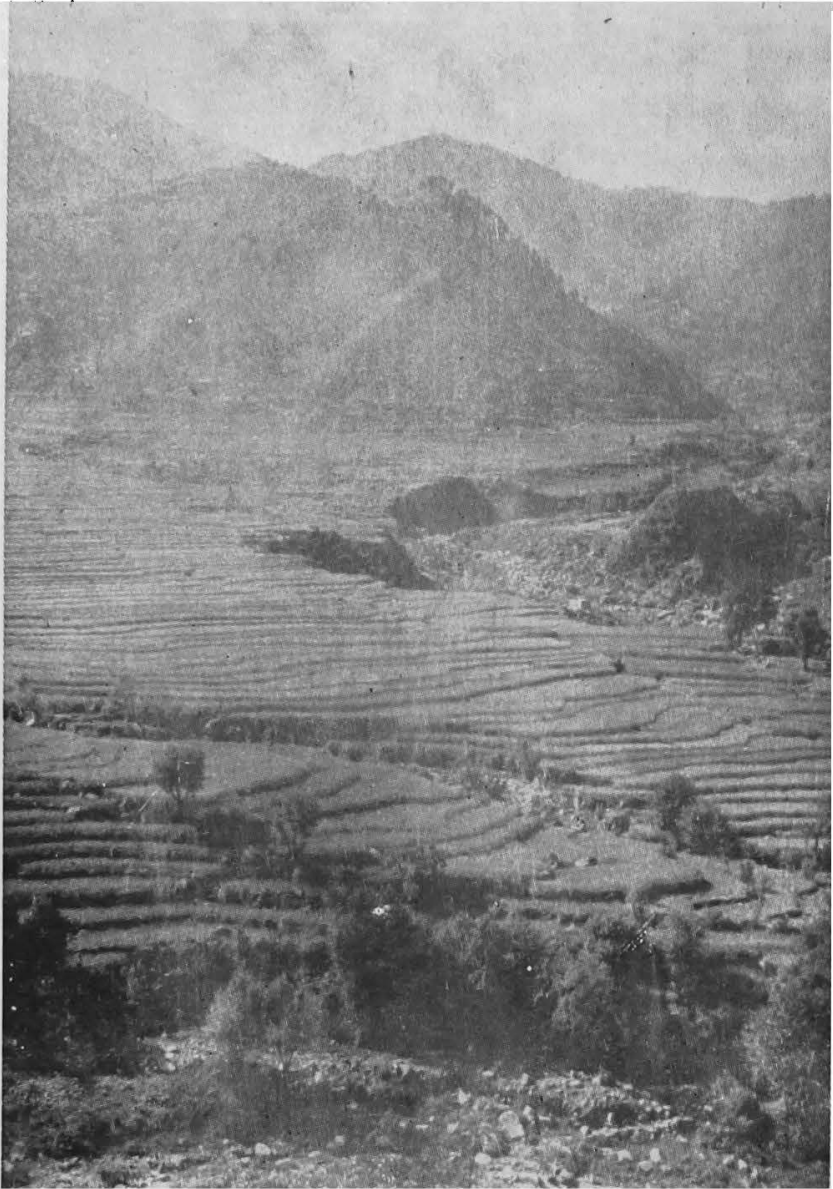
Year	Wells	Other sources	Canals	Tanks	Total
1951-52	23	118,189	—	—	118212
1952-53	23	95,670	—	—	95693
1953-54	25	92,479	—	—	92504
1954-55	41	94,894	—	—	94935
1955-56	62	94,908	—	—	94970
1956-57	63	93,453	—	—	93516
1957-58	73	93,424	—	—	93497
1958-59	296	95,807	200	—	96303
1959-60	297	95,588	330	426	96641
1960-61	57	95,013	336	—	95406
1961-62	58	96,571	430	—	97059

## INDO-GERMAN AGRICULTURE PROJECT

1.33. In the Mandi district, agricultural activities are going on in a project which is in operation under Indo-German agreement. The striking feature of this project is the development of the district on the 'mixed-farming' pattern.

1.34. Land holdings being small, it is not possible for the villagers to raise their standard of living through agriculture alone. This project envisages training of the cultivator in adopting to the 'mixed-farming' i.e., simultaneous cultivation of food crops, vegetables, orchards etc. and poultry farming, cattle breeding, sheep breeding etc. on a commercial scale.

1.35. The German Agriculture Assistance Team commonly known as GAAT includes German experts in various branches of Agriculture, Horticulture and Animal Husbandry. These GAAT experts along with their Indian counterparts have been staying in the project area and have been taking up farms in various localities for demonstration of the improved methods of agriculture and animal husbandry. Pedigree sheep and bulls, improved poultry birds, special varieties of vegetable seed, insecticides, agricultural machinery and other agricultural supplies are also being supplied by West Germany on this Assistance programme.



Extensive terracing of hill slopes in Chamba Valley  
(*Ref. Para. 2.1*)



## CHAPTER II

### KUHLS AND CANALS

2.1. The cultivation in Himachal Pradesh is generally carried out in fields prepared by terracing the hill slopes and the valleys. Irrigation projects with large commands are, therefore, not possible even when big sources of perennial water could be available. Small contour channels capable of commanding the lands on the valley-side are usually constructed and are fed from the local springs or hill streams. These small contour channels in the territory are locally known as 'kuhls'. The source of water for the kuhls is locally known as "khad".

2.2. There are two types of kuhls, some get perennial supply of water and are known as kuhls, whereas which get only seasonal supply, they are known as "katuls". By far, the largest number is of the second type.

2.3. Most of the irrigated area of the territory is by such kuhls or katuls. The cultivators have in the past been making kachcha kuhls, wherever possible. With the introduction of the Five Year Plan the work of improving the existing kuhls and construction of new kuhls has also been taken up in cases, where the cultivators required State help. As there is no separate department for irrigation, this work is also entrusted to the Public Works Department.

2.4. Initially all proposals for kuhls are prepared by the Revenue staff or by the Block staff. The schemes costing more than Rs. 25,000 are entrusted for execution to the P.W.D. (Building and Roads.) The P.W.D. Officers have no financial powers to sanction irrigation schemes. They have to be individually referred to the Finance Department for sanction before undertaking the work.

2.5. The Team visited some kuhls in different parts of the Himachal territory. Fig. 2.1. shows the position of works visited. Their particulars and performance etc. are given in the following paragraphs.

#### KARNODI KUHL

2.6. This kuhl is situated in District Mandi towards the west of Sunder Nagar Canal Colony. It takes its origin from the Nalini Nala. Karnodi kuhl was constructed during 1957-58 in the II Five Year Plan with an initial expenditure of Rs. 27,283 to command 220 acres of culturable area. The surplus water of the kuhl after flowing through the command falls in the khad below.

2.7. There is no reservoir, tank or masonry structure at the head of the kuhl to store or regulate the supply. The discharge of the kuhl is 1.8 cusecs which dwindles down to about 0.7 cusecs in the dry weather. The flow is minimum in the months of May and June. The kuhl is two miles in length, with  $1\frac{1}{2}$  feet bed-width and  $\frac{1}{2}$  to one foot depth and has a bed slope going up to 1 in 10. The channel is unlined. Dry stones are used at places to safeguard the channel slopes. The kuhl is subject to various actions like land-slides, cattle trespass, raincuts etc. and thus the maintenance is difficult.

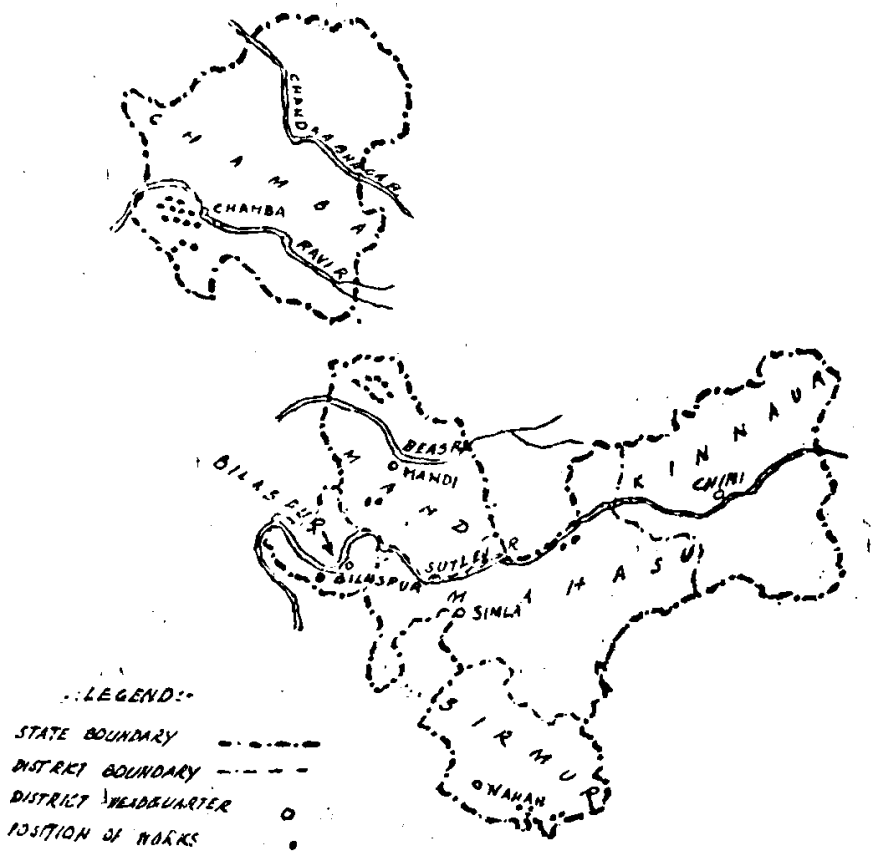


FIG. 2.1: Map of Himachal Pradesh showing the positions of works visited by the Team.

2.8. During the last three years the yearly expenditure incurred on the maintenance and repairs of the kuhl is shown below:—

Years	1961-62	1962-63	1963-64
	Rs.	Rs.	Rs.
Amount spent on ordinary annual repairs.	1,310.00	1,321.00	1,300.00
Special Repairs	3,622.00	4,151.00	3,785.00
TOTAL	4,932.00	5,472.00	5,085.00

Average = Rs. 5,163 per year.

The State has spent the amount of Rs. 5,163 annually without any return. The interest on capital even at a low rate of 4 per cent works out to Rs. 1,091, thus yearly expenditure added to the interest on outlay comes to Rs. 6,254. The State has been spending this heavy sum on the small kuhl, without any direct benefits.

2.9. The area served by the kuhl is not subjected to any assessment of water rate and there is no recording of area irrigated. Thus it cannot be ascertained as to how much benefits are being achieved.

2.10. At the time of Team's visit paddy fields were seen growing on the terraces, which were irrigated from the kuhl. The crop looked to be very healthy. Generally there is double cropping in most of the area. Principal crops are paddy, wheat and maize.

### JANAMYOGI KUHL

2.11. This kuhl is situated towards the west of Sunder Nagar a tehsil headquarter in Mandi district. It was constructed in the year 1956-57 under first Five Year Plan at an initial cost of Rs. 28,393 to command an area of 271 acres. It takes off from a natural spring called the Nag-Bag which drops down by about 1,000 feet and from where a kuhl is taken off for irrigation purposes.

2.12. There is no head regulator or escape sluice. Water falls from above and flows down without any control. No outlets are provided. The cultivators utilize the flow of the kuhl for the irrigation of paddy and maize in *kharif* season and wheat in *rabi* season.

2.13. No field channels are dug out for the irrigation of fields by the beneficiaries and irrigation is done from field to field, terrace by terrace.

2.14. The holder of fields on the upper terrace lets out the water by making a small cut in the terrace bund on one corner from where water flows down to the next field below and so on. Below the lower most field the residual supply is then let out in the khad as waste.

2.15. A khad known as the Gaugal khad intercepts the Janamyogi kuhl where an aqueduct about 200 feet long has been constructed. Total length of the kuhl is 2.5 miles and cross section is 1½ feet × 1 foot. The Janamyogi kuhl carries a discharge of 1.0 cusec which is said to reduce to ½ cusec in May and June. No record of actual area being irrigated is available.

2.16. Land-slides are very frequent in this area and with heavy rainfall of over 80 inches per year, boulders roll down and damage the banks of the kuhl and obstruct the flow of water. These necessitate heavy special repairs besides the usual annual repairs. Amount spent during the last 3 years was:—

Year	1961-62	1962-63	1963-64
	Rs.	Rs.	Rs.
Ordinary repair . . . . .	2,182	2,186	2,062
Special repair . . . . .	5,202	4,002	Nil
<b>TOTAL . . . . .</b>	<b>7,384</b>	<b>6,188</b>	<b>2,062</b>
Average . . . . .	5,211 (Rs. 19 per acre of C.C.A.)		
Interest on capital @ 4 per cent comes	Rs. 1,135.		
Total annual outlay	Rs. 6,356 (Rs. 23 per acre of C.C.A.)		

## KUHLS IN JOGINDER NAGAR AREA

### Narla Kuhl

2.17. This kuhl takes its origin from the Himri Ganga stream falling from the Narla Hill. It has a designed discharge of 3 cusecs. This was constructed in 1955-56 at a cost of Rs. 80,142. Its length is 1.5 miles. The area under command is 300 acres. Principal crops are paddy and wheat. The annual maintenance expenditure incurred during the last three years was:—

1961-62	1962-63	1963-64
Rs.	Rs.	Rs.
1,169	1,070	1,535
Average=Rs. 1,268.		

At the time of the visit the kuhl water was flowing into the khad as the demand was slack. The area irrigated is not recorded.

### Awar Kuhl

2.18. This kuhl takes off from the Nihri Khad with a designed discharge of 2.0 cusecs. This was built during the first Five Year Plan by the P.W.D., at an initial cost of Rs. 43,236. The annual maintenance expenditure is reported to be:—

1961-62	1962-63	1963-64
Rs.	Rs.	Rs.
172	239	190
Average=Rs. 197.		

The culturable commanded area of the kuhl on record is 240 acres which is usually sown with rice in *kharij* and wheat in *rabi*. The actual statistics of area irrigated year-wise are not available as the area irrigated is not assessed to any water charges.

### Manoh Majhannu kuhl and Hydro kuhl

2.19. These two kuhls were constructed by the P.W.D. at an initial cost of Rs. 2,69,211 and Rs. 40,999 respectively. Amounts spent for maintenance are reported to be:—

	1961-62	1962-63	1963-64
	Rs.	Rs.	Rs.
Manoh Majhannu kuhl	3,959	4,310	4,013
Hydro kuhl	397	223	314

These kuhls take off from the tail-race of the Joginder Nagar Power House (designed discharge of the Power House tail-race is 100 cusecs). The culturable commanded areas of the two kuhls are:—

Manoh Majhannu Kuhl	984 acres
Hydro kuhl	800 acres

The area is sown with paddy in *kharif* and wheat in *rabi*. The actual irrigation done is neither recorded nor any water charges assessed.

### Pont Kuhl

2.20. This kuhl takes off from Mandhoti Nalla with a discharge of 2 cusecs. The length of kuhl is 2.5 miles. This kuhl is a scheme of the Third Five Year Plan and came into operation in 1962-63. Its capital cost is Rs. 60,998. The maintenance expenditure during the two years was:—

1962-63	1963-64
Rs. 1,140	Rs. 1,741

Its C.C.A. is 225 acres sown with paddy which is mostly followed by wheat in *rabi*. The kuhl is unlined but has cross drainage works. It is maintained and supervised by the P.W.D.

### Saned Samkhetar Kuhl

2.21. This kuhl was constructed in the year 1961-62 at an initial cost of Rs. 8,825 by the N.E.S., Drang Block, Joginder Nagar. There is no head regulator or reservoir at its head. The length of the kuhl is 4,700 feet out of which 1,000 feet is lined. This kuhl has a culturable command of 120 acres which is usually sown with paddy in *kharif* and wheat in *rabi*. The Block Development authorities have an Overseer and an Agricultural Inspector to look after the kuhls in the block. No assessment is made on the block kuhls either and the actual area irrigated therefrom is not available.

### Garoru Kuhl

2.22. This is another kuhl constructed and maintained by the Block Development authorities. The initial capital spent is reported to be Rs. 3,950. This is a kuhl of the Third Five Year Plan. No expenditure

is incurred for the maintenance of kuhl. The annual repairs are done by the beneficiaries under the supervision of the Block Overseer and the Panchayat. This kuhl takes off from Gogli khad towards the west of Joginder Nagar town and has a discharge of about one cusec. The supply is perennial. The C.C.A. served is 200 acres but actual figures of irrigation and crops sown are not available.

### Jalpehar Kuhl

2.23. This is small kuhl of 300 feet length remodelled by the Block Development authorities during the year 1961 at a cost of Rs. 8,830. The area benefited is 140 acres sown in both crops *rabi*—wheat and *kharif* paddy. The annual maintenance and repairs is done by the beneficiaries under the supervision of the Overseer and Agricultural Inspector attached to the Block and Panchayat.

2.24. There is no difference in the construction of kuhl by the State P.W.D. and those by the Block Development Deptt. The kuhl are laid out as contour channels on the slopes of the hilly area. They take off from the natural sources and have tail escape into the khads. No field channels are made on these.

2.25. The Government kuhl are maintained at heavy expenditure annually whereas the block kuhl are maintained by the beneficiaries themselves by providing 'shramdan' manual labour.

2.26. The Drang Block has constructed some 29 kuhl at a cost of Rs. 2,96,898. The maintenance is normally done by the beneficiaries. The Block authorities, however, take up the repairs of kuhl in some cases where the Village Panchayats are not found to be in a sound financial position to take up the repairs. In such cases 75 per cent of the amount, is spent from the subsidy and 25 per cent in the form of 'shramdan', manual labour from the beneficiaries. It may, therefore, seem advantageous to place all kuhl under Panchayats for maintenance purposes.

### Sher Kuhl

2.27. This is an old kuhl taken over by the P.W.D. during the Second Five Year Plan. It was improved at an initial cost of Rs. 5,670 by the P.W.D., (B & R). The kuhl is situated at a distance of 7 miles from Dalhousie on Dalhousie-Chamba Road. It takes off from the Devi Dehra khad and has a discharge of 1.0 cusec. The kuhl is 0.7 mile in length out of which about 500 feet is lined. The kuhl is designed to irrigate an area of 40 acres. It was reported that all the 40 acres area is sown under paddy in *kharif* and wheat in *rabi*. The kuhl is under the supervision of the Assistant Engineer Bathri Sub-Division who is expected to visit the kuhl during his routine work every fortnight or so. The annual maintenance and repairs are also carried out by the P.W.D. In the year 1962-63 a sum of Rs. 350 was spent on maintenance. The area irrigated is not recorded by any agency and there are no charges for the water utilised for irrigation.

### Agoli Kuhl

2.28. This kuhl also takes off from the Devi Dehra khad. The designed discharge of the kuhl is 1.0 cusec. There is no reservoir, regulator or storage work. The channel is a short one only about a quarter

mile in length. It has a culturable command of 60 acres. The soil is red loam, yielding two crops every year. Rice is followed by wheat. Maize is also cultivated and harvested in this region as a rainfed crop.

2.29. The Agoli is an old kuhl. It was improved at a cost of Rs. 5,870 during the Second Five-Year Plan by the State P.W.D. The kuhl came into operation in 1961-62. The area irrigated is not being recorded by any agency and no assessment of water charges or betterment levy are being imposed. A sum of Rs. 125 is reported to have been spent for annual maintenance and repairs of the kuhl during 1962-63. Expenditure during subsequent years could not be had.

#### Bharuri Kakiani Kuhl

2.30. The Bharuri Kakiani kuhl is situated 5 miles north of Dalhousie on the road to Chamba in village Bharuri, Tehsil Bhatiat, district Chamba. It is an old pre-plan kuhl modified during the Second Five Year Plan at an initial cost of Rs. 5,887. It takes off from Bathri Nala with a designed discharge of 1.5 cusecs. Supplies are perennial. Its length is 3.5 miles. The width of the kuhl at top is  $1\frac{1}{2}$  feet and at the bottom 1 foot. The depth is  $1\frac{1}{2}$  feet. The channel is lined in the first mile with rubble masonry. The kuhl runs along the road.

2.31. This kuhl is designed to irrigate an area of 82 acres mostly situated in terraces jetting out from the mountain slopes. The principal crops are wheat, paddy and maize. The area irrigated is not recorded by any agency. It was however, gathered that the entire C.C.A. was double cropped year after year. The kuhl is under the supervision of the State P.W.D. During the year 1962-63 Rs. 2,310 were spent on the repairs.

#### Pandol Kuhl

2.32. The Pandol kuhl is located in the 3rd mile on road from Dalhousie to Chamba in village Sherpur, Tehsil Bhatiat. It takes off from the Nagah Khad. The designed discharge is 1.0 cusec which dwindles down to 0.5 cusec in summer months. The kuhl is old and remodelled during the Second Five Year Plan. The width is  $1\frac{1}{2}$  feet at top and 1 foot at bottom and the depth is  $1\frac{1}{2}$  feet. The channel is 1.5 mile in length out of which 1,000 feet is lined. The area irrigated is not recorded.

#### Bhanota Kuhl

2.33. The Bhanota kuhl is located in village Bhanota of Bhatiat Tehsil on mile 21 of Dalhousie-Chamba road. It is an old kuhl taking off from Bhanota khad and is perennial with a discharge of 1.5 cusecs which dwindles down to 0.5 cusec in summer months. It was remodelled by the State P.W.D. at a cost of Rs. 19,392 during the First Five Year Plan. It crosses a khad through a pipe line of six inches diameter and 100 feet length supported on pillars. The pillars were damaged in floods of 1964 and an expenditure of Rs. 5,244 was incurred on special repairs besides the annual repairs carried out with an estimate of Rs. 760.

2.34. The C.C.A. of the kuhl is 236 acres. Paddy, wheat and maize are the major crops sown from year to year. The soil is red loamy type and produces two crops in a year. The kuhl is looked after by the State P.W.D. There is no recording of irrigation and no charges for water realised.

#### Kalori Kuhl

2.35. This is a pre-plan kuhl now taken over by the Block Department. It is situated in village Devi Dehra and is looked after by the Gram Panchayat Manola. This village is situated at a distance of  $5\frac{1}{2}$  miles from Banikhet on the road to Chamba. The kuhl was remodelled at a cost of Rs. 7,400 in the year 1962. 75 per cent of this money was given by Government in the form of subsidy and the remaining 25 per cent was beneficiaries' contribution given in the form of labour. The kuhl is one mile long and has an area of 50 acres in its command. The discharge is 1.0 cusec perennial taking off from the Devi Dehra khad.

2.36. Formerly the area was under a hilly State rule now integrated into Himachal Pradesh. The assessment in pre-integration days was in kind which was fixed in cash after merger. So far, however, no charges are being realised for irrigation but a cess called the local rate by the Panchayat is levied on the area served. A part of this local rate realised is utilised by the Gram Panchayat for the maintenance and supervision of the kuhl but the annual repair and maintenance and clearance is done jointly by the beneficiaries under the supervision of the Panchayat.

2.37. The entire area under the kuhl is cultivated with a red variety of paddy in *kharif* followed by wheat in *rabi*. The kuhl appeared to be well maintained. This is one of the Block Development kuhls which have been improved by the funds allotted to the Development Department.

#### Narnulla Kuhl

2.38. This kuhl was constructed by the State P.W.D. at an estimated cost of Rs. 5,760 during the year 1961-62, for the supply of water to the Bathri Hospital. There are three tanks constructed in the head reach to serve as storages. Water is conveyed through a pipe line half a mile long and  $1\frac{1}{2}$  inch in diameter. The kuhl provides irrigation to hospital lawns and flower beds besides drinking water supply. It also has some area under vegetables.

#### Private Zamindari Kuhls in Bathri Area

2.39. There are 14 villages in the Bathri Panchayat Circle with a gross area of 1,986 acres and culturable area of 630 acres. There are 12 private zamindari kuhls in this area, all constructed and maintained by the beneficiaries under the Panchayat supervision. The red variety paddy is sown in nursery in April and transplanted in May and June and harvested in October. The yield is about 30 maunds/acre. The revenue rate of irrigated land in this area is 95 paise per bigha (5 bigha = 1 acre). For unirrigated land, the land revenue is 62 paise per bigha. For kuhls maintained by the Panchayats a cess called the local rate is levied.





Private Kuhl crossing near bridge on Dalhousie-Chamba road [Ref. Para 2·10]

Main crops are wheat, maize and paddy. Acreage under different crops in 1963-64 in the circle was:—

Wheat	Maize	Paddy	Fruit Trees	Vegetables	Pulses	Barley
231	494	80	27	11	21	152

#### Dadra Kuhl

2.40. This is a private zamindari kuhl taking off from Khadiana Nala with a discharge of 2.0 cusecs. It was constructed by the beneficiaries before 1947. There are about 300 acres of culturable area commanded by the kuhl. It was noticed that the entire area was covered with a bumper crop of paddy. The yield of the paddy was estimated to be 30 maunds per acre (about 20 maunds of rice). This superior variety of rice fetches Rs. 30 to 35 per maund. Thus one acre fetches between Rs. 600 to 700. There is no assessment of water charges. The maintenance, repairs and clearance is done by the beneficiaries.

#### Gatiani Kuhl

2.41. This kuhl also takes off from the Khadiana Nala for commanding a culturable area of 25 acres situated on the left side of the pucca road from Banikhet to Chamba. The discharge of the kuhl is 0.25 cusec and the length is 700 feet. It is an old preplan kuhl constructed, maintained and looked after by the beneficiaries jointly. The kuhl appeared to be working satisfactorily.

#### Paddan Kuhl

2.42. This kuhl takes off from the Nad Nala with a discharge of 1.0 cusec. Length of the kuhl is one mile. The culturable commanded area is 100 acres. The entire area was found to be under paddy. This is an old preplan kuhl recently remodelled by beneficiaries. No expenditure was incurred by the State on the improvement of the kuhl and there is no assessment.

### KUHLS IN NAINI KHAD AREA

#### Deoka Kuhl

2.43. This kuhl is situated between 10th and 11th mile of Dalhousie Pathankot road. It takes off from the Panj-pula khad falling from Kala tope hill. This kuhl was constructed by the P.W.D. during the First Five Year Plan at a cost of Rs. 20,416. It is a perennial kuhl, having discharge of 1.5 cusecs which dwindles down to about 0.7 cusecs in the summer months of May and June.

2.44. The kuhl is designed to command a culturable area of 53 acres. The entire commanded area was sown under paddy at the time of visit. An improved variety called 972 China was found to be popular in this area. This variety of rice was said to be yielding 40 maunds of paddy per acre and fetching up to Rs. 35 per maund of rice. The crop of paddy is harvested in October and it is followed by wheat in winter.

2.45. Deoka kuhl like most other kuhls is without any reservoir or regulator at its head. The length of the channel is 1.12 miles and width  $1\frac{1}{2}$  foot at top and 1 foot at bottom. There is an aqueduct for crossing the kuhl over the khad where an iron pipe-line is laid. The water of the kuhl flows back to the khad after irrigating the command.

2.46. This kuhl is under the supervisory control of the State P.W.D. The Assistant Engineer Banikhet is expected to inspect it fortnightly and the Sectional Officer weekly. The area irrigated is not recorded. There is no water charge or any assessment of betterment levy on the area benefited from the kuhl.

#### **Rauni Kuhl or Naini Khad Kuhl**

2.47. The Rauni kuhl is situated between mile No. 13 and 14 on the Dalhousie—Pathankot road in village Naini khad Tehsil Chowari district Chamba. The kuhl takes off from the Naini khad (a stream falling from the Kala tope hills just towards north of village Naini khad.) It was constructed by the State P.W.D. during the First Five Year Plan at an estimated cost of Rs. 10,490.

2.48. This kuhl has a designed discharge of 1.5 cusecs. The length of the channel is 3.5 miles, width 1.5 feet and depth 1.0 ft. It is partly lined. The cultivated area starts just near the head. There is an aqueduct to cross the kuhl over the khad below the market area. The culturable commanded area is 49 acres and is in patches. A variety of paddy called Begmi was found to be cultivated.

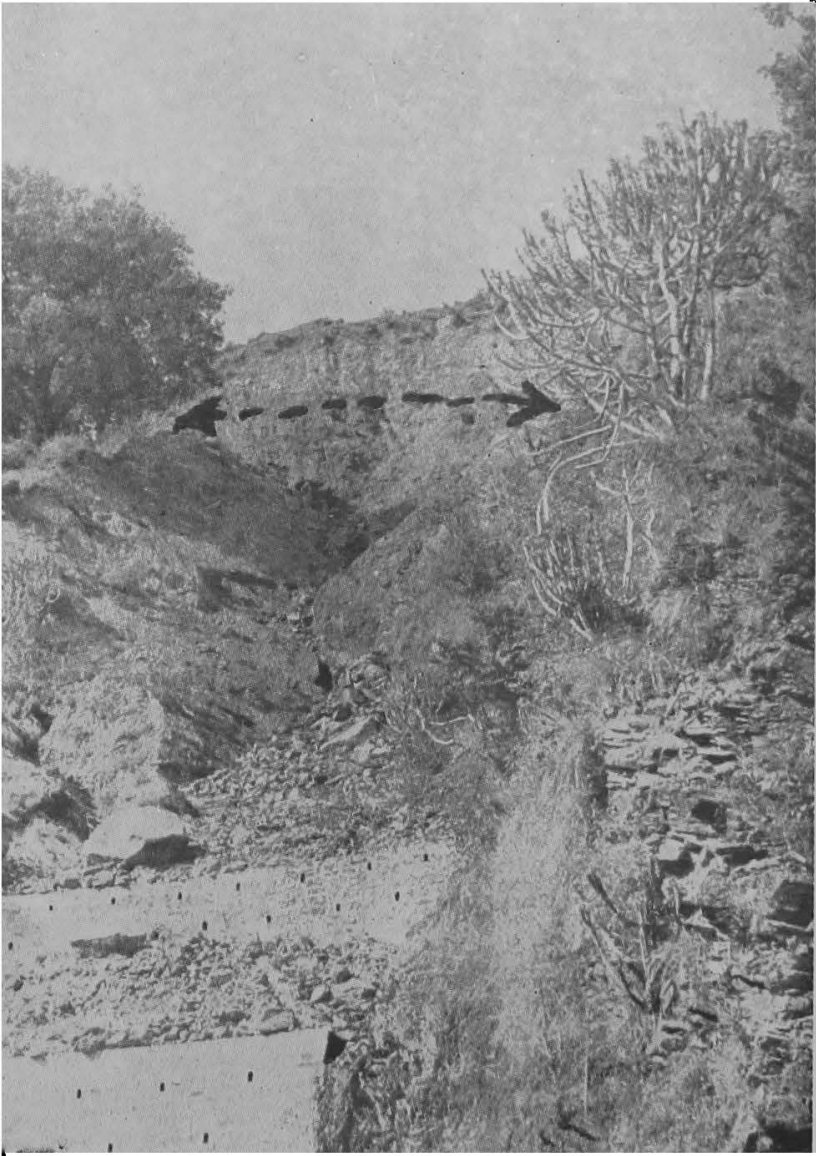
2.49. At the time of the visit in October 1964, this kuhl was lying in a damaged condition due to a land slide and the channel was blocked at two places. The water of the kuhl was flowing out into the Naini khad. The kuhl is under the supervision of the P.W.D. and the Assistant Engineer Banikhet sub-division is expected to inspect the kuhl every fortnight. The Sectional Officer is required to visit the kuhl every week. The ordinary repairs of the kuhl are carried out from A.R. funds but such heavy damages have to be repaired under special repairs grant.

#### **Ambda Lahar Kuhl**

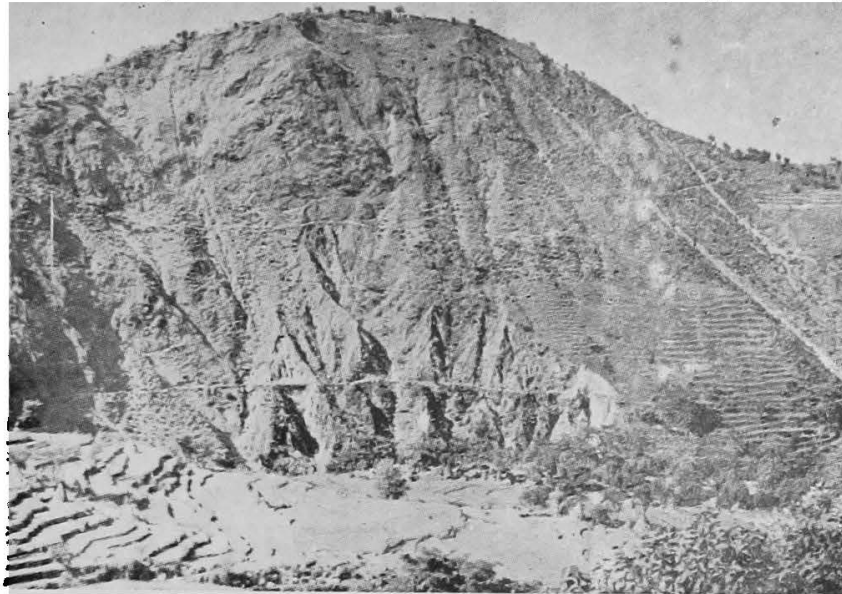
2.50. This kuhl is situated in village Naini Khad Tehsil Chowari, district Chamba at 17th mile of Dalhousie—Pathankot road. This kuhl also takes off and runs along the right bank of the Naini Khad. The designed discharge is 1.0 cusecs. The length of the channel is one mile, width is one foot and depth one foot. About 50 feet length of the channel is lined.

2.51. This kuhl was constructed by the Naini Khad village Panchayat at an initial cost of Rs. 3,500 in the year 1960-61. The area under command is 20 acres sown under rice followed by wheat from year to year. The area is irrigated from field to field terrace by terrace. The kuhl is maintained and looked after by the beneficiaries under supervision of the village Panchayat. The maintenance is done by Shramdan by the beneficiaries.

2.52. There are three more private kuhls named as Bedal, Ganand and Seri named after the villages irrigated by them, under the Gram



A breached Kuhl portion on Dalhousie-Chamba road [Ref. Para 2-49]



A Kuhl on hill side showing Landslips in Chamba valley [*Ref. Para 2-49*]

Panchayat. The area irrigated is about 20 acres for each of these kuhls. These private kuhls are also free from assessment of water charges.

## KUHLS IN THEOG AREA OF MAHASU DISTRICT

### Kepu Kuhl

2.53. This kuhl is situated at a distance of 20 miles from Narkanda (62 miles from Simla) on the road to Tibet. It takes its origin from the Swari khad and irrigates the village Kepu. The designed discharge is 3 cusecs. The length of the channel is 15,000 feet. This kuhl is a very old kuhl which was improved during the Second Five Year Plan at an estimated cost of Rs. 34,917 by the State P.W.D. An amount of Rs. 4,565 was incurred on repairs during 1963-64.

2.54. This kuhl has 45 acres of culturable area under its command and almost entire area gets double cropping i.e. paddy followed by wheat. The area irrigated is not recorded. There are no charges levied by the State on the irrigation done from the kuhls. The varieties of rice and wheat are local and methods of cultivation are also indigenous.

### Khekhar Kuhl

2.55. This is another kuhl taking off from the Swari khud. The designed discharge of this kuhl is 2.5 cusecs. It was an old kuhl remodelled during the Second Five Year Plan period at an estimated cost of Rs. 16,987 by the State.

2.56. The culturable commanded area of the kuhl is 70 acres. The main crops are paddy and wheat rotated year after year. The Assistant Engineer is expected to inspect the kuhl during his fortnightly round and the Sectional Officer is to inspect the kuhl every week.

2.57. A total of 25 kuhls were visited by the Team, which have been described in the foregoing paragraphs. Out of these, 3 are private zamindari kuhls, 5 are those constructed by the Block Development staff and the rest 17 have been constructed by P.W.D.

2.58. Statements of these kuhls have been prepared separately for each category and are given below:—

### STATEMENT I

#### *Private Zamindari Kuhls*

Sl. No.	Name of Kuhl	Length	C.C.A. (acres)	Remarks
<b>District Chamba</b>				
1.	Dadra Kuhl	N. A.	300	These kuhls have been constructed by the cultivators and are maintained by themselves. There is no assessment and recording of irrigation.
2.	Gatiani Kuhl	700 ft.	25	
3.	Paddan Kuhl	1 mile	100	

## STATEMENT II

*Kuhls constructed through Block Development Staff.*

Sl. No.	Name	New or remodelled	Year of const.	Cost Rs.	Length	CCA (acres)	Cost (Rs.)	
							Per mile	Per acre
<b>District Mandi</b>								
1.	Saned-sam-khetar	New	61-62	8,825	4700'	120	10,000	73
2.	Garoru	New	III Plan	3,950	N.A.	200		20
3.	Jalpehar	New	61-62	8,830	300'	140	1,55,800	63
<b>District Chamba</b>								
4.	Kalori	Remodelled	61-62	7,400	1.0 mile	50	7,400	148
5.	Ambda	New	60-61	3,500	1.0 mile	20	3,500	175

These kuhls are constructed through Block Development staff at government cost but are maintained by the beneficiaries by Shramdan. Practically, nothing is therefore spent on repairs. There is no recording of irrigation and no assessment of water rates. In case of Kalori kuhl, however, some local rate is reported to have been levied by the Panchayat. If such system is extended to other kuhls also, it may lead to better management of repairs and upkeep. It is for consideration of the authorities, if levying of local rates by the Panchayats concerned, could be legislated for.

## STATEMENT III

*Kuhls constructed by P. W. D.*

S. No.	Name of Kuhl	New or old	Year of const.	Cost (Rs.)	Length (mile)	CCA (Acre)	Cost (Rs.)		Financial Loss (Rs.)		A/R acre (CCA) (Rs.)
							per mile	per Acre	Annual Interest @ 4%	Annual repair	
1	2	3	4	5	6	7	8	9	10	11	12
<b>District Mandi</b>											
1.	Karnodi	New	57-58	27,283	2.0	306	13,642	89	1091	5163	17
2.	Janamyogi	"	57-58	28,392	2.5	271	11,357	105	1135	5211	19
3.	Narla	"	55-56	80,142	1.5	3000	53,428	267	3206	1268	4
4.	Awar	"	55-56	43,236	N.A.	240	..	180	1729	197	1
5.	Manoh Majhanne	"	61-62	269,211	4.0	984	67,303	274	10768	4094	4
6.	Hydro	"	61-62	40,999	3.0	800	13,666	51	1640	311	0.4
7.	Pont	"	62-63	60,998	2.5	225	24,399	272	2440	1440	6.5
<b>District Chamba</b>											
8.	Sher	Old	61-62	5,670	0.7	40	8,100	142	227	350	9
9.	Agoli	"	II Plan	5,870	0.25	60	23,480	98	235	125	2
10.	Bharuri-Kakiani	"	61-62	5,887	3.5	82	1,680	72	235	2310	28
11.	Pandol	New	II Plan	22,889	1.5	50	1,526	458	916	315	6
12.	Bhanota	"	61-62	19,392	1.5	236	1,293	82	776	6004	25
13.	Nornulla	"	61-62	5,760	..	For Bathru Hospital	..	..	..	..	..

1	2	3	4	5	6	7	8	9	10	11	12
14.	Deoka	New	I Plan	20,416	1.12	53	18,200	385	817	N.A.	..
15.	Rauni or Nainikhad	..	I Plan	10,490	3.5	49	3,000	214	418	..	..
<b>District Mahasu</b>											
16.	Kepu	Old	61-62	34,917	2.8	45	12,470	776	1,596	4,565	101
17.	Khekhar	New	61-62	16,987	..	70	..	242	679	N.A.	..

These kuhls are constructed and maintained by P.W.D. at government cost. There is no recording of irrigation and no assessment of any levy or water rate. As such, State gains nothing by way of revenue from the works.

2.59. From a perusal of these statements it would be seen that cost of schemes constructed by P.W.D. is as low as Rs. 5,670 and as high Rs. 2,69,211. New schemes constructed by P.W.D. generally cost over Rs. 20,000. The cost per acre of C.C.A. ranges between Rs. 51 and Rs. 458. Apart from the capital cost a heavy amount is spent every year in keeping these kuhls in order, which ranges from Rs. 0.40 to Rs. 101 per acre of C.C.A.

2.60. The total culturable area commanded by kuhls constructed by the P.W.D. up to 1962-63 is about 36,000 acres and the yearly maintenance expenditure is as below:—

Year	Amount (Rs. lakhs)
1956-57	1.2
1957-58	0.87
1958-59	0.85
1959-60	2.47
1960-61	2.40
1961-62	2.52
1962-63	1.71
1963-64	1.94
1964-65	2.10
1965-66	3.00
(Budget)	Average = 2.3 lakhs.

Average expenditure of Rs. 2.3 lakhs on 36,000 acres works out to an average of Rs. 6.40 per acre.

2.61. The figures of actual area irrigated are not available. If maintenance expenditure per acre of the area actually receiving water is worked out, it would be much more. Interest accruing annually on the capital cost of about Rs. 300 per acre or more by the Government is in addition to the maintenance cost.

2.62. It may not be possible to realise this amount from the beneficiaries in the shape of levy and water rates. However, as the schemes are small and do not involve much of technical knowledge; it would be much better if they are handed over to the Panchayats for operation, maintenance and repairs, as is the case of kuhls built by Block Development Staff.

2.63. In case, where works are of such magnitude, and of such nature, as cannot be handled by Development staff or Panchayats themselves, these could be done by P.W.D. on their behalf. Even special



repairs, could be done by P.W.D. as departmental or contribution work. This procedure will throw the responsibility eventually on Village Panchayats and they may in course of time be able to maintain and even construct such works themselves, efficiently.

## CANALS IN BILASPUR AND PAONTA VALLEY

2.64. The team also visited three small canal systems one near Bilaspur and two in the Paonta valley, which are described below.

### Chandpur Canal

2.65. This canal is situated 12 miles west of Bilaspur. The scheme was originally sanctioned for construction in the year 1959 with an estimated cost of Rs. 2,74,450 for the first stage for the benefits of villages Jalhal and Deslin, Tehsil and district Bilaspur. The Chandpur Canal takes off from the Ali Khad where a weir and head regulator are constructed for giving a perennial supply of 18 cusecs into the Canal. In the first stage the canal has been constructed five miles in length which is partially lined.

2.66. There are 18 cross-drainage works over this canal. The channel width is 4 feet at the top and 3 feet at the bottom with 4 feet depth. There are eleven pipe outlets fixed for the supply of water. The channel does not irrigate in the initial 17000 feet length. It is a contour channel running along a hill slope. The command of the channel is only on the left side. The canal, though not yet fully developed and properly maintained, appeared to be doing a lot of good to the people served by it.

2.67. This canal is designed to irrigate an area of 1,423 acres on completion. Out of this 381 acres is proposed to be irrigated from the first stage. The first stage was started in 1959 and completed in 1962. The actual amount of expenditure incurred is stated to be Rs. 3,70,000.

2.68. Principal crops cultivated in the area were sugarcane, paddy, maize, chillies in *kharif* and wheat in *rabi*. One cultivator holding 10 *bighas* of land was contacted. He reported that he had sown 6 *bighas* with maize and 4 *bighas* of land with paddy. During the previous *rabi* he had 5 *bighas* under wheat and rest under potatoes, tobacco and vegetables. He felt the canal had given him great help in crops like sugarcane, maize and vegetables and also in obtaining higher yields.

2.69. The location of the canal was such that it took some three hours to reach the site by foot. The Sectional Officer incharge of the canal is stationed at Bilaspur which is 17 miles from the site. The difficulties of access and approach are some of the causes for poor development. The actual area irrigated so far was intimated to be 70 acres only. It was revealed by the Assistant Engineer incharge that there was not much area left for Irrigation. He felt that the proposed C.C.A. was not worked out correctly. There was some area irrigated in the lower terraces getting water from kuhls constructed privately.

### Bata Majra Canal

2.70. This canal is situated towards the north west of village Matak Majra, Tehsil Paonta, district Sirmur. It takes its origin from the Bata

river. The water of this river is utilised for the purpose of 'Gharat' Grinding Mill which after escaping from the mill is diverted to feed the pucca head regulator. The maximum discharge of the canal is 15 cusecs. The channel was flowing with 4 cusecs only at the time of visit.

2.71. This canal was commissioned in 1959 and was to have a total length of 4.5 miles. So far the channels has been completed up to 8,700 feet, which is lined. The total cost of the scheme is estimated at Rs. 2,98,000, out of which Rs. 80,000 have been spent.

2.72. On completion the canal would feed a C.C.A. of 1,200 acres but area irrigated till now is 284 acres. The cropwise break-up is given below:—

Sugarcane	Paddy	Wheat	Maize	Berseem	Misc.	Total
25	130	30	40	51	8	284

Area irrigated more than once is 60 acres. So far there is no assessment levied on the area irrigated and the canal water is used free.

2.73. The owner of Gharat (Water mill) has his rights and it was told that he was not prepared to allow any change or diversion in the supply. When on completion full discharge will be required to be fed into the canal, there may be difficulty, as the mill-owner may object to it. It would, therefore, be necessary that his rights may be acquired after duly compensating him.

2.74. The expenditure on annual maintenance and repairs as reported is as below:—

1963-64	1964-65	1965-66
365.00	1,497.00	932.00

Further work on the kuhl has been stopped as the commanded area falls under the command of the canal system of Bata—Giri Hydro-electric Project under consideration of the State authorities.

### Rampur Giri Canal

2.75. This scheme is situated at a distance of about five miles towards north east of Paonta Sahib in Sirmur district. River Giri flows almost at the boundary of the Himachal Pradesh and U.P. This canal has been taken off from the right bank of Giri river by constructing a diversion bund of boulder crates which has to be put up after monsoons every year. There is a pucca head regulator with an opening of 4 feet × 6 feet. The canal is designed to run with head discharge of 30 cusecs. It has a length of 6½ miles. The initial cost was Rs. 7,38,862. The scheme was completed in March, 1958 in Second Five Year Plan.

2.76. The canal passes through a comparatively flat area. Its culturable commanded area is 2,580 acres. The cropwise area irrigated in 1965 is given below.

Sugarcane	Paddy	Maize	Chari	Wheat	Berseem	Gram	Misc.	Total
135	366	215	65	187	570	35	300	1873 acres

Kharif acreage	646 (Paddy, maize, chari)
Rabi ..	792 (Wheat Berseem & Gram)
Perennial ..	135
Miscellaneous	300
Total	1873

Paddy is usually followed by berseem, maize by wheat and Chari by Gram. The net area irrigated is thus only 1,227 acres.

2.77. The canal was visited in November, 1965. Due to scarcity of rainfall, that year the canal was running with only about 15 cusecs. Pipe outlets of 3 inches and 6 inches diameter have been fixed. It was reported that acreage of the command has not been the deciding factor for determining the size of the outlets, which are fixed more or less arbitrarily. The irrigation is done field to field and no field channels have been dug by the beneficiaries to take water to their fields. The sizes of outlets need to be rationalised and field channels provided in order to put the water to its optimum use.

2.78. The expenditure on annual maintenance has been as follows:

1961-62	1962-63	1963-64	1964-65	1965-66
Rs. 7,771.00	6,993.00	12,041.00	14,373.00	5,722.00

There is no assessment of water rate from the beneficiaries. It was intimated by the officers incharge of the canal that proposals were being framed for imposing water rates similar to those on Dun Canals in U.P. on the other bank of Jamuna.

2.79. This is the biggest canal system in the State and the areas served by it are receiving good benefit from it. Still the full potential has not been utilised. Special efforts are required to put the system to its maximum use.

#### CANAL SYSTEMS UNDER THE GIRI MULTIPURPOSE PROJECT

2.80. About 15,000 acres of land in Paonta valley is proposed to be brought under irrigation—8,000 acres on the left bank and 7,000 acres on the right bank of Bata River—under this project. The project envisages diversion of water from River Giri through tunnels outfalling into River Bata, for generation of hydro-electric power. The tail race of the power house shall directly feed the left bank canal in the first stage of the project. In the second stage the right bank canal would be taken off by constructing a barrage across river Bata.

2.81. The project for stage I includes construction of a lined main canal 14.41 miles along with a head discharge of 80 cusecs and the unlined distribution system at a cost of Rs. 52.41 lakhs. The total cost allocated to irrigation after including the share of cost of headworks works out to Rs. 59.56 lakhs. The gross area to be served is 8000 acres and the C.C.A. is 6000 acres. Thus the cost works out to about Rs. 1000 per acre of C.C.A. which is high.

2.82. The existing intensity of crop in the area as mentioned in the project is 143.67 per cent. An intensity of 184 per cent has been anticipated after introduction of irrigation. This includes wheat 60 per cent, maize 30 per cent, paddy 30 per cent, sugarcane 25 per cent and other crops 39 per cent. It has been anticipated that on full development after 11 years of completion, 100 per cent of the cropped area would be irrigated, yielding a net revenue of Rs. 75,720 after deducting Rs. 6 per acre for maintenance. Irrigation rates of Dun canals U.P. have been adopted for working out the revenue as no irrigation rates have been introduced in this State.

2.83. The anticipations in the project are not based on actual achievements anywhere in the State. On the existing Rampur Giri Canal hardly 60 to 70 per cent of C.C.A. is being irrigated at present with no water rates. It would seem prudent if the benefits are correctly assessed and efforts made to preplan agricultural development so that there is no time lag between the creation of potential and its utilisation. The financial picture of the project will also improve if the provision for construction of different items of irrigation systems are reviewed with a view to reduce the cost as far as possible. The benefits of irrigation may not accrue to the extent assumed in the project, as is evident from the performance picture of Rampur Giri Canal, which is comparatively a smaller work in a similar terrain.

## CHAPTER III

### OTHER MEANS OF IRRIGATION

3.1. Most of the irrigation in Himachal Pradesh is by kuhls and small canals. In a few isolated places, however, some other means of irrigation are used. These include tanks, lift irrigation and sprinkler in case of surface water schemes and percolation well and tube-wells in case of ground water schemes.

#### TANKS

3.2. It is common to tap perennial springs for drinking water-supply schemes. In these schemes pipe lines are laid from the source to the villages or hamlets to be served. Similar arrangement for conveying water was seen in a case in high hills where such water was being utilised for irrigating vegetables. This work belonged to one Mr. L. C. Stokes, a progressive horticulturist of Kotgarh in Mahasu district. Here a pond had been constructed by putting an earthen bund across a rainfed rapid to store water for irrigation purposes.

3.3. Mr. Stokes told the Team that the main difficulty in such tanks was the heavy loss of water due to percolation. He had tried to find out some suitable sealant for this purpose. He stated that use of cowdung for this purpose had given good results. This is an encouraging feature of this small tank irrigation on hill slopes.

3.4. Though capacity of the tank was only about 10,000 gallons, yet this small work was reported to be sufficient for raising green vegetables for his family. He had also placed fish fingerlings in the tank and expected to get good amount of fish. As green vegetables and fish are not available in Kotgarh locally, and have to be obtained from Simla, this small pond has become a favourite with the family. They attend to it with great care.

#### LIFT-IRRIGATION

3.5. In Mandi district, on the Indo-German Agricultural Project, at about 5 miles from Mandi, a vegetable grower was seen using an electric pump for lifting water from Suketi Khad, flowing near his 3 acre holding. He was growing vegetables there on a commercial scale. The cultivator did not yet know the cost of the pump set and the charges being incurred by him on electricity. However, he was being benefited by the lift irrigation. The small pump had cost about Rs. 500 and had been installed for him by the project authorities at their own cost.

3.6. Prospects for this type of lift irrigation exist at many places in Himachal Pradesh, particularly in valleys. With spread of electric power net work in the State, there is possibility of extending lift irrigation of this type, which needs to be encouraged. Return from such small projects is bound to be good. Manually operated like Bihar Pedal or hand pumps may also be given a trial.

## SPRINKLER IRRIGATION

3.7. Sprinkler irrigation is being given a trial at the Indo-German Agricultural Project, Mandi. They have a mobile set. The water is pumped from a natural stream flowing nearby and pipe lines were laid out in the adjoining fields for distribution. Sprinklers are connected to the outlets and the pressure of water is sufficient to sprinkle water from each sprout in a radius of about 50 ft.

3.8. In case of initial watering after ploughing one setting of sprinkler was told to be requiring 2 hours of running. In subsequent waterings this time was said to be reduced to about 40 minutes. It is just a demonstration. Actually the cost involved is prohibitive for the type of crops being grown there. Sprinkler irrigation is however good for horticulture and tea gardens where it may pay its way.

3.9. Possibility of sprinkler irrigation could be better where tanks could be located at higher elevations than the area to be irrigated. In that case gravity alone provides the necessary pressure and water can be used economically for raising and maturing crops, which otherwise fail to give economic return for want of moisture in the soils.

## OPEN WELLS

3.10. Areas, where open percolation wells can be successfully installed are extremely scarce in Himachal Pradesh. These wells have primarily been dug for drinking purposes, but they can afford means of irrigation for small plots of land especially in the low hill zone extending over Paonta tehsil of Sirmur, the Balh area of Mandi, Bhatiat tehsil of Chamba and Bilaspur district where the under-ground resources appear adequate and the strata is not hard rock.

3.11. The Team had the occasion to visit one open well in Paonta area. The particulars of the same are:—

Location	Agriculture Research Station, Dhaula Kuan
Type	Pucca stone masonry open well
Diameter	12 feet
Depth	45 feet

This well was constructed in 1958 at an initial cost of Rs. 2,500. There is a pumphouse constructed at a distance of 12 feet from the top. This pump house is fitted with a 5 H.P. electric pumping set.

3.12. The cost of the set was Rs. 700 at the time of its purchase. The monthly electric bill on an average amounts to Rs. 30. There is a 3 inches suction pipe and 2½ inches delivery pipe. This pump is run 8 hours daily during the day and 8 hours during the night. The well gets replenished in the interval. The well irrigates an area of 30 acres under citrus fruit experimental orchards.

3.13. The Team was told that a few similar open percolation wells exist in Paonta tehsil. They are fitted with persian wheels and a good use is being made of these wells. The number of these wells is small at present and could be increased in such areas where quality and quantity of sub-soil water was reassuring. Taccavi could be given for this

purpose through panchayats or co-operatives. A survey needs to be undertaken in this respect in all these areas of Himachal Pradesh where open percolation wells are feasible and where farming is an economic feasibility.

### TUBE-WELLS

3.14. Like open wells the possibilities of tube-wells are also there in the Paonta valley. As a result of exploratory drilling, three tube-wells have been energised and are being maintained by the P.W.D. These tube-wells are at (i) Dhaula Kuan, (ii) Majra and (iii) Paonta Sahib. Some more tube-wells are proposed in this valley.

### DHAULA KUAN TUBE-WELL

3.15. This tube-well is situated in the 250 acre Agricultural Research Station, Dhaula Kuan. The tube-well has been bored up to a depth of 200 feet and was completed in July 1958. It is fitted with a borehole type Johnston pump run by an electrically operated 12.5 H.P. Kirloskar motor. A suitable pucca pump house, a sump with V-notch and lined guls have been constructed in this tube-well. Overseer of Dhaula Kuan Section of P.W.D. looks after this tube-well. The discharge was reported to be 20,000 G.P.H.

3.16. The tube-well is run for about 14 hours a day and is being used to irrigate the agriculture farm apart from providing the drinking water supply to the farm colony. An over-head tank has also been provided. The well water contained some fine sand particles. It needs to be watched if the sand content is steady or is increasing, in which case remedial measures may be necessary.

3.17. The tube-well cannot command the entire farm. It was learnt that another tube-well for the remaining area was proposed to be constructed.

### MAJRA TUBE-WELL

3.18. This tube-well is situated in Majra town, which is a tehsil headquarter with a population of about 500, and is used exclusively for water supply. The tube-well has been bored to a depth of 120' only and has been yielding 2,000 gallons per hour as reported by the overseer incharge.

3.19. This tube-well is also fitted with a borehole type Johnston Pump run by a 12.5 H.P. electrically operated Kirloskar motor. It is provided with a pucca pump house and an overhead tank. It was pointed out to the local officers that for a discharge of 2,000 gallons per hour there was no necessity of having a 12.5 H.P. motor. A motor of much smaller size could be used.

### PAONTA TUBE-WELL

3.20. This tube-well is located near the Paonta rest house and is utilised for the town water supply. The boring is to a depth of 126 feet. This tube-well is also fitted with a borehole type Johnston pump run by a 12.5 H.P. electrically driven Kirloskar motor. It is yielding 6,000

G.P.H. There is a pump house and an overhead tank of 20,000 gallons capacity. A motor of smaller capacity would have been more efficient and economical in this case also.

3.21. Possibilities of ground water use exist in a few locations in Himachal Pradesh. These need to be identified and exploitation of ground water resources needs to be made wherever possible. If good supplies are available small farms could be established with assured irrigation supplies all the year round. Special crops, which can flourish in Himachal Pradesh climate could thus be grown in such farms.



## CHAPTER IV

### TYPES OF LAND AND CROP PRACTICES

4.1. Cultivation in Himachal Pradesh is carried on, wherever possible, both on the hill slopes and in the valleys and the fields are laid out in all manners to suit the terrain. Generally three kinds of lands are under cultivation, namely level irrigated land, unirrigated land, sometimes terraced but often sloping and thirdly poor unirrigated land in the high hills.

4.2. The local farmers have divided the land into six classes as under and this classification has been adopted in the regular settlement:—

- (i) **Kiar**.—Land which is fully irrigated from water courses.
- (ii) **Sanjjar**.—Land irrigated with water which collects in the pools during rainy season and the supply of which does not last beyond the sowing of wheat crop.
- (iii) **Bakhal and Karali**.—Land situated near the homesteads which is heavily manured raising two crops a year.
- (iv) **Bakhal Kiar**.—Land occasionally flooded by streams or by water flowing from other fields.
- (v) **Bakhal Baharani**.—Land situated at some distance from the home-stead, scantily manured and bearing only one superior crop a year.
- (vi) **Kultharni**.—Land on which an inferior crop is grown every year or every alternate year.

4.3. Due to isolated nature of the territory, agricultural practices continue to be backward. Crop rotation is not properly done. The land gets scanty organic manure and the local manurial resources have not been fully developed. The use of chemical fertilizers is very low especially in the remote and far-flung areas mainly because of inadequate transport facilities and high cost of the transportation. Plant protection measures are yet in the initial stages. Irrigation resources have not yet been fully tapped. However, the use of chemical fertilizers and improved seeds and the adoption of plant protection measures are slowly getting popular with the cultivators although the irrigation potential has not yet been exploited to the full extent and much remains to be done in this regard.

4.4. The agricultural conditions vary significantly in different parts of the territory ranging from almost plain-level altitude to over 10,000 feet on the mountain slopes. As such, the time of both sowing and harvesting varies with the elevation of fields. *rabi* crops are sown from middle of September to the middle of December and the crops last up to the beginning of July. *Kharif* crops are sown from March to the middle of July and are harvested from September to the end of November. In colder parts of Chini Tehsil, which remain under snow for a long time; there is only one crop in a year, sowing being done in September-October and harvesting taking place in August-September. The principal *rabi* crops are wheat, barley, gram, peas, coriander and lentils while the main *kharif* crops are maize, paddy, sugarcane, potatoes,

*ragi*, smaller millets and mash. Oilseeds which occupy more than one-half of the total area under non-food crops are grown both in the *rabi* and *kharif* seasons.

4.5 The pressure on land is comparatively high during the *kharif* season. But for rice, practically all other crops both in the *kharif* and *rabi* seasons are taken as rainfed crops although irrigation can be extended to them to a large extent with proper planning. Wheat is generally taken as a rainfed crop. Rice is mainly the irrigated crop in the terraced fields and on plain lands but is also raised as a rainfed crop. Maize and smaller millets are grown on the hill slopes, providing better drainage facilities, with the first showers of monsoons.

4.6. *Jowar* and *bajra* are practically missing in the cropping pattern of Himachal due to heavy rainfall and moist climate. Sugarcane is grown in the valleys adjoining the plains. Potato is the most important money-earning crop sown both in the plain fields and hill slopes. Two crops are raised annually but the summer one is more important with higher out-turn and nearly 98% of the total potato area is under the summer crop.

4.7. Maize is the second important crop of Himachal coming only next to wheat and occupies nearly 3 *lakh* acres out of which about twenty thousand acres are irrigated. The unirrigated crop is grown on the hill slopes, or on the upland fields which are generally devoid of irrigational facilities, but there are still some lands where irrigation can be developed, with a little extra effort. Since there is no dearth of irrigational water in Himachal, it would be worthwhile to bring as much area under irrigation as possible to ensure higher yield per unit area. The assured water supply will also encourage hybrid maize production which, of late, has been catching imagination of the cultivators.

4.8. Since the average land holding is very small and rather uneconomical, it is imperative to raise yield of wheat and paddy through better soil and water management and improved methods of cultivation. Wheat which is the most important staple diet of Himachal is generally taken as a rainfed crop. Out of 3.87 *lakh* acres under this crop, hardly 57,000 acres or 15% are under irrigation which means restricted use of chemical fertilizers ultimately resulting in overall low production. The position in regard to paddy is a little better as out of 1.14 *lakh* acres under paddy as many as 52,000 acres or 46% of the area are under irrigation. Nevertheless it requires concerted efforts to create more irrigation potential for both wheat and paddy crops to assure economic returns to the cultivator.

4.9. Agro-climatic conditions are considered favourable for cultivation of sugarcane in the Balh valley of Mandi district, Paonta valley of Sirmur district and parts of Bilaspur district and this crop stands good scope both for intensive and extensive cultivation. There are only 4,000 acres under sugarcane in the territory of which hardly 10% is irrigated with the result that the average production is stated to be extremely low to the tune of only half a ton of gur per acre which is 30% of the All-India level. The production can, however, be increased considerably through assured irrigation and scientific techniques of cultivation.

4.10. Cultivated fodders are not grown on a wide scale in Himachal. There are 5,500 acres (1961-62) under fodders of which only 600 acres were irrigated. Similarly there is very little area under green manuring crops. The programme of cultivation of fodder-cum-green manure legume crops can be laid out in the valleys having a year-round growing season. Giant napier grass is another rich and nutritious fodder which thrives well under assured irrigated conditions.

4.11. The Balh valley in Mandi and Paonta valley in Sirmur offer the greatest scope for fodder development. In these valleys, berseem is already grown in rotation with paddy to some extent but this crop makes a luxuriant growth only with copious supply of water. The existing irrigation resources can thus be utilised, with advantage, for the development of fodders and green manure crops especially in the valleys.

4.12. A scheme for the development of feeds and fodders is already in operation in Mandi district to support the cattle improvement programme through upgrading with the bulls and heifers imported from West Germany. Irrigation, therefore, can play an important role in the successful implementation of this programme.

4.13. There is a separate Deputy Director of Agriculture (Soil Conservation) in the Department of Agriculture, Himachal Pradesh and a German Soil Conservation and Water Management Specialist works with his Indian counterpart for soil conservation works in Mandi district. Some progress is stated to have been achieved under this programme. The soil conservation measures are being taken up on integrated basis with minor irrigation followed by improved practices of cultivation.

## CHAPTER V

### MATTERS RELATING IRRIGATION DEVELOPMENT IN GENERAL

5.1. Himachal Pradesh as its name suggests is a Himalaya region comprising mostly mountainous terrain. Agriculture is generally the occupation of its people. Holdings are small. Agriculture is, therefore, still in a primitive stage. Because of the topography of the region, conventional agriculture on large scale is not possible. Improvements in agricultural standards are, however, feasible if adequate steps are taken to provide irrigation and introduce improved agricultural practices in the area. In fact, to raise the per capita income, mixed farming will seem necessary. Horticulture, vegetable growing, poultry, sheep-breeding, spinning, weaving and allied vocations have to go side by side with the cultivation of food and cash crops.

5.2. Some progressive cultivators have been resorting to irrigation for a long time, wherever they have been able to divert water from local sources, without much difficulty. Some comparatively more difficult schemes have been taken up in recent years by government agencies under the Five Year Plans.

5.3. It, however, appears that these new schemes have not usually been taken up on any scientifically planned basis. They have often been chosen under pressure of popular opinion for providing minor irrigation works. Funds for minor irrigation are being mostly spent on schemes for which applications are received from the cultivators, very often for repair and renovation of old schemes. Often allotment have not been utilised. Also progress has not been commensurate with the money spent.

5.4. Steps need to be taken to conduct survey of all the available irrigation resources and contour and soil survey of areas which can be served by them along with selection of crops which can be grown there. From such surveys judicious selection has to be made of more purposeful schemes and priorities have to be assigned to them.

#### ORGANISATIONAL SET-UP

5.5. At present irrigation gets only a casual sort of attention, only an Executive Engineer, with some irrigation experience, is attached to the Chief Engineer, P.W.D., for the investigation of irrigation schemes. The construction and maintenance are looked after by Executive Engineers and Assistant Engineers of Buildings and Roads. They do not seem to have irrigation experience. Their interest in the irrigation schemes appears only superficial and consequently the irrigation is not receiving the attention it deserves.

5.6. Irrigation in Himachal Pradesh, though comprising small units, needs close attention. The existing schemes should be put to optimum use. Untapped resources, which appear numerous, need to be exploited early. Then alone the State can be rendered productive with regard to its agricultural production.

5.7. It is suggested that the status of the present post of Executive Engineer attached to the Chief Engineer, may be raised to that of a Superintending Engineer. The survey and investigation of irrigation schemes may be carried out directly under his guidance by one or two investigation divisions as necessary.

5.8. The execution and maintenance of the irrigation schemes may however remain the responsibility of the normal P.W.D. Divisions as at present except that they may be under the irrigation S.E. in respect of such works. They should be responsible to S.E. Irrigation in so far as irrigation works are concerned. That will result in irrigation works getting due attention on the part of all concerned.

5.9. The Team feels that the professional knowledge of most of the P.W.D. officers with regard to irrigation works is poor. It is suggested that all the officers of the State P.W.D. should be required to pass a departmental professional test for irrigation and canal Act etc., within a specified period of their joining the service. That will enable them to acquire knowledge of fundamental facts regarding irrigational development.

#### IRRIGATION ACT

5.10. No regular irrigation code existed in the States integrated in Himachal Pradesh. The Himachal Pradesh Minor Canals Act came into force in 1955. Some sections (8 to 13, 21, 26 to 34, 41, 60 to 64, 71 to 73) are reproduced in *Appendix III*. A perusal of these section would show that powers have mostly been vested in the Collector. These powers need to be given to Engineer officers at appropriate levels as in other States.

5.11. No financial powers have so far been given to the engineer officers for sanctioning irrigation schemes. Usual financial powers with regard to irrigation works as in other States need be given in Himachal Pradesh also.

5.12. Action needs to be caused through appropriate Government orders to enable irrigation officers to exercise such powers lack of which hinder expeditious execution of works and proper restoration and maintenance of irrigation works.

#### BETTERMENT LEVY AND WATER RATES

5.13. This Minor Canals Act empowers the State Government to impose betterment levy on schemes constructed, remodelled or extended by the Government after 1-1-1952. But so far betterment levy has not been imposed on any scheme.

5.14. Again section 41 empowers the State Government to fix a rate for use of water of a canal which shall be determined with a view to cover the maintenance and operation expenses and the collection cost of these water rates. No water rates have so far been imposed in the State and the water is being supplied free of cost.

## MAINTENANCE AND REPAIRS OF KUHLS

5.15. As indicated in the table in para 2.78 the cost of maintenance of kuhls by P.W.D. is quite high. However, in the case of the kuhls constructed by people themselves or by Block Funds the beneficiaries are responsible for maintenance. Very often the maintenance of these works involves only little technical knowledge. It may, therefore, be more economical if smaller works are looked after by the beneficiaries or the village panchayats. P.W.D. may maintain only comparatively big and/or complicated works involving regulation etc.

5.16. In case of any heavy damages to the works the beneficiaries or the panchayats could request the P.W.D. to get the special repairs carried out as deposit works. In case of lack of funds with the Panchayats, subsidy or loan could be sanctioned by the government, where necessary.

5.17. It has also been observed that the kuhls constructed so far have not achieved full utilisation of the potential created. The water is available and is either applied in higher doses over less area or runs to waste. It is, therefore, necessary that arrangements be made for equitable distribution of water over the entire command by constructing field channels, wherever feasible and a close watch exercised on the depth and number of waterings by expert advice to the cultivators in this respect.

## UTILISATION OF POTENTIAL

5.18. More attention needs be paid by the staff of agriculture extension services on the areas receiving irrigation. They should advise the cultivator about the proper doses of water along with those of fertiliser etc. to obtain optimum production. Suitable crop rotation may also be recommended for irrigated areas.

## GROUNDWATER RESOURCES

5.19. Paonta valley has good fertile cultivated area. But mostly it is without any irrigation scheme. Drinking water is being obtained from wells. On enquiry from a cultivator as to why they could not irrigate from wells in case of a drought year like the present one, the Team was told that the well irrigation was not in vogue. A survey of such areas where wells and tube-wells could be successful should be conducted early and a drive for introducing irrigation from wells made.

## LIFT IRRIGATION

5.20. For areas where the river with a good amount of discharge is flowing at a lower elevation and there is no perennial source of water for constructing a kuhl, water can be mobilised at places through hydraulic rams. These may be given a trial in Himachal Pradesh. Other cheap ways, e.g., Bihar type pump may also be tried at suitable locations.

## SOIL CONSERVATION

5.21. Very costly soil conservation measures are being adopted in the catchment of Bhakra Reservoir as it is feared that the Bhakra lake may get silted up very quickly if conditions are left to themselves. It

came to the notice of the Team that the restrictions regarding deforestation beyond a certain limit are being overlooked. This tendency needs to be checked well in time as otherwise the deforestation would lead to soil erosion.

5.22. On high altitude potatoes are cultivated during the monsoons. In Kotgarh a large number of fields were seen under potato during the Team's visit in August 1965. The fields though made as terraces on the hill slopes, yet were having quite a steep slope. This leads to erosion of soil on a large scale. Such areas may preferably be converted into orchards. Apple orchards of Kotgarh are famous all over the country and are very profitable, when worked scientifically.

#### HYDRO POWER POTENTIAL

5.23. Most of the rivers passing through the State traverse hilly terrain where their bed slopes are very steep. There is, therefore, scope for utilising some of these streams for generation of power through micro-hydel schemes. This power can also be used for lifting water for irrigation of those lands where other means are not available. This lifting of water could be done during the hours when there is no demand of electricity for other uses. Such power could be allowed at concessional rates.

5.24. Big hydel schemes may be possible at some sites, while micro-hydel schemes are feasible on a large number of perennial streams. One big advantage of the micro-hydel power houses is that they can be used for energising even the out of the way villages without incurring heavy expenses on transmission lines

## SUMMARY OF RECOMMENDATIONS

Irrigation schemes in Himachal Pradesh are, so far, mostly private kuhls. During the five year plans similar type of works have been constructed by the State P.W.D. and some through the Block Development Staff. Irrigation works of a bigger size are not possible due to the topography of the area. Also full utilisation of potential created on these schemes has not yet been achieved even though there is no assessment of water rates. Main recommendations which emerge out of the field studies made by the Team are listed below:—

I. Local irrigation cess for maintenance and repairs of minor irrigation works by the Panchayats needs to be provided with a statutory backing.

[Para 2.57]

II. Small irrigation schemes built by P.W.D. could be handed over to the Panchayats for operation, maintenance and repairs as is being done in case of kuhls built under N.E.S. blocks.

[Paras 2.26, 2.62 & 5.65]

III. Bigger and more difficult irrigation works beyond the capacity of Panchayats and Development Department could be designed and executed by P.W.D. on behalf of Panchayats, on the basis of deposit works.

[Paras 2.63, 5.16]

IV. Identification of all the available irrigation resources along with land capability surveys of different types of soils in their potential commands need to be undertaken early. Thereafter a master plan for irrigation development in the state with priorities for various schemes could be framed.

[Para 5.4]

V. An underground water survey needs to be undertaken in all such areas where open percolation wells are feasible and where farming therefrom is an economic feasibility.

[Paras 3.12, 3.21 & 5.20]

VI. With spread of electric power network in the State, there is possibility of extending lift irrigation by pumping, which needs to be encouraged.

[Para 3.6]

VII. Possibility of lift irrigation by hydraulic rams or other cheap ways, e.g., Bihar type pumps etc., may be tried at suitable locations in the State.

[Paras 3.6, 5.20]

VIII. Micro-hydel schemes may also be encouraged. Power from these schemes could be supplied for lifting water for irrigation on horticulture purposes during off peak hours.

[Para 5.23]



IX. In case of existing projects, arrangements may be made for equitable distribution of water over the entire command by constructing field channels as far as possible. Expert advice and guidance may be given on the depth and number of waterings required for various crops.

[Para 5.17]

X. Agricultural development need to be pre-planned, so that there is no time-lag between the creation of irrigation potential and its utilisation.

[Para 2.83]

XI. Priority attention needs to be paid by the extension staff on the areas receiving irrigation.

[Para 5.18]

XII. To check soil erosion, the tendency of excessive deforestation needs to be checked. Cultivation of potato on high and steep hill slopes could preferably be converted into apple or other suitable orchards.

[Paras 5.21, 5.22]

XIII. The powers under the Himachal Pradesh Minor Canal Act 1955 need to be given to Engineer Officers at appropriate levels.

[Para 5.10]

XIV. Usual financial powers with regard to irrigation works may also be given to P.W.D. Engineers in their charge.

[Para 5.11]

XV. Officers of P.W.D. should be required to pass departmental professional test for irrigation and Canal Act within a specified period of joining the service.

[Para 5.9]

XVI. The status of the present post of Executive Engineer attached to the Chief Engineer may be raised to that of a Superintending Engineer. The survey and investigation may be carried out directly under his guidance by investigation divisions.

[Para 5.7]

XVII. The execution and maintenance may remain with normal P.W.D. divisions, who should be responsible to the Superintending Engineer (Irrigation) for irrigation works.

[Para 5.7]

## APPENDICES

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# APPENDIX I

## *Terms of Reference*

The minor irrigation projects may be divided for study into two parts:—

- (a) Works already in existence.
- (b) Works which are now being constructed.

2. Case studies should be made of a number of projects of each type under the above headings with a view to judging their efficiency having regard to the objectives with which such works were carried out.

3. The following points should be especially borne in mind:—

### Existing Projects:

- (i) The present state of repair and maintenance.
- (ii) The system of keeping works in proper maintenance with particular reference to the customary obligations of villagers for keeping such works in a sound condition from year to year, the team should also examine the extent to which these obligations are enforced, the reasons for the failure to do so and the steps that should be taken to carry out such obligations efficiently.
- (iii) Reasons, if any, for non-utilisation of water by cultivators.
- (iv) Improvements necessary to make the projects more efficient either in the matter of better agricultural planning and practices or in respect of engineering works.
- (v) Cost of restoration if the project is in a state of disrepair and whether it has been included in the Plan.

### New Projects:

- (i) Method of selection—procedure and principles on which priorities are based.
- (ii) Flow chart of the construction projects should be prepared to examine whether any avoidable delay has occurred in its completion.
- (iii) Whether fullest use is made of catchment capacity in preparing designs.
- (iv) Economics of design.
- (v) State of agricultural planning with a view to optimum utilisation of benefits.
- (vi) Institutional arrangements provided for the proper maintenance of new works with special reference to the customary obligation of villagers in this regard.
- (vii) Cost of actual construction compared to estimated costs—the reasons for increase if any and the care with which the initial estimates were framed.

4. Any other matter which the Team considers necessary to report upon having a bearing on economy and efficiency of such projects.

5. The following information should be gathered by the Team for each State, taken as a whole in regard to existing minor irrigation works:—

- (i) The total area irrigated from them according to Settlement registers.
- (ii) The area actually irrigated from year to year beginning from 1947.
- (iii) The reasons for the reduction, if any, in the area irrigated.

6. In addition, the Team will carry out a study of the tubewell schemes of the Punjab and the U.P. with reference to the fact whether optimum use has been made of the facilities available by ensuring scientific crop planning and by improving agricultural practices. The study should be based on an examination of individual tubewells, which may be divided into most successful, successful and least successful varieties for the purpose of study. The Team should also select a few tubewells for which alternative crop planning and practices may be recommended that are being carried out at present in order to make them more successful. The consideration mentioned regarding minor irrigation works in paragraph 3 *mutatis mutandis* be taken into consideration for the study of tubewells also.

## APPENDIX II

*Minutes of the meeting of Irrigation Team, Committee on Plan Projects, Planning Commission, Government of India with the officers of the Himachal Pradesh Government held on 4-7-64 in the office of the Chief Engineer, P.W.D., Himachal Pradesh, Simla.*

## PRESENT

**Government of Himachal Pradesh**

1. Shri K. RAMA VARMAN,  
Chief Engineer, P.W.D.
2. Shri D. T. ASWANI,  
Executive Engineer,  
P.W.D.

**Committee on Plan Projects Irrigation Team**

1. Shri BALESHWAR NATH,  
Member.
2. Dr. ARJAN SINGH,  
Member.
3. Shri P. C. KALIA,  
Engineer.

Initiating the meeting Shri BALESHWAR NATH, Member, Irrigation Team, explained the purpose of the study to be conducted by the Team and enquired about the pattern of minor irrigation works and the administrative set-up to look after them.

2. It was intimated by Shri K. RAMA VARMAN, Chief Engineer, P.W.D., Himachal Pradesh, that mostly diversion works existed in the State. These works were looked after by Chief Engineer, P.W.D. who was assisted by an Executive Engineer, who looked after the entire correspondence of his office as well as the investigation and designs of the irrigation schemes. This post is held by Shri D. T. ASWANI.

3. The execution and maintenance of irrigation works was being attended to by the Executive Engineers incharge of Buildings and Roads. The department was not concerned with recording of irrigation and no assessment of revenue from irrigation was being made. Shri VARMAN pointed out that the officials of revenue department were, however, keeping a note of irrigated areas in their records.

4. It was also disclosed by Shri VARMAN that they were unable to spend the funds provided in the budget for minor irrigation works fully as the inclusion of schemes depended on the receipt of applications from Panchavats for construction of works. Sufficient number of applications were not forthcoming.

5. Shri BALESHWAR NATH was of the opinion that the slow progress on minor irrigation works in the State was perhaps due to some drawbacks in the organisational set-up provided to deal with the irrigation works.

6. It was gathered from the State officers that the staff of the Agriculture Department were indifferent towards the irrigation schemes and did not show much interest in the areas brought under irrigation through the schemes constructed by P.W.D.

7. It was decided that a programme for field study of some of the minor irrigation works in the State would be drawn so that the Team could make on the spot studies.

## APPENDIX III

*Extracts from the Himachal Pradesh Minor Canals Act, 1955*

8. **Notification of proposal to levy betterment charges.**—(1) For any canal to be newly constructed, remodelled, extended or repaired wholly or partially at Government cost after January 1, 1952, whether under Schedule I or Schedule II, the Government may proceed to levy betterment charges in respect of the lands which are included or are likely to be included in the irrigation scheme by notifying in the official gazette the irrigable area included in the scheme in respect of which the betterment charge is to be levied. The total amount spent on the scheme by the Government will also be given in the notification.

2. In determining the quantum of betterment charges the Government shall take into account the following matters:—

- (i) the capital cost;
- (ii) increase in the value of land through irrigation facilities; and
- (iii) increase of the agricultural produce due to irrigation facilities.

9. **Procedure for levy of betterment charges.**—(1) At any time after the expiry of one month from the date of publication of the notification referred to in Section 8, the Government may cause a schedule of betterment charges to be prepared for all lands included in an irrigation scheme showing the rates of which the charges shall be leviable and payable by the land owners and persons having interest thereon and the proportions in which the charges shall be so payable.

Provided that the total amount of levy on the total land in respect of any particular scheme will not exceed one half of the total amount spent on the scheme by the Government including interest charges for the number of years in which the betterment charge is to be recovered in equal instalments as may be prescribed.

Provided further that the betterment charges so levied shall be recoverable only after the first crop from the land irrigated by canal or kuhl water is harvested.

(2) A draft of the schedule prepared under sub-section (1) shall be published in the official gazette, copy of which shall be pasted at some conspicuous place in the area affected and in such other manner as may be prescribed.

(3) Any land owner or any person having interest in such land who may be affected by the proposed betterment charges may within ninety days, from the date of publication of the schedule in the official gazette, or from the date of its publication in the area whichever is later, present a petition in writing to the Government stating his objections, if any to the levy of the betterment charges or the rate thereof.

(4) After considering the objections and after making such further inquiry into the matter as the Government may think fit, the Government shall determine the final schedule of betterment charges and cause the same to be published in the official gazette, and in such other manner as may be prescribed.

10. **Finality of schedule of betterment charges.**—The betterment charges leviable under the final schedules as published under sub-section (4) of section 9 shall be final.

11. **Demand of betterment charges.**—(1) When the schedule of betterment charges has been published in the official gazette under sub-section (4) of the section 9, the Collector shall prepare a demand statement in respect thereof and in such form as may be prescribed containing full particulars of the amount which each land owner or the person having interest in such land shall be liable to pay and cause a notice of demand to be served on him.

(2) Any land owner or the person having interest in such land may within such period as may be prescribed from the date of the notice of demand, present a petition to the Collector objecting to the demand or any part thereof, and the petition shall be disposed of in such manner and orders passed thereon shall be subject to such appeals as may be prescribed.

(3) Any amount due under a notice of demand shall, subject to any orders that may be passed on sub-section (2) be payable within such time as may be prescribed.

12. **Exemption of certain schemes from levy of betterment charges.**—The Government may exempt any scheme or class of schemes coming under the definition of "canal" from the levy of betterment charges, if the Government is satisfied after necessary enquiry that such scheme or schemes have not enhanced the value of land or have not substantially increased its annual produce.

13. **Postponement of recovery of betterment charges.**—Where there has been a failure of crops in any area, the Government may, notwithstanding anything to the contrary contained in this Act or the rules made thereunder, postpone for such period as it thinks fit the recovery of any such betterment charges, whether wholly or in part.

21. **General powers of Collector.**—(1) Notwithstanding the existence of any rights in or over a canal or water-course, the Collector may—

- (a) exercise all powers of control, management and direction for the efficient maintenance and working of such canal or for the due distribution of the water thereof; and
- (b) whenever and so long as any water-course, sluice or outlet is not maintained in proper customary repair, or any water-course, sluice or outlet through which water is supplied to any person or, in the case of a sluice or outlet, to any water-course or any person is subjected to wilful damage or wrongful enlargement, stop the supply of water to such water-course, sluice or outlet or to any person.

(2) No claim shall be enforceable against the Government for compensation in respect of loss caused by any order passed under sub-section (1) but any person suffering loss by reason of any order passed under sub-section (1)(a) may claim such remission of the ordinary charges payable for the use of the water as is authorised by the State Government:

Provided that, if any, right to water entered in a record-of-rights prepared or revised under section 40(1) or deemed under section 40(3) to have been made under this Act or admitted in any agreement between the Government and any person is substantially diminished in consequence of action taken under sub-section (1)(a) the Collector shall award compensation under section 66 to such person in respect of the diminution of his right.

(3) No right to the use of the water of a canal shall be or be deemed to have been, acquired under the Indian Limitation Act, 1908, nor shall the State Government be bound to supply any person with water.

26. **Supply of water through intervening water-course.**—Whenever application is made to a Collector for a supply of water from a canal, and it appears to him expedient that such supply should be given and that it should be conveyed through some existing water-course, he shall give notice to persons responsible for the maintenance of such water-course to show cause, on a day not less than fourteen days from the date of such notice, why the said supply should not be so conveyed and, after making inquiry on such day, the Collector shall determine whether and on what conditions the said supply shall be conveyed through such water-course.

The applicant shall not be entitled to use such water-course until he has paid the expense of any alteration of such water-course necessary in order to his being supply through it, and also such share of the first cost of such water-course as the Collector may determine. Such applicant shall also be liable for his share of the cost of maintenance of such water-course so long as he uses it.

27. **Application for construction of new water-course.**—Any person desiring the construction of a new water-course may apply in writing to the Collector stating—

- (i) that he has endeavoured unsuccessfully to acquire from the owners of the land through which he desires such water-course to pass, a right to occupy so much of the land as will be needed for such water-course;
- (ii) that he desires the Collector, in his behalf and at his cost, to do all things necessary for acquiring such right;
- (iii) that he is able to defray all costs involved in acquiring such right and constructing such water-course.

28. **Procedure of Collector thereupon.**—If the Collector considers:—

- (i) that the construction of such water-course is expedient, and
- (ii) that the statements in the application are true

he shall call upon the applicant to make such deposit as the Collector considers necessary to defray the cost of the preliminary proceedings, and the amount of any compensation which he considers likely to become due under Section 31: and upon such deposit being made, he shall cause inquiry to be made into the most suitable alignment of the said water-course and shall mark out the land which, in his opinion it will be necessary to occupy for the construction thereof, and shall forthwith publish a notice in every village through which the water-course is proposed to be taken, that so much of such land as belongs to such village has been so marked out.

**29. Application for transfer of existing water-course.**—Any person desiring that an existing water-course should be transferred from its present owner to himself, may apply in writing to the Collector stating:—

- (i) that he has endeavoured unsuccessfully to procure such transfer from the owner of such water-course;
- (ii) that he desires the Collector, in his behalf and at his cost, to do all things necessary for procuring such transfer;
- (iii) that he is able to defray the cost of such transfer.

**Procedure thereupon.**—If the Collector considers—

- (a) that the said transfer is necessary for the better management of the irrigation from such water-course; and
- (b) that the statements in the application are true

he shall call upon the applicant to make such deposit as the Collector considers necessary to defray the cost of the preliminary proceedings, and the amount of any compensation that may become due under the provisions of Section 31 in respect of such transfer; and upon such deposit being made, he shall publish a notice of the application in every village affected.

**30. Inquiry into and determination of objections to construction or transfer of water-course.**—(1) When within thirty days from the publication of a notice under Section 28 or Section 29, as the case may be, any person interested in the land or water-course to which the notice refers, applies to the Collector as aforesaid, stating his objection to the construction or transfer for which application has been made the Collector shall give notice to the other persons interested that, on a day to be named in such notice or any subsequent day to which the proceedings may be adjourned, he will proceed to inquire into the matter in dispute or into the validity of such objections as the case may be.

(2) Upon the day so named or any such subsequent day as aforesaid, the Collector shall proceed to hear and determine dispute or the objection as the case may be.

**31. Expenses to be paid by applicant for construction or transfer of water-course before receiving occupation.**—No applicant under Section 27 or 29 as the case may be, shall be placed in occupation of such land or water-course until he has paid to the person named by the Collector such amount as the Collector determines to be due as compensation for the land or water-course so occupied or transferred, and for any damage caused by the marking out or occupation of such land, together with all expenses incidental to such occupation or transfer.

**Procedure in fixing compensation.**—Compensation to be made under this section shall be assessed as provided in section 66 but the Collector, may if the person to be compensated so desires award such compensation in the form of a rent charge payable in respect of the land or water-course occupied or transferred.

**Recovery of compensation and expenses.**—If such compensation and expenses are not paid when demanded by the person entitled to receive the same, the amount may be recovered by the Collector, and shall, when recovered, be paid by him to the person entitled to receive the same.

**32. Conditions binding on applicant placed in occupation.**—(1) When any such applicant has duly complied with the condition laid down in Section 31, he shall be placed in occupation of the land or water-course as aforesaid, and the following rules and conditions shall be thereafter binding on him and his representative in interest:—

- (a) In all cases:—

First—All works necessary for the passage across such water-course existing previous to its construction and of the drainage intercepted by it, and for affording

proper communications across it for the convenience of the neighbouring lands, shall be constructed by the applicant, and be maintained by him or his representatives in interest to the satisfaction of the Collector.

Second—Land occupied for a water-course under the provisions of Section 28 shall be used only for the purposes of such water-course.

Third—The proposed water-course shall be completed to the satisfaction of the Collector within one year after the applicant is placed in occupation of the land.

(b) In cases in which land is occupied or a water-course is transferred on the terms of a rent charge—

Fourth—The applicant or his representative in interest shall so long as he occupied such land or water-course, pay rent for the same at such rate and on such days as are determined by the Collector when the applicant is placed in occupation.

Fifth—If the right to occupy the land ceases owing to a breach of any of these rules, the liability to pay the said rent shall continue until the applicant or his representative in interest has restored the land to its original condition or until he has paid by way of compensation for any injury done to the said land, such amount and to such person as the Collector determines.

Sixth—The Collector may, on the application of the person entitled to receive such rent or compensation determine the amount of rent due or assess the amount of such compensation and if any such rent or compensation be not paid by the applicant or his representative in interest, the Collector may recover the amount with interest thereon at the rate of six per cent per annum from the date on which it became due and shall pay the same when recovered, to the person to whom it is due.

(2) If any of the rules and conditions, prescribed by this section are not complied with, or if any water-course constructed or transferred under this Act is disused for three years continuously the right of the applicant, or of his representative in interest, to occupy such land or water-course shall cease absolutely.

33. **Construction of outlets from canals by Collector.**—The Collector may construct or repair or alter a sluice or outlet to regulate the supply of water from a canal to any water-course.

34. **Powers to convert several water-courses running for a long distance side by side into one water-course.**—(1) In cases where there are water-courses running side by side or so situated as to interfere with the economical use or proper management of the water-supply, the Collector if applied to for that purpose, or on his own motion, may require the owners to make arrangements to his satisfaction to unite the water-courses or to substitute for them such system as may have been approved by him.

(2) If the owners fail within such time as the Collector may fix to comply with any order passed by him under sub-section (1) the Collector may himself execute the work.

(3) Whenever a water-course has been reconstructed or a new system substituted under sub-section (1) or sub-section (2), the Collector may fix the shares in which the water shall be enjoyed by the persons entitled to use the water-course.

41. **Levy of water-rates.**—(1) Subject to the terms of any agreement made by it with the owners or irrigators, the Government may, by notification, direct that a rate or rates shall be levied for the use of water of a canal in an authorised manner. Such rate or rates shall be determined keeping due regard of the maintenance and operation charges for the system and the cost of collection of the water-rates.

(2) The Government may, by notification, direct that in addition to or in lieu of the rate or rates above mentioned the land revenue for the time being assessed on the land receiving canal water shall be enhanced in consequence of the change of the class of the land from unirrigated to irrigated:

Provided that, the new rate of assessment shall not exceed that fixed at the time of settlement for irrigated lands of the same class in the same village or in its vicinity.

Provided further that, the Government may allow such lands to continue to be assessed at the rate or rates at which they were assessed immediately before they became irrigated, for a number of harvests to be fixed by the Government.



(3) The Government may, by notification, also impose a special rate for water obtained or used without authority or in an unauthorised manner.

(4) The rate or rates imposed under sub-section (1) or sub-section (2) or sub-section (3) shall be leviable from such persons deriving benefit from the water as the Government may, by general or special rule, direct.

(5) Subject to the terms of any such agreement as aforesaid, the proceeds of any rate or rates levied under this section shall be disposed of in such manner as the Government may, by general or special rule, direct.

(6) In the event of failure of crop due to reasons beyond the control of the farmer, he shall be entitled to remission of water rates for that year.

**60. Power to regulate flow of water in rivers, creeks, natural channels or lines of natural drainage and to prohibit therein or order removal therefrom of obstructions.**—The Government may, by notification published in the official gazette take power to regulate the flow of water in any river, creek, natural channel or line of natural drainage whether by the construction or removal of works or otherwise, and whenever it appears to the Government after inquiry through the Collector that the supply of water to a canal or the cultivation of any land or the public health or public convenience is likely to be injuriously affected by the obstruction of any river, creek, natural channel or line of natural drainage it may, by notification published as aforesaid, prohibit within the limits to be defined by such notification the formation of such obstruction or, may within such limits order the removal of or the modification of such obstruction.

**61. Power to remove obstruction after publication of notification and payment of compensation.**—(1) The Collector may, after such publication, issue an order to the person causing or having control over any such obstruction to remove or modify the same within a time to be fixed in the order.

(2) The Collector may himself remove or modify the obstruction—

(a) if the person to whom the order under sub-section (1) was issued fails to comply with that order within the time so fixed; and

(b) in any case where the obstruction is not caused or controlled by any person.

(3) The Collector shall determine from whom the cost of removing or modifying the obstruction shall be recovered and the amount of compensation due to any person injuriously affected by the removal or modification of the obstruction and the person by whom such compensation shall be payable.

Provided that no compensation shall be awarded for an advantage obtained by an arbitrary or inequitable course of action.

**62. Power of the Collector to regulate flow of water and prohibit or remove obstructions.**—When the Government has by notification as provided in Section 60 taken power to regulate the flow of water in any river, creek or natural channel or line of natural drainage it may authorise the Collector to exercise such power on its behalf in accordance with such rules as it may prescribe. A Collector so authorised may in the execution of such rules exercise all the powers conferred upon him by Section 61, and his authority shall include the power to take such action as the Government is empowered by Section 60 to take after inquiry through the Collector. Such authority may on every occasion be exercised without the publication of any further notification in the gazette.

**63. Powers as to the construction and the maintenance of works in respect of canals under Schedule II.**—(1) The Collector may, at any time, order the beneficiary of any canal under Schedule II to—

(a) repair and maintain, in a proper state, all or any embankments, protective works, reservoirs, channels, water-courses, sluices, outlets and other works connected with the canal;

(b) construct, repair and maintain, in a proper state, a suitable bridge, culvert, or similar work at any place across, under, or over the canal, for the purpose of providing communication with any public road or thoroughfare which was in use before the canal was made;

(c) construct, repair and maintain, in a proper state, suitable works for the passage of the water of the canal, across, under, or over any public road or thoroughfare or any canal or drainage channel which was in use before the canal was made;

- (d) construct, repair and maintain, in a proper state suitable regulator at or near the head of the canal, where for want of such regulator, an excessive supply of water may enter the canal or cause damage to it, or any crops, lands, road or property in the neighbourhood.
- (2) The Collector may at any time order a beneficiary to furnish unskilled labour free of cost for any one or more of the purposes specified in Section 37 of this Act.
- (3) Every order under sub-sections (1) and (2) shall be in writing, and shall specify a reasonable time within which the works or repairs mentioned therein shall be completely executed.

(4) If any order made under this section is not obeyed, to the satisfaction of the Collector, within the time therein specified, the Collector may himself execute or complete the execution of, or cause to be so executed or completed, all works or repairs specified in the order.

**64. Powers as to construction and maintenance of works in respect of canals under Schedule I.**—In the case of canals including under Schedule I, the Collector may—

- (a) call upon the beneficiary to discharge any of the liabilities specified in Section 63 sub-section (1) which the Government may have declared to attach to the beneficiary from such canal or group of canals; or
- (b) himself arrange for the performance of such acts and recover cost as provided in Section 68.

**71. Exclusion of jurisdiction of Civil Court except under Land Acquisition Act.**—Save as in Section 66 provided, no Civil Court shall have jurisdiction in any matter which a Revenue Officer or Revenue Court is empowered by this Act to dispose of, or take cognizance of the matter in which the Government, any Revenue Officer or Revenue Court exercises any powers vested in it or him by or under this Act.

**72. Power to appoint officers in exercise functions under this Act.**—(1) The Government may appoint any person or any class of official to perform any functions or to exercise any powers by this Act or the rules made thereunder conferred on or vested in the Collector, Commissioner, if any, Financial Commissioner or such Government.

(2) Such appointment may be made in respect of any canal or of all or any of the canals situated within any specified local area.

(3) In all matters connected with this Act, the Government shall have and exercise over the Financial Commissioner, the Commissioner, if any, and the Collector, and the Financial Commissioner shall have and exercise over the Commissioner, if any, and the Collector, and the Commissioner, if any, shall have and exercise over the Collector, the same authority and control as it or they respectively have and exercise over them in the general and revenue Administration.

**73. Powers of Collector in certain proceedings under the Act.**—For the purposes of every enquiry made and proceeding taken under this Act, the Collector or any other Revenue Officer, authorised by him in this behalf or any other officer authorised by the Government shall have power to summon and enforce the attendance of and examine parties and witnesses and compel the production of documents, and for all or any of these purposes may exercise all or any of the powers conferred on a Civil Court by the Code of Civil Procedure, 1908 and every such inquiry shall for the purposes of the Indian Penal Code, be deemed to be judicial proceedings.

## APPENDIX IV

### *Statement of District-wise monthly rainfall in inches during the year 1962*

Months	DISTRICTS																	
	Kinnaur			Mahasu			Mandi			Chamba			Bilaspur			Sirmur		
	Rainy days	Rain-fall	Nor-mal	Rainy days	Rain-fall	Nor-mal	Rainy days	Rain-fall	Nor-mal	Rainy days	Rain-fall	Nor-mal	Rainy days	Rain-fall	Nor-mal	Rainy days	Rain-fall	Nor-mal
January . . .	3	0.7	4.8	3	3.1	4.6	2	1.6	3.4	3	1.7	5.9	3	2.8	2.9	3	5.2	3.3
February . . .	10	5.2	4.1	7	4.2	2.4	6	3.6	2.0	8	4.9	3.8	4	2.2	1.1	4	2.0	1.4
March . . .	6	3.6	4.1	4	2.6	3.3	4	2.4	3.4	6	4.9	5.1	3	2.8	2.2	2	1.7	1.5
April . . .	6	3.6	2.8	4	1.3	1.7	3	1.2	1.7	7	3.5	2.8	2	1.3	0.5	1	0.8	0.4
May . . .	3	1.4	2.6	4	1.2	2.2	2	0.7	2.0	5	3.1	2.4	1	0.2	0.7	1	0.3	1.0
June . . .	3	0.9	1.2	5	3.4	3.5	8	4.5	5.0	5	3.4	3.0	5	3.7	2.3	6	9.5	4.3
July . . .	7	3.4	3.0	13	9.8	12.9	16	18.2	19.6	13	9.8	11.2	13	11.6	17.0	13	19.1	21.0
August . . .	6	4.3	2.5	12	8.5	10.7	15	11.5	16.2	11	10.2	9.5	8	7.0	11.7	18	20.6	22.2
September . . .	12	6.8	2.7	11	13.2	5.7	13	13.5	7.5	8	6.9	4.1	10	16.9	7.4	12	27.0	8.9
October . . .	1	0.4	2.1	—	0.4	2.7	1	0.2	3.3	1	0.4	4.4	—	0.2	3.2	—	—	4.2
November . . .	3	1.3	0.6	3	1.3	0.6	4	3.0	0.5	4	3.9	1.1	3	2.2	0.4	2	0.4	0.5
December . . .	4	1.2	3.1	3	2.7	1.9	3	1.6	1.6	5	2.8	3.0	3	0.6	1.2	2	0.6	0.8
<b>TOTAL</b> . . .	<b>64</b>	<b>32.8</b>	<b>33.6</b>	<b>69</b>	<b>51.7</b>	<b>52.2</b>	<b>77</b>	<b>62.0</b>	<b>66.2</b>	<b>76</b>	<b>55.5</b>	<b>56.3</b>	<b>55</b>	<b>51.5</b>	<b>50.6</b>	<b>64</b>	<b>87.2</b>	<b>69.5</b>

## APPENDIX V

### *District-wise break-up of land utilisation in Himachal Pradesh during 1962-63*

(In acres)

District	Total geographical area		Classification									Area sown more than once	Total cropped area
	By profes- sional survey	By village papers	Forests	Barren and uncultu- rable land	Land put to non-agri- cultural uses	Cultura- ble waste	Perma- nent pastures & other grazing lands	Land under misc., tree, crops & groves not included in area sown	Current fallow	Other fallow	Net area sown		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Bilaspur .	2,86,720	2,85,306	29,863	8,318	30,939	10,575	1,28,919	26	3,043	1,662	71,961	54,637	1,26,598
Chamba .	20,03,840	16,99,782	8,01,145	14,001	61,914	17,008	7,03,976	90	6,176	1,191	94,281	50,643	1,44,924
Kinnaur .	16,10,880	33,868	22	3,179	998	3,367	3,632	..	2,878	162	19,630	6,275	25,905
Mahasu .	13,89,440	8,38,643	1,46,679	23,455	26,396	38,263	3,92,879	863	13,359	2,656	1,94,093	1,03,602	2,97,695
Mandi .	9,74,720	7,36,650	2,62,539	14,710	30,830	9,723	2,12,558	278	4,705	548	2,00,759	1,27,341	3,28,100
Sirmur .	7,00,800	5,55,382	1,26,952	12,145	21,059	36,759	1,69,080	83,897	4,591	1,086	99,813	70,372	1,70,185
<b>TOTAL .</b>	<b>69,66,400</b>	<b>41,49,631</b>	<b>13,67,200</b>	<b>75,808</b>	<b>1,72,136</b>	<b>1,15,695</b>	<b>16,11,044</b>	<b>85,154</b>	<b>34,752</b>	<b>7,305</b>	<b>6,80,537</b>	<b>4,12,870</b>	<b>10,93,407</b>

## APPENDIX VI

*Copy of letter No. PWI-200-97/63-2642-D dated the 23rd June, 1966 from Shri V. R. Vaish, Chief Engineer, P.W.D., Himachal Pradesh, Simla to the Member, Irrigation Team, Committee on Plan Projects, Planning Commission, Government of India, 12-Jamnagar House, Shahjahan Road, New Delhi-11.*

**SUBJECT.**—*Draft Report on Minor Irrigation Works in Himachal Pradesh.*

**Reference.**—No. COPP/IT/XEN/66/3535, dated 6-6-1966 addressed to the Chief Secretary to the Govt. of Himachal Pradesh.

Sir,

I am directed to convey the general concurrence of this Department to the draft report.

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