GOVERNMENT OF PUNJAB

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Survey of Waterlogged areas covered under Anti-waterlogging Schemes

Issued by

THE ECONOMIC ADVISER TO GOVERNMENT, PUNJAB, CHANDIGARH.

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PREFACE

Waterlogging in some of the districts of the State developed in an acute form in the fifties. Various remedial measures such as link drains, shallow tube-wells etc. were adopted. In order to have an idea about the extent of eradication of Sem and Thur in the affected areas and to know the opinion of the cultivators about the adequacy of the anti-waterlogging measures and also to find out the changes in cropping pattern a survey was conducted in twelve affected tehsils of five districts covered by anti-waterlogging schemes launched by the Punjab Irrigation Department.

Out of the 2,706 total cultivators covered under the survey, the number of cultivators still affected by sem decreased with the implementation of the anti-waterlogging schemes from 944 (34.88%) to 450 (16.63%) and those affected by thur increased from 765 (28.27%) to 873 (32.26%). The extent of Sem in the areas where no crop can be grown or yield is low decreased from 7,523 hectares to 3,826 hectares forming 26.30 per cent and 1.398 per cent of the total area of sample selected villages respectively after the implementation of anti-waterlogging schemes. On the other hand the area under Thur where no crop can be grown or yield is below normal increased from 2,379 hectares to 3,206 hectares forming 8.32 and 11.21 per cent of the total area of sample villages respectively after the implementation of anti-waterlogging schemes. This increase in the area under Thur is attributed to the after-effect of the removal of excessive water from the surface of land by drains dug under anti-waterlogging schemes. The opinion of the cultivators about the programme was that the digging of drains had proved to be useful so far as problem of Sem was concerned but the area under Thur had increased on account of it. The problem of Thur could also be tackled by regulating the proper supply of canal water.

The field and compilation work was done by the staff of Irrigation and Power Cell of this Organisation under the guidance of Shri M. M. Bhardwaj, Joint Director. Acknowledgement is also made of the useful work done by Shri T. S. Bhasin, Research Officer, in bringing out this report.

CHANDIGARH :
Dated 22nd July, 1971.

V. P. SHARMA,
Economic Adviser to Government, Punjab.

CONTENTS

CHAPTER I

INTRODUCTION

By the late fifties the problem of waterlogging had cropped up in an acute form in the vast areas of the State. It was more acute in the districts of Amritsar and Ferozepur and some tehsils of the districts of Sangrur, Bhatinda and Gurdaspur. Waterlogging in plain words denotes Sem and Thur. Sem means the rise or collection of sub-soil water or moisture to such an extent that land so affected becomes unfit for cultivation. Thur means a white or ash coloured substance which may or may not subside after rains but the existence where of is betrayed by the crispness of the crust swelling over the powdered earth underneath it. Apart from the floods other reasons of waterlogging were (i) heavy rainfall, (ii) seepage from canals, (iii) blockage of natural drains. (iv) floods in rivers, (v) agricultural practices, (vi) abandonment of percolation wells and (vii) soil characteristics.

To suggest measures for the control of floods, waterlogging and its related problems, an action committee was appointed in 1957 under the then Financial Commissioner, Shri A. C. Fletcher, by the Punjab Government. This committee suggested various remedial measures such as improvement of surface drainage and installation of adequate number of tube-wells and revival of percolation wells fallen into disuse to stabilise the sub-soil water at proper level. Keeping in view the suggestions made by the above referred to Commttee, anti-waterlogging schemes were initiated in the areas where the problem was acute. Necessary measures were taken in the form of shallow tube-wells and link drains by the Irrigation Department in early sixties. Surface drains provided an outlet for flood and heavy rain water and helped in reducing the water table of the sub-soil water, which further helped in the eradication of waterlogging.. With a view to eradicating waterlogging some anti-waterlogging schemes were framed by the Punjab Irrigation Department. The details of expenditure of these schemes and area covered is detailed in the ensuing paragraph.

Six compact areas, where the problem of waterlogging existed, were selected for covering under A. W. L. schemes. These schemes were initiated during the year 1959-60 and 1960-61. A sum of Rs 195.58 lakh was allocated for execution of these schemes and it was estimated that an area of 587 thousand acres would be benefited. An idea about the year of initiation of the scheme, estimated cost and areas covered, can be had from the table given below :—

TABLE 1.1

Details of Anti-waterlogging Schemes

Serial No.	Name of the Scheme	Year of initiation	Estimated Cost (Rs in lakhs)	Tehsils covered	Area covered in acres
1	2	3	4	5	6
1	Amritsar A.W.L. Pilot Scheme (Southern area)	1960-61	65·09	Tarn Taran and Patti	16,000
2	Amritsar A.W.L. Pilot Scheme (Northern area)	1960-61	17·97	Amritsar, Batala and Ajnala	79,000
3	Zira A.W.L. Pilot Scheme ..	1959	32·84	Ferozepur, Moga and Zira	1,31,000
4	Fazilka A.W.L. Pilot Scheme ..	1959	32·84	Fazilka	58,000
5	Sunam A.W.L. Pilot Scheme ..	1961	28·91	Sangrur and Sunam	1,43,000
6	Sangrur A.W.L. Pilot Scheme ..	1961	17·93	Mansa and Sangrur	1,60,000
	Total ..	..	195·58	..	5,87,000

Rs 410 lakh were spent on flood control and drainage in the reorganized State of Punjab during First and Second Five-Year Plans. An expenditure of Rs 2 060 lakh was incurred on such schemes during Third Five-Year Plan whereas expenditure in Annual Plan of 1966-67, 1967-68 and 1968-69 was to the tune of Rs 170.00 lakh, Rs 168.21 lakh and Rs 258.74 lakh respectively. Outlay of Rs 1,128 lakh has been provided in Fourth Five-Year Plan for these schemes.

In view of the expenditure incurred in the past and future outlays for the measures of checking and controlling waterlogging, it was decided to conduct a survey by Economic and Statistical Organisation, Punjab, with the following objects :—

(a) To find out the extent of eradication of Sem and Thur from the areas where A. W. L. schemes have been executed by the Irrigation Department ;

(b) To find out the opinion about their adequacy from the cultivators and their suggestion for improvement ;

(c) Change in cropping pattern in the affected areas and utilisation of such areas.

Reference Period.—The survey was initiated in June, 1970 and completed in July, 1970.

Coverage and Sampling Design.—Information was collected regarding the utilisation of areas, irrigation facilities, cropping pattern, the attitude and reaction of cultivators towards the utility of the schemes, present problem of waterlogging and opinion of the cultivators to completely eradicate Sem and Thur.

The survey was conducted in all the twelve tehsils of five districts covered by anti-waterlogging schemes. The list of such tehsils is given in Appendix I.

From these twelve tehsils, forty-eight villages, i.e., four villages per tehsil were selected by simple random sampling method from the lists of the affected villages of these tehsils. These lists were collected by the concerned District Statistical Officers from the Revenue Department and covered only those villages where the problem of waterlogging still existed. Ten cultivators each from the selected villages were selected at random from the lists of the affected cultivators.

Schedules.—Three Schedules, viz., Listing, Individual Cultivator and village Schedules were convassed in the field. Listing Schedule was designed to provide the list of all the cultivators in the selected villages. The information for individual cultivator regarding size of holding and details of area under Sem and Thur before and after the initiation of anti-waterlogging schemes was also recorded.

In individual cultivator's schedule information from the selected cultivators regarding their holding was collected for knowing the impact of the anti-waterlogging scheme in the areas.

Village schedule was prepared to collect the basic information such as utilisation, cropping pattern, irrigation facilities, area under Sem and Thur and water table in the selected villages. Provision for recording this information before and after the initiation of the anti-waterlogging schemes was made for knowing the impact of these schemes.

Method and Source of Collection of Data.—Listing was done by the Field Assistants and Technical Assistants of Irrigation Cell of Economic and Statistical Organisation, Punjab, by contacting the cultivators and individual cultivator's schedule was convassed among the selected cultivators. The village schedule was filled in from the revenue records with the help of Patwaris. The help of knowledgeable persons such as Sarpanch, Panch, Lambardars and progressive cultivators was also taken in filling up of village schedule.

CHAPTER II

EXTENT OF PROBLEM OF SEM AND THUR

2.1. *Land Utilisation.*—According to village papers, the total area of sample villages was 28,600 hectares in 1958-59, and 28,816 hectares in 1968-69. The small change in the total area is attributed to minor adjustment during the consolidation of holding operations. The net area sown increased from 76.2% in 1958-59 to 79.2 in 1968-69 of the total geographical area of the village. The area which was not available for cultivation increased from 7.8% to 9.3% which can be mainly attributed to the digging of drains and other protective measures adopted to check floods and eradicate waterlogging. Area under current fallows and other fallow land decreased from 9.6% to 6.4% and 6.4% to 5.1% respectively in 1968-69 as compared to 1958-59.

The area sown more than once increased from 26.5% in the year 1958-59 to 40.6% in the year 1968-69 which indicates that digging of drains has aslo proved to be very useful and now Kharif Crops can be grown in these areas.

TABLE No. 2.1

Land Utilisation in Sample Villages

Classification	1958-59		1968-69	
	Area (in Hectares)	Percentage of total area	Area (in Hectares)	Percentage of total area
1	2	3	4	5
1. Total Geographical area ..	28,600	100·0	28,816	100·0
2. Area not available for cultivation	2,236	7·8	2,680	9·3
3. Current fallows ..	2,760	9·6	1,844	6·4
4. Fallow lands other than current fallows ..	1,816	6·4	1,470	5·1
5. Net area sown ..	21,788	76·2	22,822	79·2
6. Area sown more than once ..	7,575	26·5	10,791	40·6

2.2. *Extent of problem in the selected areas.*—It has been estimated that 1,498 hectares of land forming 5.24 percent of the total area of selected villages is still affected by Sem where no crop could be grown. 2,328 hectares of land (8.14 per cent of the total area of the selected villages) is affected by mild intensity of Sem where crop could be grown but the production is low. Similarly 2,199 hectares forming 7.69 per cent of the total area of the selected villages affected by Thur, where no crops could be grown at all and 1,007 hectares of land or 3.52 per cent of the total area of selected villages affected by Thur is giving low yield.

Assessing the overall position district-wise it has been found that Amritsar and Ferozepur districts are having only 0·21 and 0·09 per cent of area of selected villages, respectively, affected by Sem where no crop can be grown.

Sangrur district has the maximum intensity of Sem with 13.93 per cent of the total area of selected villages affected by it. Mansa Tehsil of district Bhatinda has also 5.41 per cent area of selected villages under Sem whereas no sem problem was reported in Batala tehsil of district Gurdaspur.

Thur affected area in district Amritsar is 846 hectares (9.08 percent of the total area of selected villages) whereas in Ferozepur district it was 325 hectares (4.74 per cent of the total area of selected villages). In the Sangrur district 873 hectares (9.06 per cent of total area of selected villages) was found to be Thur affected whereas in Mansa Tehsil of Bhatinda District only 9 hectares are Thur affected. 146 hectares (36.70 per cent of the total area of selected villages) of Batala tehsil are Thur affected. Detailed information is given in the following table :

TABLE No. 2.2

Extent of problem of Sem and Thur

District	Sem				Thur			
	Area (In hectares)		Percentage of the total area of selected villages		Area (in hectares)		Percentage of the total area of selected villages	
	A	B	A	B	A	B	A	B
1	2	3	4	5	6	7	8	9
Amritsar ..	20	18	0·21	0·19	846	379	9·08	4·07
Ferozepur ..	6	412	0·09	6·01	325	364	4·74	5·31
Sangrur (Sangrur and Sunam Tehsil only)	1,343	1,876	13·93	19·46	873	264	9·06	2·74
Bhatinda (Mansa Tehsil only)	129	22	5·41	0·92	9	—	0·38	—
Gurdaspur (Batala Tehsil only)	—	—	—	—	146	—	36·70	—
Total ..	1,498	2,328	5·24	8·14	2,199	1,007	7·69	3·52

N.B.—(1) A indicates area where no crop can be grown. (2) B indicates area where crops can be grown but yield is low.

2.3. *Number of affected Cultivators.*—The percentage of cultivators affected by Sem in the Punjab State before the initiation of anti-waterlogging schemes was 34.9 which came down to 16.6 after the implementation of these schemes. On the other hand the percentage of cultivators affected by Thur increased from 28.3 to 32.9. Amongst the districts maximum improvement was affected in Amritsar district by the anti-waterlogging schemes where the percentage of cultivators affected by Sem came down from

36.6 to 4.4 and those affected by Thur were reduced from 48.2 to 43.26 per cent. Improvement in Sem affected land was also noticeable in the case of Ferozepur district where the percentage of affected cultivators was reduced by these schemes from 33.2 to 8.8. Position in regard to Sem deteriorated in case of Sangrur district with the increase of affected cultivators from 57.6 to 70.9 per cent and also in Bhatinda district where the increase was from 22.9 to 25.6 per cent.

The percentage of cultivators affected by Thur invariably increased except in case of Amritsar district, the maximum increase being in Ferozepore district where it increased from 8.2 to 23.1 per cent. The least increase in regard to Thur affected cultivators was in Gurdaspur district from 70.7 to 72.4 per cent whereas in Sangrur district the corresponding increase was from 36.9 to 43.5 per cent Detailed picture in this respect is depicted in the following table :—

TABLE No. 2.3

Number of sample cultivators and their percentage before and after the initiation of the anti-waterlogging schemes

District	Total number of cultivators	Before the initiation of the anti-waterlogging scheme				After the initiation of the anti-waterlogging scheme			
		Sem	Percentage	Thur	Percentage	Sem	Percentage	Thur	Percentage
1	2	3	4	5	6	7	8	9	10
Amritsar ..	980	359	36·6	472	48·2	43	4·4	424	43·3
Ferozepur ..	955	317	33·2	78	8·2	84	8·8	221	23·1
Sangrur ..	347	199	57·6	128	36·9	246	70·9	151	43·5
Bhatinda ..	301	69	22·9	—	—	77	25·6	6	2·0
Gurdaspur ..	123	—	—	87	70·7	—	—	89	72·4
Total ..	2,706	944	34·9	765	28·3	450	16·6	891	32·9

2.4. *Distribution of affected cultivators in different sizes of holdings.*—The majority of the cultivators whose land was affected by Sem were having the holding of more than 10 acres. Holdings of 30.0 per cent of cultivators range between 10 and 20 acres and 25.3 per cent of total cultivators have holdings of size between 20 to 50 acres. On the other hand 53.1 per cent of the total cultivators whose holdings were affected by Thur were found to have holdings of the size above 10 acres.

The number of affected cultivators having a bigger size of land holdings was comparatively more than those having smaller holdings. It may also be due to the fact that cultivators with larger size of holdings were not very much interested to reclaim their small affected piece of land. It was also noticed that cultivators having smaller size of the holding were not in a position to reclaim their affected land due to paucity of funds. In former categories there is a need of convincing the cultivators about the gain of reclaiming the land and for the latter category some grant-in-aid should be given to reclaim such areas.

District-wise classification of the number of cultivators under different sizes of holdings is given below :—

TABLE No. 2.4

Present Classification of Cultivators in different sizes of Holdings

District	Sem (Acres)				Thur (Acres)			
	0—9·9	10—19·9	20—49·9	50 and above	0—9·9	10—19·9	20—49·9	50 and above
1	2	3	4	5	6	7	8	9
Amritsar ..	38	5	—	—	260	109	51	4
Ferozepur ..	51	21	10	2	60	89	56	16
Sangrur ..	82	75	81	8	48	40	57	6
Bhatinda ..	19	34	23	1	2	1	3	—
Gurdaspur ..	—	—	—	—	48	29	11	1
Total ..	190	135	114	11	418	268	178	27
Percentage ..	42·2	30·0	25·0	2·5	46·9	30·1	20·0	3·0

CHAPTER III

3.1. *Impact of Antiwaterlogging Measures.*—In the previous chapter an attempt was made to give an idea about the extent of Sem and Thur, number of cultivators affected etc. In this chapter the measures taken by the Government and extent of eradication of Sem and Thur area have been discussed. The following type of work was done under the anti-waterlogging schemes mentioned in the preceding chapter :—

(1) Lining and deepening of drains ;
(2) Installation of shallow tubewells ;
(3) Excavation of main seepage and link seepage drains ;
(4) Construction of link and field drains ;
(5) Extension and deepening of existing drains ;
(6) Construction of link and ditch drains ;
(7) Cuntnetts in the bed of the existing drains.

On account of above measures, percentage of area affected by Sem where crops can be grown but production is low reduced from 21.41 to 8.14. The percentage of area affected by Thur where no crop could be grown increased from 7.41 to 7.69. This is due to the reason that insoluble matter, when the flooded water dries up from Sem affected area, comes up on the surface in the form of white alkaline matter called Thur or Kallar.

From the figures of different compact areas covered by these schemes, it can be observed that in Amritsar and Ferozepur Districts, percentage of area under Sem after the implementation of schemes has much decreased but Sangrur and Bhatinda Districts are adversely affected by Sem and Thur. Increase in the percentage of area affected by Thur after the implementation of anti-waterlogging schemes has been observed in Ferozepur, Sangrur and Bhatinda Districts covered in the survey. It declined in the case of Amritsar District and remained the same in Gurdaspur District. Figures of area under Sem and Thur classified according to the production, before and after the implementation of A.W.L. Schemes is given in the following table :—

TABLE No. 3.1

Extent of eradication of Sem and Thur

District	Sem				Thur			
	Percentage of area to the total area of selected villages				Percentage of area to the total area of selected villages			
	Before the initiation of scheme		After the initiation of scheme		Before the initiation of scheme		After the initiation of scheme	
1	2	3	4	5	6	7	8	9
Amritsar ..	2·29	25·83	0·21	0·19	13·71	0·45	9·08	4·07
Ferozepur ..	2·64	29·87	0·09	6·01	0·67	1·43	4·74	5·31
Sangrur (Sangrur and Sunam Tehsils only)	9·96	1·53	13·93	19·46	6·74	1·23	9·06	2·74
Bhatinda (Mansa Tehsil only)	1·89	8·34	5·41	0·92	—	—	0·38	—
Gurdaspur (Batala Tehsil only)	—	—	—	—	36·70	—	36·70	—
Total ..	4·89	21·41	5·24	8·14	7·41	0·91	7·69	3·52

N.B.—(1) A indicates area where no crop can be grown.

(2) B indicates area where crop can be grown but yield is low.

3.2. *Causes of Sem and Thur.*—Information regarding causes of water-logging has also been collected from the sample cultivators. Heavy rains and flood water was reported by 189 or 43.65 per cent of the cultivators as the cause of water-logging, 52 or 12.00 per cent reported the waterlogging in their holdings due to "Seepage from Canals" and 31 or 7.2 per cent of the sample cultivators said that "Lower Level of their Holdings" was the cause.

Similarly analysing the causes of Thur, it was observed that 41 cultivators or 9.4 per cent reported Thur in their holdings due to the "After-affects of heavy rains and flood water" while 137 or 31.6 per cent reported that Thur had cropped up due to "Natural Causes". Shortage of canal water was reported by 58 or 13.4 per cent of the cultivators as one of the reasons of Thur. Cause-wise water-logging in the covered districts is depicted in the following table :—

TABLE 3.2

Causes of water-logging in the holdings of sample cultivators

District	No. of cultivators reporting sem in their holdings due to different causes			No. of cultivators reporting Thur in their holdings due to different causes			
	Rain and Flood Water	Seepage from canals	Holding at lower level	After-effect of rain and flood water	Natural	Shortage of canal water	After-effect of sem
1	2	3	4	5	6	7	8
Amritsar ..	54 (36·00)	9 (6·00)	1 (0·67)	16 (10·67)	97 (64·67)	11 (7·33)	— —
Ferozepur ..	74 (54·89)	21 (15·71)	14 (10·53)	23 (17·29)	— —	37 (27·82)	26 (19·55)
Sangrur ..	39 (55·71)	20 (28·57)	— —	2 (2·86)	— —	10 (14·29)	35 (50·00)
Bhatinda ..	22 (55·00)	2 (5·00)	16 (40·00)	— —	— —	— —	3 (7·50)
Gurdaspur ..	—	—	—	—	40 (100·00)	—	—
Total ..	189 (43·65)	52 (12·01)	31 (7·16)	41 (9·47)	137 (31·64)	58 (13·39)	64 (14·78)

N.B.—Figures in brackets are percentages worked out on the basis of total sample cultivators.

3.3. *Efforts of the cultivators for eradication of Sem and Thur.*—Efforts in reclaiming the land affected by Sem and Thur by using manures, ploughing and watering had been reported by a few cultivators. 12 or 2.77 per cent of the cultivators had installed tube wells for removing Thur from their holding though not exclusively for this purpose ; 27 or 6.23 per cent of the cultivators had used "Excessive Irrigation" for eradicating Thur in their holdings ; 13 or 3.00 per cent of the total cultivators had used "Land levelling method" for removing Sem and Thur from their holdings and only one cultivator (0.23% of the total sample cultivators) had constructed pucca drain in his holding for removing Sem. Looking to the overall position, it can safely be said that the cultivators are not putting much efforts in reclaiming their land affected by Sem and Thur.

This can be attributed partly to the fact that pieces of land affected by Thur trom just a fraction of the holding for which investment in sinking a tube-well is not possible either for want of funds or so much investment is not worth its while for a small piece of land. Moreover, water in large quantity is not available within the vicinity of the soil.

3.4. *Reason for not reclaiming the land affected by Sem and Thur.*—Out of a total 272 informants who responded to give reasons for not reclaiming the affected land in their holdings, 172 or 39.7 per cent demanded more canal water for reclaiming their land. 30 or 6.9 per cent of the total respondents gave "lack of finances" as a reason for not reclaiming the land and 70 or 16.2 per cent of the cultivators demanded additional drains.

3.5. *Cropping Pattern.*—No significant change has been observed in the cropping pattern in the selected tehsils before and after the initiation of the anti-waterlogging schemes. Area under almost all the crops has increased during the decade. This has only been possible mainly due to the availability of the better drainage system. Table No. 9 indicates the cropping pattern for the areas covered by this study.

The main crops of areas of the selected sample villages are wheat, maize and paddy. The area under wheat in the selected villages has increased from 6,051 hectares in 1959-60 to 11,556 hectares in 1968-69 showing an increase of 90.98%, that under maize inceased from 1,405 hectares in 1959-60 to 2,517 hectares in 1968-69 (79.07% increase) and the area under paddy increased from 1,730 hectares in 1959-60 to 2,650 hectares showing 53.17% increase. The overall cropped area has increased in 1968-69 as compared to that of 1959-60 which is mainly due to the drains dug in the Sem affected area under the anti-waterlogging schemes launched by the Punjab Irrigation Department. Downward trend can be noticed in the area under Cotton, "Berara", Gram and other food and non-food crops.

3.6. *Minor Irrigation Works.*—An idea about the trend of installation of minor irrigation works in selected sample villages since 1959 to 1969 can be had from the figures collected and given in the folliwng table :—

TABLE No. 3.3

District-wise details of minor Irrigation works

Name of District	Tube-wells				Pumping Sets				Wells			
	1959	1961	1968	1969	1959	1961	1968	1969	1959	1961	1968	1969
1	2	3	4	5	6	7	8	9	10	11	12	13
Amritsar ..	31	31	78	109	—	—	19	74	224	223	161	120
Ferozepur ..	14	14	87	131	—	—	14	18	264	269	234	226
Sangrur ..	—	—	64	125	—	—	19	34	138	139	146	160
Bhatinda ..	—	—	6	6	—	1	9	27	7	8	21	21
Gurdaspur ..	1	—	6	11	—	—	2	2	8	8	32	32
Total ..	46	45	241	382	—	1	63	155	641	647	594	559

It would be observed from the table that the number of tube-wells has increased from 46 in 1959 to 382 in 1969, i.e., an increase of more than eight times over this decade. Similarly the number of pumping sets which was 1 in 1961 increased to 155 in 1969. On the other hand, the number of ordinary wells fell down to 559 in 1969 from 641 in 1959. The increase in area irrigated was due to increase in the number of tubewells.

3.7. *Area irrigated by different sources of Irrigation.*—The area irrigated by canals, wells, tube-wells and other sources is depicted in the following table:—

TABLE NO. 3.4

District-wise area irrigated by different sources of irrigation

(Hectares)

District	1958-59				1968-69			
	Canal	Well/ Tube-well	Others	Total	Canal	Well/ Tube-well	Others	Total
1	2	3	4	5	6	7	8	9
Amritsar ..	4,146	1,641	252	6,039	5,498	1,733	78	7,309
Ferozepur ..	2,980	862	205	4,047	3,413	919	333	4,665
Sangrur ..	3,606	417	42	4,065	3,914	771	24	4,709
Bhatinda ..	524	35	—	559	730	331	—	1,061
Gurdaspur ..	—	—	—	—	15	325	3	343
Total ..	11,256	2,955	499	14,710	13,570	4,079	438	18,087

From the above table, it is evident that the area irrigated by canals in the selected sample villages increased from 11,256 hectares in the year 1958-59 to 13,570 hectares in the year 1968-69 showing 20.56 per cent increase. The area under wells/ tube-wells in these villages increased from 2,955 hectares in 1958-59 to 4,079 hectares showing an increase of 38.07 per cent. The total irrigated area in these villages increased from 14,710 hectares in 1958-59 to 18,087 hectares in 1968-69 showing an increase of 22.96 per cent.

CHAPTER IV

CONCLUSIONS

(1) The main reason for waterlogging was heavy rains and lack of natural drains to drain out the flood waters. With the construction of drains the Sem problem has lessened and the water table has gone down but it has given rise to Thur.

(2) Thur can be eradicated by supply of more water but due to shortage of canal water, it could not be eradicated.

(3) The drainage system has proved useful in wiping out Sem from large areas but following shortcomings were noticed during the study :—

(i) Certain drains were not dug completely and in some cases they had no links with other drains. The water of other villages also flows in those thus causing Sem in the other villages ;

(ii) Maintenance of the drains is not undertaken regularly and as a result the flow of water is blocked in the rainy season ;

(iii) In areas where the drains are at a higher level the adjoining lands are affected by the Sem ;

(iv) In certain cases the cultivators are not willing that the drains should pass through their fields. In their cases either the drains had not been completed so far or the drains had been diverted through the fields of other cultivators ;

(4) In certain areas the sem problem is the outcome of seepage from canals or from drains.

The following suggestions are made for improving the programme :—

(a) The excavation of drains should not be left incompete. Link drains should be provided where these are not in existence so as to provide a net work for draining out the excess water ;

(b) There should be regular maintenance of drains. Weeds and other natural blockages should be cleared before the rainy season well in time. The flow of drains should not be allowed to block or diverted to the detriment of other cultivators ;

(c) Demand of more canal water should be met where the problem of 'Thur' exists. The feasibilty of lining the canals may be looked into so as to check the wastage of water and seepage problem.

TABLES

TABLE

Land utilisation of

District/Tehsil	Total geographical area	Area not available for cultivation	Current fallows	Fallow land other than current fallow	Net area sown
	1958- 59				
1	2	3	4	5	6
AMRITSAR					
Amritsar ..	1,210·4	82·5	203·9	138·0	785·9
Ajnala ..	2,142·8	388·1	285·7	106·0	1,363·0
Tarn Taran ..	1,725·2	184·5	114·5	108·5	1,317·6
Patti ..	4,241·4	410·4	526·5	210·0	3,094·6
Total ..	9,319·8	1,065·5	1,130·6	562·5	6,561·1
FEROZEPUR					
Ferozepur ..	1,095·9	73·6	93·1	180·1	749·1
Fazilka ..	1,481·1	106·8	35·6	252·9	1,085·8
Zira ..	1,458·5	139·6	309·2	149·3	860·3
Moga ..	2,821·8	187·0	280·0	40·9	2,314·0
Total ..	6,857·3	507·0	717·9	623·2	5,009·2
SANGRUR					
Sangrur ..	1,417·2	85·4	53·4	236·3	1,042·0
Sunam ..	8,221·9	346·8	439·5	329·4	7,106·2
Total ..	9,639·1	432·2	492·9	565·7	8,148·2
BHATINDA					
Mansa ..	2,385·6	187·8	269·2	64·4	1,864·4
GURDASPUR					
Batala ..	397·8	43·8	148·9	—	205·2
Grand Total ..	28,599·6	2,236·3	2,759·5	1,815·8	21,788·1

No. 1

Sample Villages

(Hectares)

1968-69						
Area sown more than once	Total geographical area	Area not available for cultivation	Current fallows	Fallow land other than current fallow	Net area sown	Area sown more than once
7	8	9	10	11	12	13
652·3	1,223·3	118·6	154·6	36·4	913·7	857·5
969·6	2,163·0	537·4	142·4	—	1,483·2	1,109·6
898·0	1,718·3	176·8	114·5	79·3	1,347·7	1,491·7
559·7	4,252.8	378·4	540·7	201·1	3,132·6	1,299·4
3,079·6	9,357·4	1,211·2	952·2	316·8	6,877·2	4,758·2
259·8	1,095·5	85·0	96·7	36·8	877·0	295·4
664·9	1,482·4	106·0	29·9	245·6	1,100·9	724·0
331·8	1,449·1	154·2	46·1	194. 2	1,054 6	733·3
241·2	2,821·8	124·2	101·2	156·2	2,440·2	787·1
1,497·7	6,848·8	469·4	273·9	632·8	5,472·7	2,539·8
293·8	1,407·9	110·5	59·1	140·8	1,097·5	474·3
2,496·5	8,296·3	614·3	297·4	234·3	7,150·3	2,277·5
2,790·3	9,704·2	724·8	356·5	375·1	8,247·8	2,751·8
207·6	2,390·8	220·6	99·1	145·3	1,925·8	289·8
—	514·3	53·8	161·9	—	298·6	451·2
7,575·2	28,815·5	2,679·8	1,843·6	1,470·0	22,822·1	10,790·8

TABLE No. 2

Tehsilwise number of Sample Cultivators and number of cultivators affected by Thur and Sem

Name of Tehsil/District	Number of cultivators	NUMBER OF CULTIVATORS			
		Previously affected by		Still affected by	
		Sem	Thur	Sem	Thur
1	2	3	4	5	6
AMRITSAR					
Amrijsar ..	174	35	117	30	28
Ajnala ..	229	61	171	—	132
Tarn Taran ..	264	14	160	7	147
Patti ..	313	249	24	6	117
Total ..	980	359 (36·63)	472 (38·16)	43 (4·4)	424 (43·29)
FEROZEPUR					
Ferozepur ..	126	68	54	1	85
Fazilka ..	104	74	—	—	66
Zira ..	430	84	2	61	21
Moga ..	295	91	22	22	49
Total ..	955	317 (33·19)	78 (8·2)	84 (8·8)	221 (23·14)
SANGRUR					
Sangrur ..	83	23	62	36	63
Sunam ..	264	176	66	210	88
Total ..	347	199 (57·35)	128 (36·89)	246 (70·89)	151 (43·52)
BHATINDA					
Mansa ..	301	69 (22·92)	— (—)	77 (25·58)	6 (1·99)
GURDASPUR					
Batala ..	123	— (—)	87 (70·73)	— (—)	89 (72·36)
Grand Total ..	2,706	944 (34·89)	765 (28·27)	450 (16·63)	891 (32·93)

Note :—Figures in brackets show percentages.

TABLE NO. 3(a)

Tehsilwise number of cultivators classified according to size of the holding before the execution of Anti-waterlogging Schemes

TABLE

Tehsilwise number of cultivators classified according to the size of the holding

District/Tehsil	Holding size (Sem)		
	Below 10	10—20	20—50
1	2	3	4
AMRITSAR			
Amritsar ..	29	4	2
Ajnala ..	26	24	10
Tarn Taran ..	14	—	—
Patti ..	148	70	29
Total ..	217 (60·5)	98 (27·3)	41 (11·4)
FEROZEPUR			
Ferozepur ..	19	25	22
Fazilka ..	27	20	17
Zira ..	45	23	11
Moga ..	36	42	13
Total ..	127 (40·0)	110 (34·7)	63 (19·9)
SANGRUR			
Sangrur ..	7	4	9
Sunam ..	60	60	52
Total ..	67 (33·6)	64 (32·2)	61 (30·7)
BHATINDA			
Mansa ..	28 (40·6)	22 (31·9)	16 (23·2)
GURDASPUR			
Batala ..	— (—)	— (—)	— (—)
Total ..	439 (46·5)	294 (31·1)	181 (19·2)

NO·3(a)

before the execution of Anti-waterlogging Schemes

acres			Holding Size (Thur) acres				
50 and above	Total		Below 10	10—20	20—50	50 and above	Total
5	6		7	8	9	10	11
—	35		76	27	13	1	117
1	61		98	51	20	2	171
—	14		118	28	14	—	160
2	249		12	5	5	2	24
3 (0·8)	359 (100·00)		304 (64·4)	111 (23.5)	52 (11·0)	5 (1·1)	472 (100·0)
2	68		11	24	17	2	54
10	74		—	—	—	—	—
5	84		—	2	—	—	2
—	91		5	12	4	1	22
17 (5·4)	317 (100·00)		16 (20·5)	38 (48·7)	21 (26·9)	3 (3·9)	78 (100·00)
3	23		16	17	26	3	62
4	176		18	25	20	3	66
7 (3·5)	199 (100·00)		34 (26·5)	42 (32·8)	46 (35·9)	6 (4·6)	128 (100·00)
3 (4·3)	69 (100·00)		— (—)	— (—)	— (—)	— (—)	— (—)
— (—)	— (—)		47 (54·0)	28 (32.2)	11 (12·6)	1 (1·2)	87 (100·00)
30 (3·2)	944 (100·00)		401 (52·4)	219 (28·6)	130 (17·0)	15 (2·0)	765 (100·00)

Note:—Figures in brackets show percentages.

TABLE

Tehsilwise number of cultivators classified according to the size of

District/Tehsil	Holding Size (Sem)		
	Below 10	10– 20	20– 50
1	2	3	4
AMRITSAR			
Amritsar ..	27	3	—
Ajnala ..	—	—	—
Tarn Taran ..	7	—	—
Patti ..	4	2	—
Total ..	38 (88·4)	5 (11·6)	— (—)
FEROZEPUR			
Ferozepur ..	—	1	—
Fazilka ..	—	—	—
Zira ..	44	9	6
Moga ..	7	11	4
Total ..	51 (60·6)	21 (25·0)	10 (11·9)
SANGRUR			
Sangrur ..	9	8	16
Sunam ..	73	67	65
Total ..	82 (33·3)	75 (30·5)	81 (32·9)
BHATINDA			
Mansa ..	19 (24·7)	34 (44·2)	23 (29·9)
GURDASPUR			
Batala ..	— (—)	— (—)	— (—)
Total ..	190 (42·2)	135 (30·0)	114 (25·3)

No. 3(b)

holding after the execution of Anti-water logging Schemes

acres			Holding Size (Thur) acres				
50 and above	Total		Below 10	10—20	20—50	50 and above	Total
5	6		7	8	9	10	11
—	30		25	3	—	—	28
—	—		62	48	20	2	132
—	7		112	22	13	—	147
—	6		61	36	18	2	117
—	43		260	109	51	4	424
(—)	(100·0)		(61·3)	(25·8)	(12·0)	(0·9)	(100·0)
—	1		15	38	29	3	85
—	—		21	18	18	9	66
2	61		6	10	2	3	21
—	22		18	23	7	1	49
2	84		60	89	56	16	221
(2·5)	(100·0)		(27·1)	(40·3)	(25·3)	(7·3)	(100·0)
3	36		24	9	27	3	63
5	210		24	31	30	3	88
8	246		48	40	57	6	151
(3·3)	(100·0)		(31·8)	(26·5)	(37·7)	(4·0)	(100·0)
1	77		2	1	3	—	6
(1·2)	(100·0)		(33·3)	(16·7)	(50·0)	(—)	(100·0)
—	—		48	29	11	1	89
(—)	(—)		(53·8)	(32·6)	(12·5)	(1·1)	(100·0)
11	450		418	268	178	27	891
(2·5)	(100·0)		(46·9)	(30·1)	(20·0)	(3·0)	(100·0)

Note :—Figures in brackets show percentages.

TABLE No. 4

Extent of Sem and Thur in selected Tehsils of Punjab

(Hectares)

District/Tehsil	Before A. W. L. Schemes				After A. W. L. Schemes			
	Sem		Thur		Sem		Thur	
	A	B	A	B	A	B	A	B
1	2	3	4	5	6	7	8	9
AMRITSAR								
Amritsar ..	28 (2·31)	22 (2·81)	359 (29·66)	12 (0·99)	16 (1·32)	8 (0·66)	242 (19·99)	37 (3·06)
Ajnala ..	56 (2·61)	256 (11·95)	526 (24·55)	—	—	—	300 (14·00)	8 (0·37)
Tarn Taran ..	14 (0·81)	—	314 (18·20)	10 (0·58)	4 (0·23)	—	192 (11·13)	6 (0·35)
Patti ..	115 (2·71)	2,129 (50·20)	79 (1·86)	20 (0·47)	—	10 (0·24)	112 (2·64)	328 (7·73)
Total ..	213 (2·29)	2,407 (25·83)	1,278 (13·71)	42 (0·45)	20 (0·21)	18 (0·19)	846 (9·08)	379 (4·07)
FEROZEPUR								
Ferozepur ..	2 (0·18)	266 (24·27)	15 (1·37)	44 (4·01)	1 (0·09)	—	16 (1·46)	92 (8·39)
Fazilka ..	37 (2·50)	917 (61·91)	25 (1·69)	—	—	—	271 (18·30)	61 (4·12)
Zira ..	—	606 (41·55)	4 (0·27)	6 (0·41)	—	350 (24·00)	15 (1·03)	101 (6·92)
Moga ..	142 (5·03)	259 (9·18)	2 (0·07)	48 (1·70)	5 (0·18)	62 (2·20)	23 (0·82)	110 (3·90)
Total ..	181 (2·64)	2,048 (29·87)	46 (0·67)	98 (1·43)	6 (0·09)	412 (6·01)	325 (4·74)	364 (5·31)
SANGRUR								
Sangrur ..	3 (0·21)	193 (13·62)	75 (5·29)	52 (3·67)	21 (1·48)	312 (22·02)	167 (11·78)	44 (3·10)
Sunam ..	957 (11·64)	1,277 (15·53)	574 (6·99)	67 (0·81)	1,322 (16·08)	1,564 (19·02)	706 (8·59)	220 (2·68)
Total ..	960 (9·96)	1,470 (1·53)	650 (6·74)	119 (1·23)	1,343 (13·93)	1,876 (19·46)	873 (9·06)	264 (2·74)
BHATINDA								
Mansa ..	45 (1·89)	199 (8·34)	—	—	129 (5·41)	22 (0·92)	9 (0·38)	—
GURDASPUR								
Batala ..	—	—	146 (36·70)	—	—	—	146 (36·70)	—
Grand Total ..	1,399 (4·89)	6,124 (21·41)	2,120 (7·41)	259 (0·91)	1,498 (5·24)	2,328 (8·14)	2,199 (7·69)	1,007 (3·52)

Notes.—(1) Figures in brackets show percentage to total geographical area.
(2) A indicates where no crop can be grown.
(3) B indicates where crops can be grown but the yield is low.

TABLE NO. 5

Causes of Sem and Thur in the holding of sample cultivators and their percentage to total sample cultivators

TABLE

Causes of Sem and Thur in the holding of sample cultivators and

District/Tehsil	SEM					
	Rain and Flood Water		Seepage of canal water		Holdings at lower level	
	No.	Percentage	No.	Percentage	No.	Percentage
1	2	3	4	5	6	7
AMRITSAR						
Amritsar ..	1	2·50	9	22·50	—	—
Ajnala ..	14	35·00	—	—	—	—
Tarn Taran ..	—	—	—	—	1	3·33
Patti ..	39	97·50	—	—	—	—
Total ..	54	36·00	9	6·00	1	0·67
FEROZEPUR						
Ferozepur ..	3	7·89	—	—	1	2·63
Fazilka ..	30	100·00	—	—	—	—
Zira ..	12	38·71	20	64·52	11	35·48
Moga ..	29	85·29	1	2·94	2	5·88
Total ..	74	55·64	21	15·79	14	10·53
SANGRUR						
Sangrur ..	10	33·33	10	33·33	—	—
Sunam ..	29	72·50	10	25·00	—	—
Total ..	39	55·71	20	28·57	—	—
BHATINDA						
Mansa ..	22	55·00	2	5·00	16	40·00
GURDASPUR						
Batala ..	—	—	—	—	—	—
Grand Total	189	43·65	52	12·01	31	7·16

No. 5

their percentage to total sample cultivators

(Tehsil-wise)

THUR

After effect of rains		Natural		Shortage of canal water		After effect of Sem	
No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
8	9	10	11	12	13	14	15
—	—	26	65·00	10	25·00	—	—
—	—	40	100·00	—	—	—	—
—	—	30	100·00	—	—	—	—
16	40·00	1	2·50	1	2·50	—	—
16	10·67	97	64·67	11	7·33	—	—
—	—	—	—	15	39·47	14	36·84
—	—	—	—	17	56·67	12	40·00
7	22·58	—	—	1	3·22	—	—
16	47·06	—	—	4	11·76	—	—
23	17·29	—	—	37	27·82	26	19·55
—	—	—	—	10	33·33	20	66·67
2	5·00	—	—	—	—	15	37·50
2	2·86	—	—	10	14·29	35	50·00
—	—	—	—	—	—	3	7·50
—	—	40	100·00	—	—	—	—
41	9·47	137	31·64	58	13·39	64	14·78

TABLE

Measures adopted by the cultivators in eradicating the

District/Tehsil	SEM							
	Manuring		Tubewell		Watering		Land Levelling	
	No. of cultivators	Percentage of total sample cultivators	No.	Percentage	No.	Percentage	No.	Percentage
1	2	3	4	5	6	7	8	9
AMRITSAR								
Amritsar ..	—	—	—	—	—	—	1	0·23
Ajnala ..	—	—	—	—	—	—	—	—
Tarn Taran ..	—	—	—	—	—	—	—	—
Patti ..	—	—	—	—	—	—	—	—
Total ..	—	—	—	—	—	—	1	0·23
FEROZEPUR								
Ferozepur ..	—	—	—	—	—	—	—	—
Fazilka ..	—	—	—	—	—	—	—	—
Zira ..	—	—	—	—	—	—	—	—
Moga ..	—	—	—	—	—	—	—	—
Total ..	—	—	—	—	—	—	—	—
SANGRUR								
Sangrur ..	—	—	—	—	—	—	—	—
Sunam ..	—	—	—	—	—	—	—	—
Total ..	—	—	—	—	—	—	—	—
BHATINDA								
Mansa ..	—	—	—	—	—	—	—	—
GURDASPUR								
Batala ..	—	—	—	—	—	—	—	—
Grand Total ..	—	—	—	—	—	—	1	0.23

No. 6

Sem and Thur in their holdings.

SEM						THUR			
Pucca Drains		Tubewells installed		Excess use of water		Manuring		Land Leveling	
No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
10	11	12	13	14	15	16	17	18	19
—	—	7	1·61	1	0·23	—	—	2	0·46
1	0·23	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	22	14·67	—	—	—	—
1	0·23	7	1·61	23	15·33	—	—	2	0·46
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—
—	—	5	1·16	4	0·92	6	1·38	11	2·54
1	0·23	12	2.77	27	6·23	6	1·38	13	3·00

TABLE No. 7

Reasons for not reclaiming the affected areas

Name of District/Tehsil	Number of cultivators giving reasons			
	Shortage of Canal Water	Shortage of Finance	Lack of Drainage	Total
1	2	3	4	5
AMRITSAR				
Amritsar	40	—	—	40
Ajnala	30	—	—	30
Tarn Taran	26	—	—	26
Patti	2	—	—	2
Total	98 (22·6)	— —	— —	98 (22·6)
FEROZEPUR				
Ferozepur	6	—	—	6
Fazilka	1	29	—	30
Zira	—	—	—	—
Moga	—	—	—	—
Total	7 (1·6)	29 (6·7)	—	36 (8·3)
SANGRUR				
Sangrur	29	1	—	30
Sunam	—	—	40	40
Total	29 (6·7)	1 (0·2)	40 (9·3)	70 (16·2)
BHATINDA				
Mansa	2 (0·5)	— (—)	30 (6·9)	32 (7·4)
GURDASPUR				
Batala	36 (8·3)	—	—	36 (8·3)
Grand Total	172 (39·7)	30 (6·9)	70 (16·2)	272 (62·8)

Note :—Figures in brackets indicate percentages.

TABLE No. 8

Tehsilwise area irrigated by different sources of irrigation in the sample villages

District/Tehsil	1958-59				1968-69			
	Canal	Well/ Tube-well	Others	Total	Canal	Well/ Tube-well	Others	Total
1	2	3	4	5	6	7	8	9
AMRITSAR								
Amritsar ..	860	1,027	151	2,038	1,280	890	1	2,171
Ajnala ..	1,223	1,460	266	2,949	1,831	1,920	121	3,872
Tarn Taran ..	1,630	1,265	153	3,048	2,390	1,385	70	3,845
Patti ..	6,533	304	52	6,889	8,080	87	—	8,173
Total ..	10,246	4,056	622	14,924	13,587	4,282	192	18,061
FEROZEPUR								
Ferozepur ..	1,213	384	34	1,631	1,290	515	276	2,081
Fazilka ..	2,484	263	8	2,755	2,539	304	39	2,882
Zira ..	991	757	328	2,076	1,743	579	275	2,597
Moga ..	2,676	727	138	3,541	2,860	874	234	3,968
Total ..	7,364	2,131	508	10,003	8,432	2,272	824	11,528
SANGRUR								
Sangrur ..	414	757	103	1,274	713	1,374	60	2,147
Sunam ..	8,496	274	—	8,770	8,960	530	—	9,490
Total ..	8,910	1,031	103	10,044	9,673	1,904	60	11,637
BHATINDA								
Mansa ..	1,296	85	—	1,381	1,804	819	—	2,623
GURDASPUR								
Batala ..	—	—	—	—	37	804	61	847
Grand Total ..	27,816	7,303	1,233	36,352	33,533	10,081	1,082	44,696

TABLE No.

Area under

District	Kharif					
	Maize	Paddy	Cotton	Sugar-cane	Other Food Crops	Other Non-Food Crops
1	2	3	4	5	6	7
AMRITSAR						
1959-60 ..	456·50	951·00	526·08	263·44	101·57	40·06
1968-69 ..	731·66	1599·70	491·28	283·28	189·39	50·59
Percentage increase/decrease	(59·58)	(68·21)	(—6·61)	(7·53)	(86·46)	(26·29)
FEROZEPUR						
1959-60 ..	392·94	667·32	457·69	62·73	144·47	26·71
1968-69 ..	753·92	761·20	449·60	124·24	216·50	17·00
Percentage increase/decrease	(91·87)	(14·07)	(—1·77)	(98·06)	(49·86)	(—57·12)
SANGRUR						
1959-60 ..	500·18	111·69	1437·02	89·43	618·35	420·87
1968-69 ..	937·24	146·09	643·85	221·76	1570·16	495·33
Percentage increase/decrease	(87·38)	(30·80)	(—55·20)	(147·97)	(153·93)	(17·69)
BHATINDA						
1959-60 ..	53·82	—	53·41	—	260·61	96·31
1968-69 ..	59·08	—	204·77	—	263·45	62·32
Percentage increase/decrease	(9·77)	—	(283·39)	—	(1·09)	(—35·29)
GURDASPUR						
*1965-66 ..	7·28	33·59	2·43	10·12	0·40	—
1968-69 ..	34·80	142·85	8·50	25·49	0·81	14·97
Percentage increase/decrease	(378·02)	(325·28)	(71·41)	(151·88)	(102·50)	—
TOTAL						
1959-60 ..	1405·45	1730·01	2474·21	415·61	1125·01	583·95
1968-69 ..	2516·70	2649·84	1793·95	654·77	2240·31	640·20
Percentage increase/decrease	(79·07)	(53·17)	(—27·49)	(57·54)	(99·14)	(9·63)

*Data for 1965-66 instead of 1959-60 was available.

various Crops —

(Hectares)

Rabi							
Oils Seeds	Wheat	Berara	Barley	Gram	Others Non-Food Crops	Other Food Crops	Oil Seeds
8	9	10	11	12	13	14	15
4·86	2277·95	376·76	54·23	159·85	138·80	82·15	82·96
9·71	4053·68	42·90	55·44	72·03	95·10	61·92	202·34
(99·79)	(77·95)	(—88·61)	(2·23)	(—54·93)	(—31·48)	(—24·63)	(143·90)
2·43	2019·76	114·12	58·27	129·03	—	21·04	42·44
8·90	2831·95	9·31	339·12	49·37	—	2·83	47·75
(266·26)	(40·21)	(—91·84)	(481·98)	(—61·74)	—	(—86·55)	(12·51)
36·83	1169·12	34·80	31·65	1468·58	—	121·81	49·37
379·59	3691·09	11·33	176·85	642·23	—	18·62	45·73
(930·65)	(215·72)	(—67·44)	(45·88)	(—56·27)	—	(—84·71)	(—7·37)
—	583·95	—	33·59	339·93	—	—	—
—	784·27	—	31·97	49·37	—	—	—
—	(34·30)	—	(—4·82)	(—85·48)	—	—	—
—	57·06	57·06	..	—	—	—	—
—	195·06	61·51	283	—	—	—	—
—	(241·85)	(7·80)	..	—	—	—	—
44·11	6050·78	525·68	177·69	2097·46	138·80	225·00	204·77
398·20	11556·04	125·05	606·21	813·00	95·10	83·36	295·82
(802·74)	(90·98)	(—76·21)	(241·16)	(—61·24)	(—31·48)	(—62·95)	(44·46)

ANNEXURE I

Name of the District	Names of the affected tehsils
1	2
1. Amritsar	.. Amritsar, Ajnala, Tarn Taran and Patti
2. Ferozepur	.. Ferozepur, Fazilka Moga and Zira
3. Sangrur	.. Sangrur and Sanam
4. Bhatinda	.. Mansa
5. Gurdaspur	.. Batala

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