Ad-hoc Study No.41

EVALUATION OF INTEGRATED DRYLAND AGRICULTURAL DEVELOPMENT PROGRAMME

(A Study in Rewa District of Madhya Pradesh)

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C O N T E N T S

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CHAPTER I

INTRODUCTION

1.1 Semi Arid Tropical Region(SAT)

Semi-arid tropical region spreads over nearly 200 districts of the Country, falling in the States of Tamil Nadu, Karnatak, Andhra Pradesh, Maharashtra, Madhya Pradesh, Gujrat, Rajasthan, Uttar Pradesh and Haryana. The physical, economic, social and technological characteristics with in this region differ widely. At the one extreme are the tracts which receive reasonably high rainfall and at the other extreme are the areas receiving very low rainfall. It is inbetween these two extremes are the tracts which are also very poor in irrigation facilities and are predominantly rainfed. Such areas are generally identified as dry farming areas.

1.2 Dry-Farming in India

Dry farming refers to cultivation of an area which has inadequate and uncertain rainfall and also inadequate irrigation facilities.

Indian Council of Agricultural Research has defined the dry farming areas as, 'those receiving rainfall between 400 m.m. to 1000 m.m. and having less than 25 per cent of the cultivated area under irrigation. In all 84 districts constituting nearly 36 per cent of the net area sown in the country (nearly 47 million hectares) fall in this typically dry farming tract. However, the high intensity dry farming areas are those which receive an annual rainfall from 375 m.m. to 750 m.m. and have less than 10 per cent of their total cropped area under irrigation.

Inadequate and uncertain rainfall has often lead to partial or complete failure of crops in the rain-fed areas. The need for reducing this risk was officially recognised as far back as 1880 when the Famine Commission suggested the initiation of protective irrigation works in such dry lands. However, such protective irrigation had a limited success particularly in the years of poor monsoon. The Royal Commission on Agriculture concluded in it's Report in 1928 that, "The problems of cultivation in such tracts in which crops are entirely dependent on rainfall, deserve far more attention than they have received from their agricultural departments."

Attempt at systematic and scientific tackling of dry farming problems started around 1923 with a research project in Maharashtra (former Bombay Province) where some investigations were conducted into the dry farming problems. A comprehensive plan of research was formulated by Sri V.A Tamhane in 1926. The ICAR, soon after it was founded, recognised the importance of dry farming and approved and financed an integrated research scheme on various aspects, in collaboration with the State Government. Five regional research Centres were setup at Sholapur, Bijapur, Raichur, Hagari and Rohtak between 1933 and 1935.[1]

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[1] * Report on 'A Study of Integrated Dry Land Agricultural Development Project, Hydrerabad District, Andhra Pradesh' Agro-Economic Research Centre Andhra University, Waltair, March 1976.

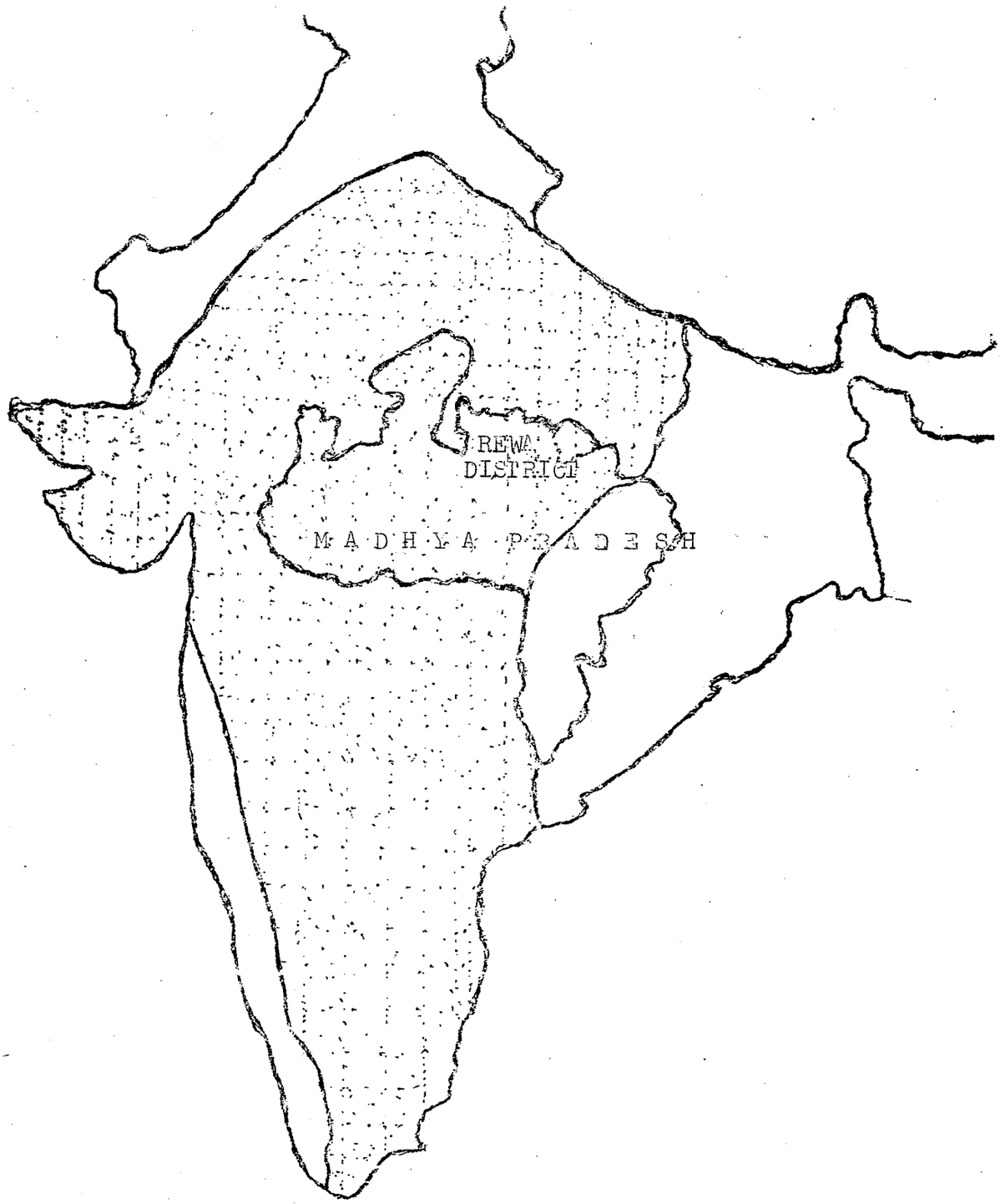

Figure 1 Semi-Arid Tropical(SAT) Region in India
(also showing its coverage in Madhya Pradesh)

Note : In 210 districts of SAT Region in India, over two - third cropped area has no irrigation. Out of 353 million acres net sown area, mean annual rainfall is over 1,125 m.m. in 101 million acres, 750-1,125 m.m. in 126 million acres, 350-750, m.m. in 79 million acres and below 350 m.m. in 47 million acres.

A nation-vide action programme to improve dry land farming was taken up after Independence. During the Second Five Year Plan period, 45 dry farming projects covering about 10,000 Acres each were taken up in different States. These projects aimed at demonstrating the benefits of improved dry farming practices in low and erratic rainfall areas. These demonstrations included measures like contour bunding, terracing and agronomic practices relating to water conservation.

The problem of dry farming acquired a new dimension and urgency when the H.Y.Vs. revolutionalised wheat and paddy farming in the irrigated areas of the Country. The growing disparity between irrigated and dry land farming tracts threatened to accelerate dissatisfaction on account on various economic problem. Consequently more attention was paid to research for increasing the yields of dryland crops and various new varieties of different crops were evolved.

1.3 Integrated Dry-Land Agricultural Development Projects

The need for achieving a quick and rapid increase in agricultural production in dryland areas assumed great importance in the context of the existing economic situation. In order to meet the situation a Centrally sponsored scheme of Integrated Dry land Agricultural Development was initiated in 1970-71 during the Fourth Five Year Plan. Twenty Four Pilot projects named as Integrated Dry Land Agricultural Development Project - were started in 12 States. The programme envisaged had two objectives -

(i) research into improved dry farming technology and (ii) application of such technology to dry farming areas. Each Project was linked with one of the main or sub-Centres for research in dry farming. The dry land agricultural technology evolved at these research Centres was demonstrated to the farmers of the associated State operated Dry Land Agricultural Development Block.

For implementing the 24 IDAD projects in the Fourth Plan an allocation of 20 crores was made in the Central Sector. It was proposed that in the first year about 2500 acres of compact area was to be covered by each project. In the second year the coverage was to be increased to 10,000 acres and in the last 2 years to about 25,000 acres. Nine pilot projects were taken up in 1970-71 and 15 in 1971-72.

1.4 Dry Farming in Madhya Pradesh

In Madhya Pradesh, barring a few districts of the south east, entire State comes under Semi-Arid Tropical Region, where farming is a gamble with nature. Till recent past nearly 90 per cent of the total cultivated area of the State depended entirely on monsoon. Rainfall in the State is subject to large fluctuations in volume and spread. Average rainfall varies from 668 m.m. to 1623 m.m. while it's coefficient of variation ranges between 10.85 per cent to 48.93 per cent.[2] In addition to this there are considerable climatic variations

2 'Inter-District Comparison of Agricultural Development in Madhya Pradesh', Agro-Economic Research Centre, J.N.Krishi Vishwa Vidyalaya, Jabalpur, 1977 (Mimeographed) p.31 (Table 3.2)

caused by varying topography. "On the basis of rainfall soil type and maximum and minimum temprature conditions in various parts, the State needs to be properly classified for better planning and to suggest improvement in the existing cropping patterns which have come to stay due to agro-climatic conditions on the one hand and socio-economic situations on the other.[3]" 'The existing cultivation practices and cropping pattern of the various regions in the State is responsible for very low per capita income of the large section of the farmers as compared to the per capita incomes in the irrigated areas.[4]'

1.5 Present Study

1.5.1 Initiation

In Madhya Pradesh ICAR had established the main Dry land Agricultural Research Centre at Indore and a sub-Centre at Rewa.

The district Rewa was covered under the IDAD Programme in 1971-72. Since project under the scheme had been in operation for seven to eight years it was opportune to evaluate the work already done and to assess the benefits accruing from the technology evolved and prospects for its, wider applicability. At the initiation of the Directorate of Economics and Statistics

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3 'Strategy for Agricultural Development in Rainfed Areas in Madhya Pradesh' D. Sharma, Laxman Singh and G.S. Tomar, Directorate of Research Services J.N.K.V.V. Jabalpur.P.1.

4 Ibid

Figure 2 - Location of Integrated Dry land Agricultural Development Projects in Madhya Pradesh.

Ministry of Food and Agriculture, Government of India, Agro-Economic Research Centre for Madhya Pradesh, Jabalpur took up the study of "Evaluation of Integrated Dryland Agricultural Development Programme, Rewa (M.P.) in the year 1978-79 with the following objectives :

1.5.2 Objectives

1. To study the nature and components of the IDAD Programme.

2. To assess the extent of adoption of the recommended practices by farmers in the Project area.

3. To study the factors having a bearing on the response of farmers to the Programme.

4. To investigate the reasons for non-adoption, partial adoption and reversion to traditional practices.

5. To assess the feasibility of wider adoption of the recommended and profitable practices.

1.5.3 Sampling

In view of the objectives of this study the main problem was to select a representative sample. Sampling was done at two stages, first selection of villages and second selection of farmers.

There had been three distinct stages in the IDAD Project Rewa :

I Stage - 1971-72- Initiation of the Project with coverage of 15 villages.

II Stage-1972-73 - First expansion of the Project area by including 26 more villages.

III Stage-1977-78- Second expansion by including 11 more villages.

In order to cover the entire area selection was done from all the three areas covered at different stages. Two villages from the first, two from the second and one village was selected from the third stage. One more village was selected from the adjacent area out side the Project i.e. from the area which was not exposed to the programme till then. Thus in the first stage of sampling 5 villages were selected from the Project area and one village from the adjacent area out side the Project. Selection of all the six villages done at random from the list of villages available for each category seprately. Guidance of the Project officials was also taken into consideration for this purpose.

The second stage of sampling involved selection of cultivating house-holds. Two categories of farmers were to be selected, One-participants or adopters (who had adopted any practice recommended under the IDAD Programme) and second non-participant or non-adopters (who had not participated in any of the IDAD Programmes). Sample size was pre-determined. Sixty participant farmers and forty non-participant farmers were to be selected.

For selecting the participant farmers their lists for all the selected five villages with in the Project area were obtained from the Project Office. The lists of twin villages - two villages selected from a common stage - were combined. Thus we had three lists of participant farmers from which the selection was done.

It was decided to select 20 participants from the first list, 30 from the second and 10 from the third.* The participant farmers of each list were divided, seprately, into 8 categories on the basis of their participation in IDAD programmes. These categories represented participation in single programme, participation in two programmes, Three programmes ... four five, six, seven and likewise, participation in eight programmes. The requisite number of households for each list were selected seprately from each category in the proportion in which they were actually distributed in different categories. Selection of the required number was done at random, out of the total number available in each category.

Similarly the sample of non participant farmers was also selected from the lists of non-participant of each paired or single village including one outside the Project area. All the four lists of non-participant farmers were recasted in ascending order of the operated holdings and the requisite number of farmers were selected from each list at random.

The over all sample of participant and non-participant farmers selected for the study, and its' breakup by type, stages and participation categories is given in the following table.

* This distribution of 20,30 and 10 was approximately in proportion to the number of participant farmers available in the lists.

Table Distribution of Selected Farmers by Type of Area, Stages and Participation categories

Area under Study	Selected villages	No.of Participants selected in different categories of Participation									No.of Non-Participant selected	Total No.of Households selected for study
		I	II	III	IV	V	VI	VII	VIII	Total		
Project Stage I	Maddhepur, Chhijwar	1	1	10	5	1	2	-	-	20	10	30
Area II	Chorhata, Kachoor	1	1	4	3	9	6	5	1	30	15	45
III	Sumeda	-	2	5	1	1	1	-	-	10	5	15
Adjacent Area out side the Project	Kuiyan	-	-	-	-	-	-	-	-	-	10	10
Total		2	4	19	9	11	9	5	1	60	40	100

1.5.4 Data Collection

Each sample farmer was personally interviewed by the investigators of the Research Centre with a structured schedule during 1978-79. The primary data used in the study pertains to the agricultural year 1977-78. Besides primary data from the farmers, secondary data pertaining to the District, selected Project and villages were also collected from Official records and other printed material.

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CHAPTER II

DRYLAND AGRICULTURAL DEVELOPMENT PROGRAMME

2.1 A Historical Perspective

In order to increase the agricultural production in dryland areas, Government of India launched a Centrally Sponsored Scheme of Integrated Dryland Agricultural Development in 1970-71 for implementation in the Fourth Five Year Plan. The scheme aimed at demonstrating the new dryland technology as being developed by the Dryland Research Centre of I.C.A.R. on farmers fields and to translate the research findings of dryland agriculture into practice. Nine pilot projects for Integrated Dryland Agricultural Development were started during 1970-71 and 15 during 1971-72. Each project was attached to one of the main or sub-centre engaged in dryland farming research for technical guidence. Thus, twenty four pilot projects were taken up under this scheme in close proximity to I.C.A.R's Dry land Research Centres in 12 States, viz., Uttar Pradesh, Karnatka, Rajasthan, Andhra Pradesh, Gujrat, Haryana, Madhya Pradesh, Maharashtra, Tamil Nadu, Bihar, Jammu and Kashmir and Orissa.

It was proposed that in the first year about 25,000 acres of compact area was tobe covered by each project. In the second year, depending upon the success in the initial year, the area coverage was to be increased by 10,000 acres and in the last two years to about 25,000 acres.

2.2 Integrated Dryland Agricultural Development Project

2.2.1 Objectives: The Integrated Dryland Agricultural Development Projects were set up with the following objectives:

1. To bring about change in the existing cropping pattern of dry land areas by introducing drought resistant and early maturing varieties of crops of [illegible].

2. To familiarize the farmers with the economic use of chemical fertilizers and plant protection measures in dryland crops.

3. To undertake soil and moisture conservation works like contour bunding, paddy bunding, haveli bunding, construction of waste weir, deep ploughing, land levelling, construction of check dams and farm ponds to reduce soil erosion and to increase the moisture conservation.

4. To popularise the minor irrigation programmes like construction of new wells, repair of old wells, construction of tube wells and distribution of electric and diesel pumps.

5. To encourage farmers of dryland areas to adopt the improved implements and farm machineries.

6. To induce farmers to take up dairy farming and keep improved breed of animals.

7. To educate the farmers in the modern dryland agronomic practices by laying demonstration plots in the

farmers' fields and by conducting farmer's training camps/and other extension activities.

2.2.2 Capital Out-lay

The outlay for the Fourth Plan was Rs.20.00 crores against which the expenditure was Rs.6.56 crores. The plan outlay for the 5th Plan was Rs.10.00 crores which was later reduced to Rs.7.83 crores in the mid term appraisal. The amount utilized during the first three years of the Fifth Plan was Rs.3.66 crores. A budget provision of Rs.1.70 crores was kept for 1977-78.

2.3 I.D.A.D. Projects in M.P.

In Madhya Pradesh, two projects, one at Inore and another at Rewa were established. Indore Project was attached to the main and Rewa Project was attached to the sub-centre for Dryland Farming Research.

2.4 I.D.A.D. Project - Rewa (M.P.)

2.4.1 Initiation

The Dryland Farming Project, Rewa was started in 15 villages of Bankuiya revenue circle in Huzur tehsil of Rewa district. Though the scheme was sanctioned by the Government of India on 11.2.71 but actual functioning started from 1.7.71. The project area is about five kilometers from the Dryland Research Centre and two kilometers from the district head-quarters.

2.4.2 Coverage

In 1972-73, 26 villages were added to the project covering the cultivated area of 20,000 acres. Again 11 villages were added to the project in 1977-78 and area of the project was extended in 52 villages. Thus the total cultivated area reached to 25,000 acres.

The soils of the project are heavy. About 40% of the area is under clay-soil, 40% under clay loam and other 20% under loamy sand to loam. The average rainfall of the project area is 1102 m.m. and the onset of rains are expected by about 2nd or 3rd week of June. The monsoon ends by end of September.

2.4.3 Administrative Set up

For implementation of the various schemes in the Project area successfully, a core of technical administrative staff was sanctioned for each project. The Project Office is headed by a Project Officer who is assisted by a team of technical personnels; one Soil Conservation Officer, one Veterinary Officer, two Agriculture Assistants (U.D.) and two Agriculture Assistants (Soil Conservation, L.D.). At the village level 5 V.L.Ws and 8 Surveyers were appointed to help the cultivators participating in the programmes within the Project area.

2.5 Programme Content

The under mentioned programmes were prepared for implementation in the Project area:-

Table 2.1 Government Subsidy Rates Under Dry Land Agricultural Development Programme in Rewa in 1971-72 and 1976-77

Item - Programme	1971-72		1976-77	
	Datails of subsidy	Rate	Details of subsidy	Rate
1. Seed, Ferrilizer and pesticides	First Year	50%	-	-
2. Soil conservation and land development	Work is done through State Agri. Deptt.	25%	Work is done through State Agri. Deptt.	25%
3. Demonstration	Rs. 200/- per Demonstration.			
4. Farmers training & tour	Organised by Project officials at full cost			
5. Implements, machinery and plant protection equipments	Worth below Rs. 300/- Subject to maximum of 200/- per implement.	50%	Worth below Rs. 1000/-	50%
6. Urea Spray	On cost of urea	50%	On cost of urea	50%
7. Minor irrigation	Farmers having 10 acres and below	25%	Small Farmers	25%
8. Animal husband ry	Farmers having below 10.00 acres	33 1/2	Marginal Farmers	33%
9. Gobar Gas Plant	-	-	-	20%
10. Orchard	-	-	-	-
11. Sprinkler irrigation	Farmers having below 10.00 acres above 10.00 acres	50% 25%	Farmers having below 10.00 acres above 10.00 acres	50% 25%
12. Water Harvesting				
i) Digging of new wells	Community work is done through the Deptt.	100%	Community work is done through the Deptt.	100%
ii) Repairing of old wells				
iii) Nala bunding.			Private individual work	75%

2.6 Dry Land Research Sub-Centre, Rewa

The dryland Research Sub-centre, Rewa is a part of All India Coordinated Research Project on Dryland Agriculture which is associated with State operated Dryland Farming Development Block, Rewa as an Integrated Dry-Land Agricultural development Scheme. The main objectives of the Research Sub-Centre is to (1) find methods of pushing up the yield of crops grown by the farmers (ii) devise methods of soil moisture and water conservation for stabilising the income of farmer and (iii) demonstrate the influence of dryland research technology to farmers by imparting training and participating in action and development plans of DryLand Farming Block, Rewa and adjoining areas.

2.8 Recommendations of Dry Farming Practices*

Some of the recommendations of dry farming practices on the basis of demonstrations and field experiences in Dryland Agricultural Development Project Rewa are as given below:

* Reproduced from Annual Progress Report of DDAD Project Rewa 1973-74, Department of Agriculture Madhya Pradesh.

1. Problem:- Heavy Kans and Doob infestations resulting moisture loss and heavy weeding costs in Kharif.

Solution:-Summer cultivation by deep tractor ploughing or cultivation by Bakhar.

Result:- This adds 20% yields and reduces 10% weeding cost in Kharif.

2. Problem:- Moisture conservation.

Solution: A Kharif

i) Line sowing

ii) Interculture operation in Kharif crop e.g. Paddy, Jowar, Arhar, Sun flower etc.

iii) Inter ploughing in standing Kodo and Jowar crop to control weeds and conserve moisture.

Results:- Reduces weeding costs by 15% and sustains crop yields in period of droughts.

B. Rabi

Solution:- Introduction of Singh Patela and Bakhar to control Doob and Kans and creation of mulch for seed bed preparation.

Results:- This adds 5% yields of crops like wheat under dry conditions.

3. Problem:- Replacement of late low yielding varie-ties which suffer to moisture and introduction of remunertive crops.

Solution:- To grow drought resistant crops which can also sustain heavy rainfall and are early maturing. Early Paddy like Cauvery and Sabarmati, Sunflower, Early Moong Urd. T9, Prabhat and Sharda Arhar, Ground nut for shallow to deep soils, Safflower as a border crop can be grown successfully.

Sunflower and Laha 5904 may replace Linseed crop which is very low yielder.

Results:- Doubles the yield. Double croppfng-is possible.

4. Problem:- Use of fertilizer

Solution:- Placement of fertilizer below the seed through the suitable implements.

Results:- It increases 20% yields over broadcasting and 10% over mixing fertilizer with the seed.

5. Problem:- Growing of low yielding crops like Kodo in light shallow soils.

Solution:- Bunding

Results:- Bunding of light shallow soils helps for sucessful growing of Sun flower, Hybrid Jowar and Groundnut crop.

6. Problem:- Use of impounded water of existing Bandh

Solution:-Use of water by constructing Jal Mohra or by 'siphon' in command area for protective irrigation.

Results:- Crops of command area can be ensured and double croping is possible.

7. Problem:- Use of implements

Solution:- Introduction of the following implements recommended by the Committee and liked by the cultivators:-

i) Shabash plough
ii) Kanghi Bakhar
iii) Bullock drawn Leveller
iv) Ferti-Seed Drill
v) Interculture implements (Hoe)
vi) Singh Patela
vii) Bund former

Results:- Approximately it adds 5 to 10% yields.

2.9. General Recommendations

1. Deepploughing and Bakhering is beneficial for eradiction of Doob and kans.

2. Line sowing and Interculture operation of Kharif crops is essential.

3. Double cropping is possible after early Paddy, Early Moong and Urd crop.

4. Early varieties of Arhar like Prabhat, Sharda and T-21 escape frost and yields 5 to 6 quintals per acre.

5. Sun-flower crop gives good yield during Kharif in light soils and during Rabi in heavy soils. It can also be grown up to January in water logged soils where other crops cannot be grown.

6. Paddy Cauvery and Sabarmati give double the yield over local varieties and mature in 100 to 110 days.

7. Ground nut crop gives 5 to 6 quintals yield per acre in light shallow soil where existing Kodo crop gives 1 to 1½ qtls per acre.

8. Safflower crop is beneficial for border crop.

9. Sun flower and Laha 5904 give more economic returns as compared to Linseed crop.

10. Growing R.R.21 or H.D.M.1553 varieties of wheat in Bandh area under delayed condition gives more yield in comparision to tall varieties.

11. Placement of fertilizer below the seed is beneficial.

12. Urea spray increases 20 to 25 kgs grain yield per acre.

13. Fertilizer use during Kharif is gainful.

14. Paddy bunding in command of existing Bandh ensures paddy crop and possibility for double cropping.

15. Jal-Mohra in existing Bandh is essential for the control use of water for protective irrigation in command area.

16. Levelling by bullock drawn levellers is cheapest and it conserves moisture.

17. Harvesting of water of perennial Nallahs can be done by constructing Stop Dam for the use of irrigation.

18. Use of improved implements reduces the cost to operation and increases yields.

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CHAPTER III

AGRO-ECONOMIC CONDITIONS OF THE SELECTED AREA

In Madhya Pradesh two Integrated Dry Land Agricultural Development Project (IDAD) were started in the Fourth Plan, one at Indore and the other at Rewa. Present study is an 'Evaluation of IDAD Programme in Rewa. [illegible]

I REWA DISTRICT

3.1 Situation

Rewa district lies between 24° 18' and 25° 12' North latitude, and 81° 2' and 82° 18' East longitude in the north-eastern part of Madhya Pradesh. The boundry of the district marches with that of the state of Uttar Pradesh in the north, with the Amarpatan and Raghurajnagar tehsils of Satna district, in the west with the Sidhi district in south and in the east again with Uttar Pradesh. With the exception of the uppermost Teouther tahsil, the district lies entirely on the great Vindhya Plateau.

3.2 Size-Area and Population

It's area is 6,135 sq. miles which is 1.43 per cent of the state area. In 1971 Census the population of the district as recorded was [illegible] 9,77,894. The density of population was 155 per sq. km. The district ranks 5th in the state according to the density and 15th on the basis of total population[5].

5.. District Census hand book of Rewa district 1971 page 173

3.5.3

3.4.3 Rainfall and Climate

The average (ignoring the Govindgarh Station) rainfall of the district is 1,102.8 m.m. (43.4") Neither the total annual rainfall nor its distribution in various months of the year has any stability, both suffer from a high degree of variability. The coefficient of variation of rainfall for the Rewa district is 44.62 per cent.[6]

The onset of monsoon is expected by 2nd and 3rd week of June and recession by the end of September The downpour is erratic during September. In some years the recession is in first or Second week of September. If it happens during first week, the Kharif and Rabi crops are considerably damaged. The rains during third and fourth week of September are considered vital from the point of view of achieving greater production of Rabi and Kharif crops.

Ceasing and onset behaviour of rains, therefore creates uncertainty in the agricultural operations and production of this area. Climatic data of Rewa as recorded at Dry Farming Research Sub-Centre Rewa for the year 1971 to 1976 is given in Appendix Table 2 and 3

Most of the rain is received during July and August. From the rainfall and rainy days data, it seems that 25th to 38 weeks (15th June to third week of September) may be considered to be fairly reliable periods of rains.

Winter rainy days distribution pattern does not show any clear tendency during 8 years of studies.

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6 Inter District Comparison of Agricultural Development in Madhya Pradesh: Agro-Economic Research Centre for M.P. J.N.K.V.V., Jabalpur Table 3.2 page 31.

conspicuous by its absence and what goes by the name of Sigaon there is a very sandy, inferior soil. Domat in Teonther tahsil is a mixture of sand and clay. There are large areas of dark soil called Mair or Matiyar in Teonther tahsil. Refuse soils in the district are known as Bhata or Bharra, which are very red poor gravel soils.

3.6 Agricultural Situation

3.6.1 Land Utilization

The total geographical area of the district is 15,54,259 acres out of which net area sown was 8,89,095 acres i.e. 57.08 per cent. Area sown more than once was 165,557 acres which was 18.66 per cent of net area sown.

Area under the forest was 1,63,086 acres i.e. 10.49 per cent of the total area as compared to 32.20 per cent area under forest in the State as a whole.

About 16 per cent of the total geographical area in the district was not available for cultivation. Only 3.02 per cent was culturable waste. Another 5.40 per cent calturable land was under pastures, tree, crops and groves. The area under fallow land was 7.79 per cent which included 4.45 current fallow and 3.34 per cent old fallow land.

3.6.2 Operational Holdings

According to available statistics there were 1,04,700 operational holdings having an area of 11,71,995 acres in the district. The average size of an operational holding in the district was 11.19 acres which was

3.6.4 Cropping Pattern

The district of Rewa falls in Wheat-Rice Zone of the State and these two crops occupy 42.06 per cent of the total cropped area of the district. Kodon-Kutki, Linseed, Jowar Barley and Tur are other crops of importance occupying 16.15, 9.28, 4.65, 3.10 and 3.80 per Cent of the total cropped area respectively.

Among Rabi crops Gram, and Lentil occupied 12.30 and 2.39 per cent area respectively.

Of the different crops Wheat, Paddy Barley, Gram, fruits & Vegetables, spices, Sugarcane and Tobacco are the main irrigated crops which together share 97.59 per cent of the total irrigated area. Wheat alone occupied 85.25 per cent of the gross irrigated area. Though only 19.34 per cent of total area under the crop is irrigated.

3.6.5 Production Variability

High production variability from year to year is the main characteristic of all dry-land farming areas. This is probably more pronounced in M.P. due to other associated features. The production and acreage variability of some selected crops in Rewa district is presented below:-

Table 3.11 Coefficient of Variation in Area and Production of Important crops in Rewa district (1956-57 to 1976-77)

Crop	Production		Acreage	
1. Rice	39.38	Per cent	9.89	per cent
2. Jowar	31.62	"	16.31	"
3. Kodon-Kutki	39.95	"	9.65	"
4. Tur	44.27	%	10.68	"
5. Wheat	46.24	"	27.28	"
6. Gram	27.80	"	18.93	"
7. Barley	52.87	"	23.44	"
8. Linseed	50.45	"	22.23	"

The table shows that in Rewa district variability in the production of crops is much higher than the variability in their area.

3.6.6 Monsoon Rains and Yields of Kharif Crops[8]

A study on 'Effect of Monsoon Rains on Yield of Kharif Crops in M.P. was conducted. It's results pertaining to Rewa district were as given below:

Table 3.12 Average and Coefficient of Rainfall in Rewa District

Period	Weeks	Days of the year	Two weeks average and C.V. of Rainfall	
			Average (m.m.)	C.V. (Per cent)
I	27 and 28	July 2 to 15	162	80
II	29 and 30	July 16 to 29	125	75
III	31 and 32	July 30 to Aug.12	169	65
IV	33 and 34	Aug 13 to 26	151	72
V	35 and 36	Aug 27 to Sept 9	124	85
VI	37 and 38	Sept 10 to 23	85	84
VII	39 and 40	Sept 24 to Oct 7	36	138

Rice - In Rewa yield of rice was significantly correlated with the rains in period III and the correlations approached significance level for period I and VI. Rains in period VII influenced the yield of Rice. Computed lines of regression are given below:

8 'Effect of Monsoon Rains on Yield of Kharif Crops in Madhya Pradesh By Lal Chand, R.B.Gour, N.G. Paradkar and S.K.Jain. Agricultural Situation in India, June 1980, Vol XXXV No.3.

$Y = 225.155^{*} + 0.510\ x_3 + 0.718\ x_6 + 0.290\ x_1$

$R = 0.5898$

$Y = 245.689^{*} + \overline{0.614}\ x_3 + \overline{0.814}\ x_6$

$R = 0.5777$

Note:- Coefficient^{s} bearing a star(*) or a bar (-) on them indicate their significance or approaching significance at 5 per cent level, respectively.

MAIZE

Yield of maize was significantly correlated with the rains in period V in Rewa.

$Y = 645.550^{*} + 2.455\ x_5$

$R = 0.5962$

KODON-KUTKI

It's yield was significantly correlated with the rains in VI period in Rewa.

$Y = 197.069^{*} + 1.200^{*}\ x_6$

$R = 0.7476$

URD

The correlation of yield of Urd with rainfall in Rewa was significant for period I and was approaching significance for period IV.

$Y = 121.631^{*} + 0.\overline{328}\ x_1 + 0.157\ x_4$

$R = 0.5558$

MOONG & MOTH

The correlation between yield of moong and moth and rainfall of Rewa were significant for period I

$Y = 127.332^{*} + 0.383^{*}\ x_1$

$R = 0.5993$

PROJECT AREA

3.7.1 Situation

The Integrated Dry Land Agriculture Development Project, Rewa, lies between 81°.10' to 81°.17' east longitude and 24°.30' to 24°.35' north letitude towards north east of Rewa city. Location of the Project area is shown in Figure 3.

3.7.2. Coverage

In July 1971 when the Project was initiated it covered 15 villages of Ban Kuiyan Revenue Circle covering 8,747 acres of cultivated area. In 1972-73 the coverage of the Project was extended to 41 villages since 26 new villages were included. Total area covered became 19,827 acres. Again in 1977-78, eleven more villages were included in the Project area and the total cultivated area covered became 23,830 acres.

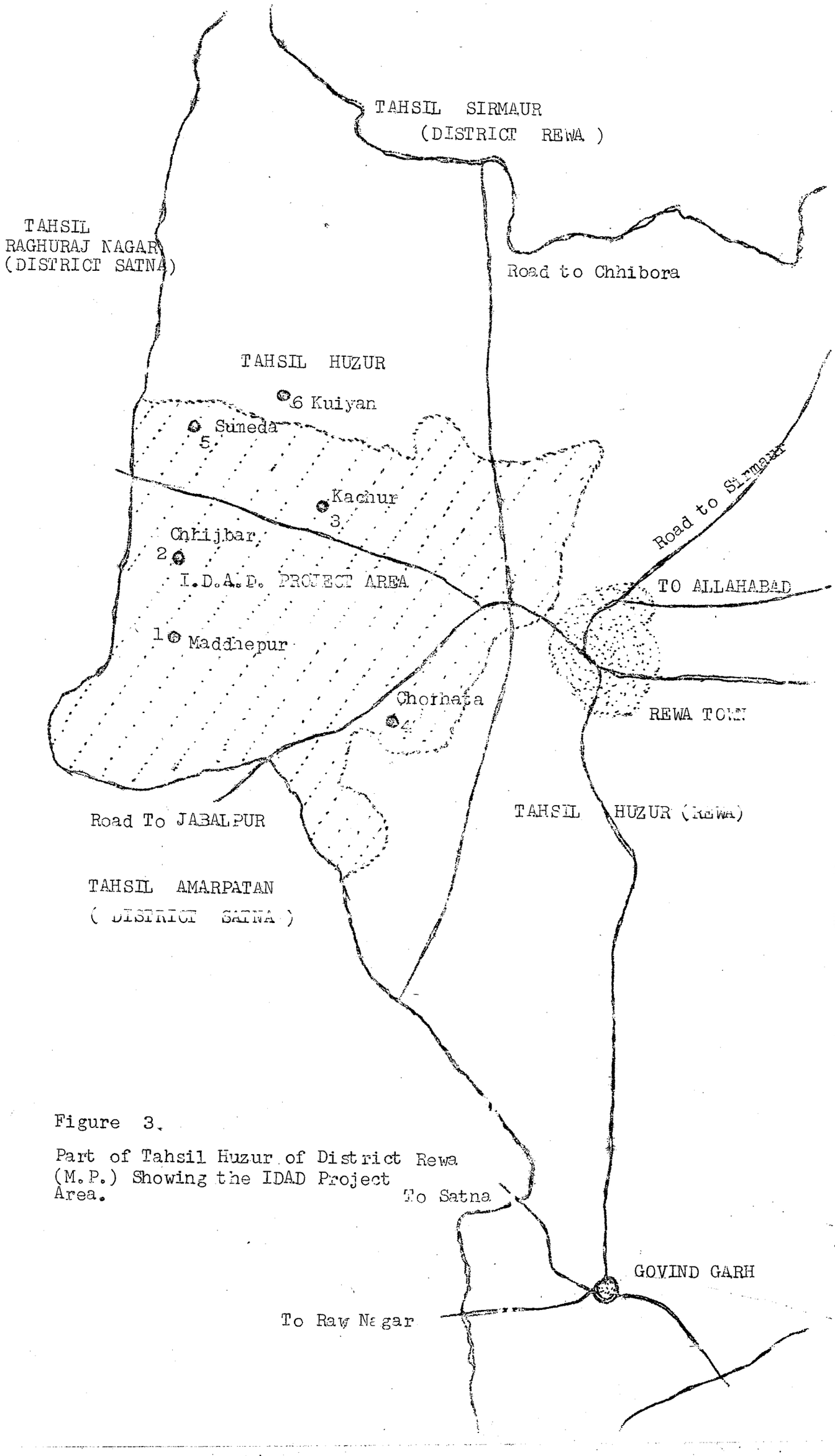

Figure 3.

Part of Tahsil Huzur of District Rewa (M.P.) Showing the IDAD Project Area.

II SELECTED HOUSEHOLDS

The selection of sample households was done on the basis of their participation in the IDAD programmes and therefore at the very outset two categories were formed, viz. 'Adopters' and ' Non-Adpotors. The definition of adopters and non-adopters and the procedure of their selection has already been described in the methodology given in the first chapter. Village wise distribution of sample farmers in different participation categories has been given in Table 1.1 on page 11. In the present chapter the socio-economic characteristics of the selected cultivating households has been discussed.

4.1 Family Size

Total population of all the sample households was 585 and the overall average size of family was 5.85. The average size of family among the participants was 6.06 and among non-participant 5.55.

4.2 Economically Active Members

All men, women and children who ware actually engaged in some productive work were treated as 'Workers' or 'economically active members' In the total sample nearly 60 per cent of the family members were economically active. Their percentage among participant families was 59.78 per cent and among non-participants 59.91 per cent. The average number of economically active members per family was 3.62 among participants and 3.32 among non-participants

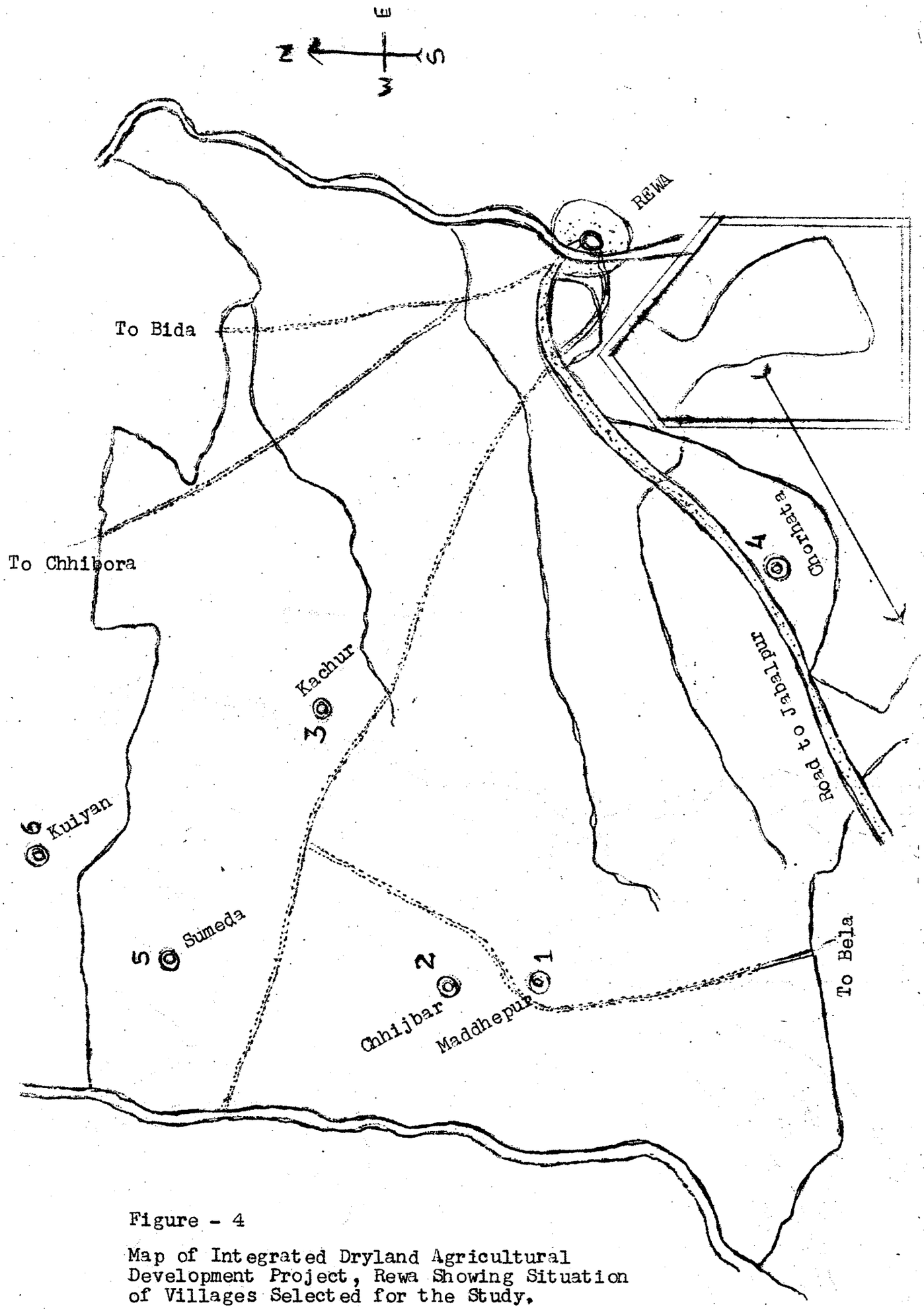

Figure - 4

Map of Integrated Dryland Agricultural Development Project, Rewa Showing Situation of Villages Selected for the Study.

Table 4.4 Family size and Number of workers of Selected House Holds

	Particulars	Selected Households		
		Participants	Non-Participants	Total sample
1.	No. of Households	60	40	100
2.	Total Family members	363	222	585
3.	Average Size of Family	6.06	5.55	5.85
4.	Total No.of workers	217	133	350
5.	Average No.of workers per family	3.62	3.32	3.50
6.	Percentage of workers to total family members	59.78	59.91	59.83
7.	No. of Farm workers	195	125	320
8.	Percentage of Farm workers to total No.of workers	89.86	93.98	91.43
9.	No. of Non-Farm workers	22	8	30
10.	Percentage of Non-Farm workers to Total No.of workers	10.14	6.02	8.57

The percentage of farm workers was higher among non-participants(93.98 per cent) as compared to participants(89.86 per cent) while, the percentage of non-farm workers was higher among participants(10.14 per cent). The percentage of non-farm workers among non-participants was 6.02 per cent.

4.3 Literacy and Years of Schooling

Table 4.5 gives the literacy percentage and average years of schooling of the selected households. The over-all

Table 4.5 Literacy among Selected Households.

Particulars	Selected Households		Total sample
	Participants	Non-Participants	
1. Total Family members	363	222	585
2. No.of Literates	147	78	225
3. Literacy Percentage	40.49	35.13	38.46
4. Average Years of Schooling	6.63	5.91	6.46

Literacy was 38.46 per cent with an average 6 years of schooling. Literacy among participant families was a bit higher (5.38 per cent) and similar was the position of years of schooling.

4.4 Operated Holdings

Since the selection of participant farmers was done on the basis of their distribution in different participation categories their distribution in holding size groups was neither equal nor proportionate to the number of cultivators of each group in the universe. The distribution of sample farmers in holding size groups of below 5 acres, 5 to 10 acres and 10 and above is given in Table 4.6.

Table 4.6 Distribution of sample Households in different Holding Size Groups.

Size-Group (Acres)	No. of Selected Farmers		Total Sample
	Participants	Non-Participants	
Below 5 ac. (small)	8	12	20
5 - 10 ac. (medium)	23	20	43
10 ac.and above (large)	29	8	37
Total	60	40	100

It reveals that 20 per cent of the sample farmers had less than 5 acres and 37 per cent had 10 acres or more than that. Highest concentration i.e. 43 per cent was in the second group ranging from 5 acres to 10 acres.

4.5 Land Ownership

Particulars of ownership of land among the selected households is given in Table 4.7 Households cultivating entirely leased in land were none and the number of such households who had leased in some part of their operated holding were also few . Among the participant/s leased in land formed only 5.02 per cent of their operated area while in case of non-particpat farmer/s it was 9.29 per cent.

Table 4.7 Owned and Operated Area of Sample Farmers

Category	Owned land (Acres)	Leased in Land (Acres)	Total Operated Area (Acres)	Average Farm Size (Acres)
Participant	596.80 (94.98)	31.50 (5.02)	628.30 (100.00)	10.47
Non-Participants	293.13 (90.71)	30.00 (9.29)	323.13 (100.00)	8.07
All Farmers	889.93	61.50	951.43	9.51

Note - Figures in paranthesis are percentages to total operated area in each category.

4.6 Irrigation

Wells and tube wells were the major source of irrigation on the sample farms. Thirty nine per cent farms had some irrigation facility either owned or hired and

21.38 per cent of their operated area was irrigated. The percentage of irrigated area on participant farms was 29.75 per cent and average irrigated area per farm was 3.12 acres. The non-participant farms had only 5.11 per cent irrigated area and the average irrigated area on these farms was only 0.41 acres.

Table 4.8 Irrigated Area on Sample Farms

Category	No.of Farms	No.of farms having Irrigation Facility	Area of the Farms Total Operated	Irrigated	Percentage of Irrigated Area to total Operated Area	Average Irrigated Area per farm (Acres)
Participant	60	34	628.30	186.90	29.75	3.12
Non-Participant	40	5	323.13	16.50	5.11	0.41
All Farms	100	39	951.43	203.40	21.38	2.03

4.7 Farm Assets

The average value of farm assets was Rs.26634/- per farm in the overall sample. It was higher (Rs.36650/-) in case of participants than the non-participants (Rs.17602/-) Table 4.9. The dominant asset in all cases was ofcourse real estate which mainly comprised land and wells. Drought animals were the most valuable livestock asset. Milch cattle were secondary Agricultural equipment and machinery occupied third position in the assets structure. It included mostly the traditional implements and equipment. Only in few case irrigation equipment, which may be categorised as

modern were possessed by the farmers. Itemwise value of farm asset per acre on selected farms is given in Table 4.10.

Table 4.9 Value of Farm Assets Per Farm

Category	Participants		Non-Participants		Value Per Farm	Percentage
	Value per farm	Percentage	Value Per farm	Percentage		
Real Estate	27581	84.40	15669	89.00	22817	85.66
Agri-Equipment and Machinery	1536	4.80	286	1.62	1036	3.89
Livestock	3533	10.80	1647	9.38	2780	10.45
Total	38650	100.00	17602	100.00	26634	100.00

Table 4.10 Itemwise Value of Farm Assets Per Acre on Selected Farms.

Items	Participants		Non-Participant		All Farms	
	Value per Acre	Percentage	Value per Acre	Percentage	Value per Ac.	percentage
Agri.Land	2347	75.23	1887	86.52	2191	7836
Well and Tube well	239	7.66	51	2.34	175	6.26
Farm House and Cattle Shed	49	1.57	3	0.14	33	1.18
Real Estate	2635	84.46	1941	89.00	2399	85.80
Agri.Implement and Equipment	53	1.70	23	1.05	42	1.50
Irrigation Equipment	94	3.01	13	0.60	67	2.40
Agri.Equipment and Machinery	147	4.71	36	1.65	109	3.90
Drought Animals	212	6.79	140	6.42	183	6.55
Milch Animals	107	3.43	57	2.61	90	3.22
Others	19	0.61	7	0.32	15	0.53
Live stock	338	10.83	204	9.35	288	10.30
Total	3120	100	2181	100	2796	100

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CHAPTER V

ADOPTION OF DRYLAND AGRICULTURE TECHNOLOGY

5.1 Introduction

In this chapter an attempt has been made to evaluate the extent of adoption of dryland agriculture technology at the micro-level. It includes dry farming practices followed by the participant farmers. These practices in their totality constitute the level of technology the farmers have been able to reach, thus, indicating the gap between the expected and the actual. It also gives an insight into the complexities of dry farm technology at the operational level.

5.2 Selected Participants

As already mentioned in the first chapter(under sampling)the selection of participant farmers was done on the basis of their participation in the I D A D programmes. They were categorised into different categories representing participation in one programme, two programmes, three and likewese combinations of four, five six, seven or eight programmes (Table 5.1)

It is evident that the percentage of participant farmers adopting three to six programmes in combination was about 80 in the population as well as the sample. Participants of higher programme combinations i.e. seven or eight programmes as well as participants of fewer programme combinations i.e. one or two grogrammes were 10 per cent each (Table 5.1)

Table 5.1 Distribution of Participant Farmers According to Participation in Number of Programmes

Particulars	Participation in Number of Programmes								Total Participant Farmers
	One	Two	Three	Four	Five	Six	Seven	Eight	
Total Participant Farmers in Sample Villages	3	13	50	26	39	30	16	5	182
Perecentage	1.64	7.14	27.48	14.29	21.43	16.49	8.79	2.74	100.00
Sample Participant Farmers	2	4	19	9	11	9	5	1	60
Percentage	3.33	6.66	31.68	15.00	18.34	15.00	8.33	1.66	100.00

5.3 Participation under Individual Programmes

Apart from the combinations of various programmes participation in individual programmes varied considerably. Participation in some of the programmes e.g. use of inputs and training was as high as 95 per cent, while under other programmes e.g. land improvement and water harvesting the participation was less than five per cent (Table 5.2) Looking to these variations it is worth while to examine the situation of each programme individually.

I Use of Inputs -

Following items were included under this programme -

a) Use of recommended seed-of recommended crop/s and crop varieties.

b) Use of fertilizers.

c) Use of insecticides

d) Agronomical practices.

Table 5.2 Number of sample farmers Participating under each Programme

I.D.A.D Programmes		Participating Sample Farmers	
Main Item	Sub-Item	Number	Percentage to total of 60 Selected Participant Farmers
I Use of Inputs	(A) Recommended Seeds -		
	(i) Recommended Crops	7	11.66
	(ii) Recommended Varieties	57	95.00
	(B) Fertilizers	52	86.66
	(C) Insecticides	16	26.66
	(D) Agronomical Practices	10	16.66
III Soil and water Conservation	(a) Land Improvement	1	1.66
	(b) Water Harvesting	2	3.33
	(c) Deep Ploughing	12	20.00
III Agricultural Demonstrations		20	33.33
IV Training		57	95.00
V Use of Improved Agricultural Implements and Plant Protection Equipment		24	40.00
VI Urea Spray		12	20.00
VII Minor Irrigation		16	26.66
VIII Live Stock Improvement		11	18.33

(a) Use of recommended seeds :- Recommended crops

Some new crops such as groundnut, soybean, sunflower, laha etc. which were not grown in the traditional cropping pattern were recommended on the basis of research findings of Dry Land Agricultural Research. Efforts were made to

b) Use of Fertilizers

Use of fertilizers was common. Out of 60 farmers 52 applied fertilizers. However application of recommended doses of fertilizers and also the recommended methods of placement were rarely followed in right earnest.

Use of Insecticides

Use of insecticides and pesticides was confined to 25 per cent of the farmers. The factors restricting their wider application were lack of knowledge, equipment and availability. Cost factor was also a major constraint.

d) Agronomical Practices

An important phase of this programme is adoption of improved agronomical practices, because in the dry land agriculture such agronomical practices which improve conservation of soil moisture and its utmost utilisation in crop production have their own importance and therefore, such practices were recommended and popularised by the extension agencies. However, the adoption of such practices was not very encouraging. Most of them were bound to their traditional practices. Only 10 sample farmers adopted some recommended agronomical practices. Twelve accepted their awareness and the rest 38 expressed unawareness about such practices. (Table 5.3)

II Soil and Water Conservation

(a) Land Improvement

Out of the 60 participant farms land improvement was done on only one farm (Table 5.4) and the area improved was only 9.38 per cent of total owned cultivated area of that farm. It is evident that this item did not received popularity either on account of it's lesser necessity or

poor extension eduction. Out of the remaining 59 participant farmers not participating under this item of I D A D Programme 25 expressed their ignorance of land improvement techniques and their benefits.

Table 5.4 Participation of Sample Participant Farmers in I D A D Programmes

Programme	Sample Participant Farmers								
	Adopters	Non-Adoptors			Reasons for Non-Adoption				
		Aware	Unaware	Total	High Cost	Risk	Lack of facilities	Not Convinced	No Reason
II Soil & water Conservation									
a Land Improvement	1	34	25	59	21	-	21	-	17
b Water Harvesting	2	22	36	58	20	-	18	-	20
c Deep Summer Ploughing	12	44	4	48	9	-	17	-	22
III Agricultural Demonstration	20	24	6	30	-	-	-	-	30
IV Training	57	3	-	-	-	-	-	-	3

b) Water Harvesting

The recommended water harvesting devices involved two types of work viz. (i) Community works (2) Private works Community works were taken up by the Department of Agriculture/IDAD Project and therefore, participation of farmers in this programme was confined to the utilisation of water available from these works. Private work required interest, initiative and investment of the farmer. Out of the 60 participant farmers only two had adopted some water harvesting devise of the

second catetory i.e. private works. Both constructed Bundhies and Jalmohra (Field Bund and waste weir) to utilise the run-off water.

This is another item of the Programme which was not adopted by the vast majority of farmers. The constraints in adoption of this programme were lack of knowledge, fragmented holdings/ and the high initial cost.

c) Deep Summer Ploughing

Deep summer ploughing is also a recommended practice for dry farming areas. It enables the preservation of larger amount of moisture anabling successful germination of Rabi crops grown after kharif. Percentage of total cultivated area ploughed deep in the summer was taken as an indicator of the adoption of this practice. Out of the 60 participant farmers only 12 practiced deep summer ploughing. Their distribution in different holding size groups of small, medium and large was, 1,2 and 9 respectively. Of the remaining 48 farmers forty four were awere about the benefits of this practice, while four were quite unaware. The important constraint in the adoption of this practice was the use of iron mould board plough. Farmers expressed two difficulties in the use of mould board plough (i) poor draft power of their farm animals and (ii) initial financial out lay. They were also reluctant in taking financial help in this regard from Project, because they did not find any direct benefit to the crop and were not hundred per cent sure of the benefits to the succeding crop.

III Agricultural Demonstrations

Laying out agricultural demonstrations on the farmers fields is one of the methods of popularising the recommended technology. In the I D A D Project area several demonstrations

of line-sowing urea spray, crop rotations and other techniques of dry land farming were laid. The participant farms on which demonstrations were laid numbered 20 i.e. 33.33 per cent of the total farms.

IV Train-ing

Training in recommended methods of farming is another approach of extension. Of the sixty, participant farmers 57 joined the training programme.

Demonstrations and training are extension techniques. Participation in these programmes educates the farmers regarding the new techniques and motivates them to adopt the recommended technology. Thus participation in demonstration and training does not mean real adoption until the farmers do not actually follow and continue the practices. Therefore, for our further study of the level of adoption these two programmes i.e. demonstration and training have not been taken into consideration.

V) Use of Improved Agricultural Implements

Use of improved agricultural implements suitable for the area was also advised. Various bullock drawn tillage implements, specially designed seed and fertilizer placement equipments were popularised by the I D A D Project staff through demonstrations and provision of subsidy on their purchases. Twenty four sample farmers purchased one or the other improved agricultural implement, however the largest number was of the soil turning iron plough which were rarely used by the farmers (as already explained under deep summer ploughings) Some of the farmers had also purchased dusters or sprayers and were using them. Bullock drawn seed and fertilizer placement equipment was still in fancy and none of the sample

participant farmer had purchased it.

VI) Urea Spray

Foliar spray of urea is a new technique. It has special significance in the dry land agriculture as it does not require much water and also the irrigation which is a must after top dressing (a method of fertilizer application in the standing crop). Twleve farmers (20 per cent) had practised urea spray. Fifty per cent of the farmers expressed their unawareness about this practice and a lagge number expressed difficulty of facilities or the proper equipment required for the purpose.

VII) Minor Irrigation

Increasing irrigation through maximum utilisation of ground water is another important item of I D A D Programme. It includes sinking of tube wells, new cavity wells, renovation of old wells and utilisation of electric or diesel pumps Sixteen participant farmers who formed 26.66 per cent participated in this programme (Table 5.5)

VIII) Livestock Improvement

Keeping cattle along with agriculture is a common practice. However, little attention was paid to particular breed for specific purpose, therefore, quality of cattle remained poor and uneconomic. Thus inorder to supplement the agricultural imcome, popularising quality good milch animals suitable for the tract was included in the I D A D Programme. Farmers were not only given financial assistance to purchase good milch animals but the Project officials also arranged for such purchases. Eleven sample farmers (10.33 Per cent) participated in the programme (Table 5.5)

Table 5.5 Participation of Sample participant Farmers in I D A D Programmes

Programmes	Sample Participant Farmers				Reasons for Non-Adoption				
	Adopters	Aware	Unaware	Total	High cost	Risk of failities	Lack of Conv-inced	Not	No Reason
V) Agricultural Implements & Plant Protection Equipment	24	20	12	32	18	-	10	-	4
VI) Urea Spray	12	18	30	48	3	-	38	-	7
VII) Minor Irrigation	16	44	-	44	9	-	-	-	35
VIII) Live stock Improvement	11	49	-	49	11	9	18	-	11

5.4 Measurement of Adoption or Participation Level

In addition to this i.e. the study of participation in individual programmes it is the objective of this study to measure if possible the extent or level of adoption of the over all programme and therefore, it was felt necessary to evolve some measure of adoption. After a through study of the I D A D programme and it's performance in the field twelve indicators were selected for which data could be computed to construct the adoption index. The indicators selected for the purpose are following.

5.4.1 Selected Indicators of Adoption

Programme	Selected Indicator	
	S.No	Particulars
1 Use of Irputs - A Seed		
a) Recommended Crops	1.	Percentage of area under new (recommended) crops to total cropped area.

factors responsible for different levels of adoption it is necessary first to measure the level of adoption. As such an index of adoption has been attempted.

At the time of survey for this study the I.D.A.D Programme had been in operation in the area for 6 years and as such atleast 10 per cent of the farmers must have by then reached the highest level of adoption (of the indicators chosen for Adoption Index) under the constraints of existing natural conditions of soil and climate, infra-structure and technology. The remaining 90 per cent could be expected or motivated to reach that level by removing the constraints-if possible-because of which they had remined behind the top 10 per cent. As such the mean achievement of the top 10 per cent participant farmers in respect of each of the 12 selected indicators was computed separately and was given a weight equal to 100. On the basis of this mean equal to 100 taken as base achievement of each participant farmer for each of the selected indicator was converted into index. These indices of all the twelve indicators for each were pooled separately and again the mean of the top 10 per cent was given a weight equal to 100. On the basis of this composite average index of top ten per cent participant farmers taken as base equal to 100 participation or adoption index was prepared for each participant sample farm.

5.4.3. Level of Adoption

Based on the level of adoption index all the participant farmers were divided into three categories viz. low, medium and high level of participation or adoption. The index range of each category was as given below -

Adoption Category	Adoption Indices Range
1) Low	Below 33.33
2) Medium	33.33 to 66.67
3) High	66.67 & above

The over all situation of adoption as given in table 5.6 reveals that 53.33 per cent of the participant sample farmers belonged to the category of 'low adoption' Thirty five per cent were in the middle group of 'medium adoption' and the percentage of cases representing the high level of adoption category was only 11.67

5.5 Factors Associated with the Level of Adoption

Having classified the farms according to their level of adoption, an attempt has also been made to study the factors associated with the difference in the level of adoption. Through various factors-socio-economic, humam and personal are responsible for these variations and numerous studies have been conducted to ascertain the association of these factors with the adoption of new technology, here only few of them have been studied.

5.5.1 Farm size and Adoption

It is genefally argued that the dry-land agriculture technology is neutral to scale, still due to technical and economic uncertainties, inherent, in the adoption of new practices adoption is generally positively related with the farm size. Economic resources and capacity to bear risk increase with the farm size. Thus it is expected that the adoption of dry farm agriculture technology would be faster and intense on large farms. Table 5.7 reveals that among small farms 50 per cent had low adoption index and the rest

Table 5.6 Programmewise Distribution of Participant Sample Farmers in Different Adoption/Participation Categories

Selected Indicators for Different Programmes	Average of top 10% taken as Base = 100	No of Participating Farmers in Each Participation or Adoption Category		
		Low	Medium	High
1) Percentage of area under new (recommended) crops to total cropped area on the farm	5.19 %	1	2	4
2) Percentage of area under recommended varieties to total area of those crops	89.71 %	5	26	26
3) Quantity of fertilizers used per acre	0.67 kg.	16	23	13
4) Value of pesticide used per acre	Rs. 5.33	7	6	3
5) Percentage of area under recommended agronomical practices to total area of those crops for which the practices were recommended	38.17 %	5	-	5
6) Percentage of owned cultivated area [illegible] in which some land improvement was done	9.38 %	-	-	1
7) Percentage of owned cultivated area brought under water harvasting practice	42.22 %	-	-	2
8) Percentage of total cultivated area in which deep ploughing was done	72.32 %	5	3	4
9) Per acre capital investment on improved implement (total owned land)	Rs. 184/-	13	8	3
10) Percentage of total cropped area in which urea was sprayed	42.75 %	3	6	3
11) Per acre investment on minor irrigation (total owned land)	Rs. 2000/-	5	6	5
12) Per acre investment on live stock (milch cattle of recommended breeds)	Rs. 2230/-	-	3	8
Composite Index (Average of top 10 % taken as Base = 100	593.22	32	21	7
Percentage of Participant sample farmers in each Participation or adoption Category		53.33	35.00	11.67

half were under the medium category, while none had high level of adoption. Among large farms percentages of farms under low, medium and high level of adoption were 51.71, 27.58 and 20.65. Among the medium size farms the percentage of medium level adoptors was 39.13 while low level adopters were 56.53 percent and high level adoption 4.34 per-cent.

The mean adoption index increased with the increase in the size of farm. It was 33.65, 36.25 and 57.62 on small, medium and large farms rewpectively (Table 5.7)

5.5.2 DDEducationnal Level of Farmers and Adoption

A possitive association between education and adoption of new practices has been established by several studies. The result of the present study also indicates a positive relationship between education and adoption of dry land agriculture technology. The adoption index rises wi with the rise in educational level of the farmers (Table 5.8)

5.5.3 Off-farm Income and Adoption

The off-farm cash income was also taken into account. Assuming that off-farm income would help the farmers in investment on adoption of new technology or provide some base to bear risk. It's relationship with the level of adoption was studied. Only 20 sample farmers had some off-farm income which ranged from few hundred rupees to Rs. 5000/-

Table 5.9 reveals that higher the off-farm income grator was the adoption index. Mean adoption index of the farmers in lowest income group (uptoRs.1000) was 23.17 which increased to 46.80 in the third or the biggest off-farm income group In the intermediary group of Rs. 2000 the meat adoption index was also in between i.e. 29.72.

Table 5.7 Distribution of Participant farmers in Different Holding Size groups & Adoption Categories

Holding Size Groups (Acres)	Adoption or Participation Categories (participation Index)									All Participant Farmers		
	Low (upto 33.33)			Medium (33.33 to 66.67)			High (Over 66.67)					
	No.	Percentage	Mean Index	No.	Percentage	Mean Index	No.	Percen-tage	Mean Index	No.	Percentage	Mean Index
Small (Below 5 acres)	4	50.00	15.51	4	50.00	51.79	-	-	-	8	100.00	33.65
Medium (5 to 10 acres)	13	56.53	19.86	9	39.13	50.53	1	4.34	120.19	23	100.00	36.25
Large (10 acres & above)	15	51.74	23.64	8	27.58	52.00	6	20.68	92.43	29	100.00	57.62
All Participant Farmers	32	53.33	21.21	21	35.00	51.33	7	11.67	96.50	60	100.00	40.47

Table 5.8 Distribution of Participant Farmers According to Difference in Educational Level and Adoption Levels

Educational Level	Adoption or Participation categories									All Participant Farmers			
	Low			Medium			High						
	No.	P.C. %	Mean Index	No.	P.C. %	Mean Index	No.	P.C. %	Mean Index	No.	P.C. %	Mean Index	Total All Farm
Illiterate	19	59.37	20.96	11	34.37	48.65	2	6.26	99.64	32	100.00	35.40	53.34
Upto-Primary	7	58.34	21.30	4	33.33	52.53	1	8.33	80.81	12	100.00	39.27	20.00
Junior High-School (8th)	3	42.86	22.49	2	28.57	48.09	2	28.57	82.98	7	100.00	47.09	11.66
Higher Secondary or above	3	33.33	14.48	4	44.45	55.41	2	22.22	114.72	9	100.00	54.94	15.00
All Participant Farms	32	53.34	21.21	21	35.00	51.33	7	11.66	96.50	60	100.00	40.87	100.00

Table 5.9 Distribution of Participant Farmers in Non-Farm Income Groups and Adoption Categories

Non-Farm Income Groups	Adoption Categories (Participation Index)			All
	Low (upto 33.33)	Medium (33.33 to 66.67)	High (over 66.67)	
Upto 1000	4 (15.35)	1 (54.48)	-	5 (23.17)
1000-2000	5 (22.35)	1 (66.55)	-	6 (29.72)
2000-5000	(6 (23.83)	1 (64.11)	2 (107.05)	(46.80)
Farmers having Non-Farm Income	15 (21.07)	3 (61.71)	2 (107.05)	20 (35.76)
Farmers having No Non-farm Income	17 (21.33)	18 (49.60)	5 (92.28)	40 (42.92)
All Participant Farmers	32 (21.21)	21 (51.33)	7 (96.50)	60 (40.47)

Figures in parenthesis are mean adoption index

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C H A P T E R VI

IMPACT OF DRY LAND AGRICULTURE TECHNOLOGY

6.1 Approach

In this chapter the impact of dryland agricultural technology on the sample farms has been discussed. The term impact has been used in the restricted sense of economic impact so as to reflect the additional benefits in terms of increased income and employment together with the organisational changes in enterprise/ combination, cropping pattern and intensity of cropping.

The approach therefore is to study the changes in two different set of conditions i.e. comparison of farms adopting recommended technology called adopters and the traditional farmers i.e. non-adptors.

6.2 Method of Study

The adoption of dry land agricultural technology envisaged certain changes in farm structure and economy of the participant farms. The changes studied are of two categories-

1) Changes in Farming Practices

   1) Cropping pattern
   2) Intensity of cropping
   3) Average yields

2) Changes in Farm Economy

   1) Farm Income
   2) Farm Employment
   3) Combination of enterprises particularly crop production and maintenance of milch animals.

The changes observed under each item have been discussed below-

6.3 Changes in Farming Practices

6.3. Cropping Pattern

The overall cropping pattern of the sample farmers was in conformity with the district cropping pattern that is/ it was basically cereal oriented. Cereals alone accounted for about 60 per cent of the total cropped area. The other important feature is the high percentage of mixed crops (cereals and pulses) which were grown on 30.65 per cent of the gross cropped area.

As regards the relationship between the level of adoption (of the recommended technology) and the cropping pattern it was observed that-as the farmers reach higher level of/ adoption production becomes less cereal and food crop oriented and the proportion of cash crops increases. The percentage of area under food crops (cereals & pulses) of low level participant farmers was 93.22 as compared to 87.19 in the category of high level participant farmers (Table 6.1)

Another markable difference was in the proportion of pulse crops. It was 1.81 per cent on the farms of lower category as compared to 8.75 per cent on high level participant farms. The proportion of vegetables, fodder crops and other cash crops was also higher on the farms of higher category.

An important feature of the traditional farming in fainfed areas is the practice of kharif fallowing and babi cropping. This practice is wide spread in the Semi-Arid Tropical (SAT) Region. (Table 6.2)

Table 6.2 Relative Importance of Kharif & rabi season crops on sample farms.

Category	Kharif		Rabi		Total	
	Area (acres)	P.C.	Area (acres)	P.C.	Area (acres)	P.C.
Participants	360.69	45.76	425.94 (Zaid 1.50 = 0.19%)	54.05	783.13	100.00
Non-Participants	145.50	42.10	200.10	57.90	345.60	100.00
All Farms	506.19	44.65	626.04 (Zaid 1.50 = 0.13)	55.22	1133.73	100.00

Table 6.1 Area Under Different Crops on Participant Farms Under Different Participation Categories

Crops	Participation Index	Low 33.33		Medium 33.33 to 66.67		High over 66.67		All Participant Farms	
		Area (acres)	P.C.	Area (acres)	P.C.	Area (acres)	P.C.	Area (acres)	P.C.
Rice		84.00	22.57	65.50	24.50	21.00	14.14	170.50	21.63
Jowar		1.00	0.27	2.00	0.75	9.00	6.06	12.00	1.52
Kodon		1.50	0.40	-	-	2.74	1.85	4.24	0.54
Jowar+Arhar		1.00	0.27	1.00	0.37	3.50	2.36	5.50	0.70
Kodon+Jowar+ Moong		4.00	1.08	-	-	4.00	2.69	8.00	1.02
Small Millets & Pulses		69.00	18.45	42.50	15.89	22.00	14.82	133.50	16.94
Other Pulses		2.50	0.67	1.00	0.37	4.00	2.69	7.50	0.95
Black Soybean		-	-	1.50	0.56	6.50	4.38	8.00	1.02
Groundnut		0.50	0.13	2.00	0.75	4.50	3.03	7.00	0.89
Til & Arhar		0.25	0.07	-	-	-	-	0.25	0.03
Kharif Vegetables		-	-	2.20	0.82	2.00	1.35	4.20	0.53
Kharif Total		163.75	44.00	117.70	44.01	79.24	53.37	360.69	45.77
Wheat		170.80	45.89	119.50	44.69	51.24	34.50	341.54	43.33
Barley		0.75	0.20	-	-	-	-	.75	0.10
Gram		2.00	0.54	3.00	1.12	2.50	1.68	7.50	0.95
Wheat & Gram		8.50	2.28	11.00	4.11	3.00	2.02	22.50	2.85
Lentil		2.25	0.60	1.50	0.56	-	-	3.75	0.48
Potato		0.15	0.04	-	-	0.50	0.34	0.65	0.08
Rape & Mustard		1.00	0.27	0.50	0.19	3.50	2.36	5.00	0.63
Linseed		22.50	6.05	12.50	4.67	5.00	3.37	40.00	5.08
Rabi Vegetables		0.50	0.13	1.50	0.56	1.50	1.01	3.50	0.44
Berseem		-	-	0.25	0.09	0.50	0.34	0.75	0.10
Linseed + Gram		-	-	-	-	-	-	-	-
Rabi Total		208.45	56.00	149.75	55.99	67.74	45.62	425.94	54.04
Zaid Vegetables		-	-	-	-	1.50	1.01	1.50	0.19
Total Crops		372.20	100.00	267.45	100.00	148.48	100.00	788.13	100.00

The important reason advanced for keeping more than 50 per cent of the area under fallow during kharif was that the crops planted during the first phase of the monsoon are exposed to the risk of drought in a prolonged mid-season dry spell and to water logging as well as increased disease incidence caused by continuous rains in the second phase of the monsoon when they are at the lowering or ripening stages. The farmers generally not awere of crop varieties and land management practices that could reduce these hazards of rainy season cropping-continued to follow the traditional practice of fallowing land in the monsoon season.

Inter-cropping is another important feature of traditional farming in SAT areas. The superiority of inter-cropping in terms of higher gross returns as well as higher and more evenly spread employment of labour as compared to sole cropping has been recorded by some economists. To the extent that inter-cropping is a strategy against weather induced risk the increase in irrigation facilities decreases the proportion of inter-cropped area. To certain extent the high yielding varieties and inter-cropping are not incompatible. HYV technology is a high cost techonology mainly suited to irrigated tracts where as inter-cropping is a distinct feature of SAT areas. The HYV's are not inter-cropped whereas the local varieties are generally inter-cropped.

The percentage of inter-cropped area on non-praticipant farms(51.52 per cent) was more than double the percentage of area on participant farms (21.50 per cent Table 6.3. It indicates that with the adoption of dry land agricultural technology the proportion of inter-cropping is decreasing.

Table 6.3 Importance of Crop Mixtures (Mixed Crops) in the cropping pattern of sample farms

Crop Category	Participants		Non-Participants		All Farms	
	Area	P.C.	Area	P.C.	Area	P.C.
Kharif						
Cereals	186.74	23.69	55.50	16.06	242.24	21.37
Pulses	15.50	1.97	2.00	0.58	17.50	1.54
Cereals & Pulses Mixed crops	147.00	18.65	88.00	25.46	235.00	20.73
Oilseeds	7.25	0.92	-	-	7.25	0.64
Other Crops	4.20	0.53	-	-	4.20	0.37
Total Khrif	360.69	45.76	145.50	42.10	506.19	44.65
Rabi						
Cereals	342.29	43.45	85.50	24.74	427.79	37.74
Pulses	11.25	1.43	4.50	1.30	15.75	1.39
Cereals & Pulses Mixed Crops	22.50	2.85	90.00	26.06	112.50	9.92
Pulses & Oil Seeds Mixed Crops	-	-	2.25	0.65	2.25	0.20
Oil Seeds	45.00	5.71	9.75	2.82	54.75	4.83
Other Crops	4.90	0.62	8.10	2.13	13.00	1.14
Total Rabi	425.94	54.05	200.10	57.90	626.04	55.22
Zaid Crops	1.50	0.19	-	-	1.50	0.13
Gross Cropped Area	788.13	100.00	345.60	100.00	1133.73	100.00

6.3.2 Intensity of Cropping

The index of the intensity of cropping reflects the relation between the net cultivated area and the area sown more than once. Low intensity of cropping is a

characteristic feature of rainfed farming, as most of the land in such areas is mono-cropped. The intensity of cropping in the area under study was 106.95 per cent on the non-participant farms and 125.54 per cent on the participant farms, revealing the fact that adoption of dry land agricultural technology has increased the intensity of cropping (Table 6.4) Further probe into the area and crop data revealed that the intensity of cropping increased with the increase in the level of adoption. Low level participant farms had 111.17 per cent intensity of cropping which increased to 133.14 per cent and 160.96 per cent on medium and high level participant farms respectively

Table 6.4 Intensity of Cropping on Sample Farms by Size Group and Level of Participation

Holding Size Group (Acres)	Non-Participant Farms	Participant farms			
		Participation Categories (Participation Index)			
		Low (Below 33.33)	Medium (33.33 to 66.67)	High (66.67 & above)	All Participant Farms
Small (Below 5)	109.89	151.43	147.50	-	148.74
Medium (5-10)	108.42	111.68	138.12	199.67	125.00
Large (10 & above)	104.99	108.15	128.60	158.12	123.63
All Farms	106.95	111.17	133.14	160.96	125.54

6.3.3 Composite Yield Index

Composite yield index of participant and non-participant farms showed markable difference. On non-participant farms the index of yield was 396 kg. per acre whereas on the participant farms it was 447 kg. per acre. On the participant farms the composite yield index increased with the level of participation. It was

lowest (417) on low level participant farms and the highest 526 on the high level participant farms (Table 6.5)

Table 6.5 Composite Yield Index on participant and Non-participant Farms (Kg. per acre)

Catagory	Participation category & Level of Participation			All Farms
	Low (Below 33.33)	Medium (33.33 to 66.67)	High (66.67 & above)	
Participant	417	466	526	447
Non- Participant	-	-	-	396

A comparison of average yields of paddy and wheat on participant farms under different participation categories further confirms the above conclusion.

Table 6.6 Average yields of Paddy & wheat on different Levels of participant Farms.

Crops	Level of Participation			All Participant Farms
	Low	Medium	High	
Paddy	337	453	532	400
Wheat	330	476	612	414

To observe the magnitude of relationship between level of participation index and the composite yield index, simple least square regression analysis was done. Following regression equation was fitted

$$Y = a + bx$$

Where Y stood for composite yield index and X for the participation index. The equation thus stood was

$$Y = 367.93 + 0.48 X$$

It shows that for every one point increase in the adoption index the yield increased by 0.48 X

6.4 Changes in Farm economy

6.4.1 Farm Income

6.4.1.1 Method of Calculation

The total farm income is d fined so as to include total farm family income from crop enterprises, cash income which is restricted to any cash income from sale of irrigation water, hiring out of bullocks and agricultural wages earned by family workers.

Total farm family income from crop enterprises includes net profit, estimated wages of family labour force attributable to crop enterprises and interest on working capital. Income from animal husbandry is restricted only to cash income from sale of milk and milk products minus the cash expenditure incurred an maintenance of milch animals. The by-products of this enterprise i.e. dung cakes and farm yard manure have not been taken into account. Similarly domestic consumption of milk has also not been included in the income as the feeds and fodder of farm produce fed to the animals has not been added in the expenditure on maintance.

6.4.1.2 Income per Farm

The farm income includes income from crop production and other farm income as explained above. Income on the participant farms (Rs.6760) was more than double the income of non-participant farms (Rs.3001½. Among the participant farms income increased with the size of farm and also with the level of participation/adoption. It was lowest i.e. Rs. 2212 per farm on small farms with low level of adoption. and the highest i.e. Rs. 13868 per farm on the lagge farms with high level of adoption. (Tabale 6.7)

Table 6.7 Average Farm Income Per Farm in Different Size Groups and Participation Categories of Sample Farms.

Size Group	Non-participants	Participant Farms in Different Participation Categories			All Participant Farms
		Low	Medium	High	
Small	2387	2212	3590	-	2901
Medium	3543	3616	4924	6396	4250
Large	5226	7711	10713	13868	9813
All Farms	3001	5361	6875	12800	6760

6.4.1.3 Income Per Acre

Farm income per acre of participant famrs was Rs. 647 as compared to Rs. 371 on the non-participant farms. Among the participants income per acre increased with the level of participation but it's relationship with the size group was not consistent. Among non-participants income per acre was lowest on big famrs (Rs.223/-) and highest on small farms (Rs.623/-) but among the participants it was lowest in the medium size group (Rs. 609/-) and highest on the small farms (Rs. 761/-) (Table 6.8)

Table 6.8 Farm Income Per Acre in Different Size Groups and Participation Categories of Sample Farms.

Size Groups	Non-Participant Farms	Participant Farms in Different Participation Categories			All Participant Farms
		Low	Medium	High	
Small	623	843	718	-	761
Medium	468	503	726	1066	609
Large	328	516	657	1016	652
All Farms	371	583	683	1019	647

As regards the inverse relationship in both the categories i.e. participants and non-participants it was perhaps due to higher intensity of cropping on smaller and medium famms.

From the above discussion it is clear that as a consequence of the adoption of dryland agriculture technology the farm income on participant farms has increased in both ways i.e. per farm and per acre basis. On an average the per farm income of participant farms was higher by 125.25 per cent and the income per acre was higher by 74.39 per cent over the non-participant farms.

6.4.1.4 Adoption Level and Farm Income

Table 6.9 furthur confirms the direct relationship of farm income (per acre) with the level of adoption. Farm income of the group having participation index below 30 was Rs. 534/- per acre and highest Rs. 1251/- per acre on farms having participation index above 100. In the intermediate groups the farm income increased with the level of participation.

Table 6.9 Mean Participation Index and Farm Income (per acre) in Different Participation Groups :-

Participation Group with Range of Participation index	No. of farms	Percentage	Mean Participation index	Farm Income (per acre)
I (Below 30)	30	50.00	20.00	534
II (30 - 50)	11	18.33	39.96	618
III (50 - 70)	12	20.00	59.06	775
IV (70 -100)	5	8.32	83.19	936
V (Above 100)	3	3.34	129.76	1251

A least square regression analysis was done with farm income (per acre) as a function of adoption level (quantified in the form of adoption/ participation Index) the estimated equation was :-

$$Y = -9.8 + 0.07 X$$

The value of b i.e. elasticity coefficient of participation index 0.07 is too low still it is positive indicating a positive influence on the value of 'Y' i.e. farm income (per acre)

6.4.15 Sources of Family Farm Income

It is observed that crop production was the major source of from income on all categories of farms. Income from crop production formed more than 90 per cent of total farm income in all categories except the high level participant farmers. Income from milk production formed about 8 to 9 per cent and the remaining part was contributed by other famm income.

On the high level participant farms income from crop production was 87.95 per cent. The share of other farm income was 4.34 per cent. Sale of irrigation water or hiring out of pumps were the major sources of 'other' farms income on high level participant famms. (Table 6.10 6.11)

6.4.2.1 Farm Employment

A comparison of average employment days on participant and non-participant farms showed a difference of 389 days per farm and 28 days per acre. Not only the employment days per farm were higher on participant farms but the difference increased with the size group. The increased employment days per farm were 156, 198 and 424 days respectively. (Table 6.12) However the increase in employment days per acre was inversely related to the size. It was lowest (30 days per acre) on large farms and highest (39 days per acre) on small farms.

Table 6.10 Sourcewise, Income Per Farm in Different Holding Size Groups of Participant Farms

Items	Small		Medium		Large		All Farms	
	Rs.	%	Rs.	%	Rs.	%	Rs.	%
Crop Production	2616/-	90.18	3841/-	90.98	8996/-	91.67	6170/-	91.27
Milk Production	285/-	9.82	409/-	9.62	681/-	6.94	524/-	7.75
Other Farm Income	-	-	-	-	136/-	1.39	66/-	0.98
Total Farm Income	2901	100.00	4250/-	100.00	9813/-	100.00	6760/-	100.00

Table 6.11 Income Per Farm from Different Sources in Different Participation Categories

Items	Low		Medium		HIGH		All farms	
	Rs.	%	Rs.	%	Rs.	%	Rs.	%
Crop Production	4984/-	92.97	6279/-	91.33	11257	87.95	6170/-	91.27
Live Stock	377/-	7.03	593/-	8.63	987/-	7.71	524/-	7.75
Other Farm Income	-	-	3/-	0.04	556/-	4.34	66/-	0.98
Total Farm Income	5361/-	100.00	6875/-	100.00	12800/-	100.00	6760/-	100.00

6.12 Farm Employment Days on Sample Farms by Size Group

Size Group	Farm Employment Days Perfarm			Farm employment Days Per Acre		
	Non-Participant	Participant	Difference	Non-Participant	Participant	Difference
Small	196	352	156	53	92	39
Medium	323	521	198	43	75	32
Large	561	985	424	35	65	30
All Farms	333	722	389	41	69	28

Similar comparison of farm employment days on non-participant farms and participant farms of different levels showed that the difference of farm employment days on participant and non-participant farms increased with the level of participation. The low level participant farms gave increased employment of 297 days per farm and 21 days per acre, it increased to 402 days per farm and 32 days per acre on medium level participant farms. On the high level participant farms the increased employemnt days were 766 days per farm and 47 days per acre (Table 6.13)

Table 6.13 Farm Employment Days on Sample Farms by Level of Participation

Categories	Employment days Per farm		Employment days per Acre	
Participation Categories	Employment days per farm	Increase over the non-participant Farms	Employment - days per acre	Increase over the Non-Participant Farms
Non-Participant	333	-	41	-
Participants				
(a) Low	630	297	62	21
(b) Medium	735	402	73	32
(c) High	1099	766	88	47
All Participant farms	722	389	69	28

6.4.2-2 Adoption Level and Farm Employment

A simple regression analysis of participation index and farm employment days per acre on participant farms gave the following equation-

$$Y = 8.53 + 0.42 \quad X$$

Where Y the dependent variable represented number of farm employment days per acre and X the explanatory variable was participation index. It showed that one point increase in participation index increased the farm employment by 0.42 days.

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CHAPTER VII

EVALUATION OF THE PROGRAMME

7.1 The programmes

The scheme of Intergrated Dry Land Agricultural Development aims at demonstrating the new dry land technology (as being developed by the Dry Land Research Centres of I.C.A.R.) on farmers fields. The various programmes being executed under this scheme include cultivation of drought resistant, short-duration and high yielding varieties of crops, soil conservation, land development including land shaping and land levelling, water harvesting, construction of wells, bundies, new techniques of fertilization including foliar spray and adoption of plant-protection measures. Besides these programmes livestock improvement which includes providing good milch animals is also taken to provide supplementary imcome source to the participating farmers. Incentives in the shape of grants and subsidies are given to the participating farmers to encourage them to adopt new inovations. The Centrally Sponsored scheme of Integrated Dry Land Agricultural Development was launched in 1970-71. The project under the scheme have beem in operation for seven to eight years, therefore, it was an oportune time to evaluate the progress made by these projects. In this chapter evaluation of IDAD Project Rewa, under study has been done.

7.2 Progress of Implementation

A summary of the physical progress achieved under different items of the programme of the project is given in Appendix Table 9. It is noted that the progress of the programmes area covered under inputs, demonstrations, training camp and minor irrigation had been satisfactory. The programme

item of foliar spray of urea had also been extensive but the remaining items particularly soil conservation, land improvement, water harvesting and distribution of milch animals showed slow progress.

7.3 Allotment and Expenditure

Allotment of grant for different programmes and it's utitisation has been studies. The years included are 1971-72 to 1973-74 i.e. the last three years of fourth plan period and 1974-75 as well as 1976-77 i.e. the first and third years of fifth plan. Averge of the five selected years has also been arrived at to/ calculate percentages of the ammounts spent to the ammount sanctioned for each programme. The programme items under which the expenditure exceeded the allotment were demonstrations and minor irrigation. The expenditure on items farmers training, foliar spray of urea and inputs was more than 50 per cent of their allotment. Expenditure on permanent works-soil conservation and water harvesting remained between 45 to 50 per cent of their allotment. The items on which the utilisation of funds remained poor were implements and machinery (30.92 per cent) and animal husbandry (28.46 per cent) Appendix Table 10 .

7.4 Evaluation

On the basis of the above discussion i.e. physical achievement and expenditure incurred on various items of the programme it may be/ concluded that ' Use of inputs ' had been satisfactory. Physical achievement under this item had been more than 90 per cent and the/ expenditure of the alloted fund had also been nearly 80 percent. Discussion on adoption of I.D.A.D. Programmes by participant sample farmers done in Chapter V also confirms this conclusion as 95 per cent of the sample farmers had sown recommended seed and 86 per cent had used fertiligers.

The physical achievement under soil conservation, land improvement and water harvesting had been 50 to 60 per cent and the expenditure of the alloted fund on these programmes had been-

45 to 50 per cent. The percentages of participants of these programmes in the sample were 1.66, 3.33 and 20.00 respectively. The percentages of the sample farmers expressing their unawareness to these items of the programme were 41.66, 60.00 and 6.66 per cent respectively.

Expenditure on minor irrigation exceeded the alloted fund where as other items e.g. implement, machinery and animal husbandry lagged behind as only 30.92 and 28.46 per cent of grant could be spent on these items. Participation under these items in our sample was 26.66 per cent under minor-irrigation, 40.00 per cent under implements and machinery and 18.33 per cent under animal husbandry programme.

There was no consistency in participation in various items of the programme. Unawareness of several participant farmers to certain items of the programme indicated that the demonstrations laid and training given had not the desired effect in the area. Dispite the fact that the adoption of dryland agricultural technology popularised under the I D A D programmes had increased the farm income and production (on the participant farms) not only the level of adoption had been poor the natural spread of the programme had also not been smooth.

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CHAPTER VIII

SUMMARY AND CONCLUSIONS

The semi-arid tropical region (SAT) spreads over 210 districts of the country. Most of the areas are predominantly rainfed and identified as dry-farming areas. They are characterised by inadequate and uncertain rainfall and also inadequate irrigation facilities. Eighty four districts constituting nearly 36 per cent of the net area sown in the country fall in this typically dry farming tract.

Though the need for reducing the risk of inadequate and uncertain rainfall in the rainfed areas was recognised as far back as 1880, attempts at systematic and scientific tackling of dry farming problem started around 1923. A nation wide action programme to improve dryland farming was taken up after independence. The problem acquired a new dimension and urgency when H.Y.V.s revolutionalised wheat and paddy cultivation in irrigated areas. In order to meet the situation a Centrally Sponsored Scheme of Integrated Dryland Agricultural Development was intiated in 1970-71 during the Fourth Five Year Plan. Twenty four IDAD Projects were started in 12 states. In Madhya Pradesh two such projects one at Indore and another at Rewa were established.

The IDAD project Rewa was established in 1971-72. To evaluate the work done under the Programme in Rewa district this study was taken up at the initiation of Ministry of Agriculture, Government of India. The objectives of the study included assessment of adoption of recommended practices by the farmers, factors associated with it and the feasibility of wider adoption of these practices.

Sampling was done at three stages. Six villages were selected-five within the project area and one outside it. Participant and non-participant-two categories of farmers were selected. Sample included 60 participant farmers and 40 non-participant farmers. The participant farmers were categorised on the basis of their participation in number of programmes. Requisite number was drawn from the total in the proportion in which they existed in each category. Selection was done at random. Similarly the sample of non-participant farmers was selected at random. The reference year for the study was 1977-78.

The IDAD Project, Rewa was started in 1970-71 covering a compact area of 15 revenue villages. In 1972-73 twenty six villages were added and again in 1977-78 eleven more villages were brought under the Project thus extending it's coverage to 52 villages. The programme prepared for implementation included following items-land improvement and water conservation, use of inputs (seeds of recommended crops and varieties, fertilizers and pesticides) farmers training, demonstrations of dry land agricultural technology, use of improved implements, minor irrigation and live stock improvement.

To implement these programmes a core technical and administrative staff was appointed and adequate financial assistance was provided in the form of Government subsidy and bank loans. Dryland Research Sub-Centre, Rewa was associated with the Project to conduct research on dryland agricultural problems under local conditions.

Rewa district comes under S A T region of Madhya Pradesh. It's annual ranifall is 1100 m.m. and the coefficient

of variation is 44.62 per cent. Neither the total rainfall nor it's distribution in various months has any stability. Irrigation facilities in the district are also poor. Only 1.70 per cent of the net cropped area was irrigated in 1970-71. Variability in production of crops a characteristic feature of dryland farming was higher than the variability in their area.

The district falls in wheat-rice zone of the State and these two crops occupy more than 40 per cent of the total cropped area. Cropping pattern is cereal oriented and mixed crops occupied nearly 30 per cent of the gross cropped area.

At the time of survey of this study the IDAD Project Rewa had been in operation for seven years, therefore, to evaluate its progress and study the impact of dryland agricultural technology on participant farms a sample of 100 households (including 60 participant and 40 non-participant farmers) was drawn. The approach was to study the changes in two different sets of conditions i.e. camparison of farms adopting recommended technology called adopters and the traditional farmers i.e. non-adopters. The adoptions of dryland agricultural technology was studied at micro-level i.e. the dryland agricultural practices followed by the participant farmers. To measure the level of adoption, adoption index was computed for each participant farmer on the basis of twelve selected indicators. Three categories (on the basis of level of adoption) low, medium and high were formed. The distribution of 60 participant farmers in low, micium and high level categories was 32,21 and 7 respectively.

Participant farmers adopting combinations of three to six programmes were about 80 per cent. Others participating in higher programme combinations i.e. seven or eitht programmes as well as participants of fewer programme combinations i.e. one or two programme were 10 per cent each. Apart from this the participation in individual programmes also varied considerably. Participation in use of inputs and training was 95 per cent while the participation in land improvement & water harvesting was less than five per cent.

Response to the new recommended crops such as-groundnut, soybean, sunflower and Laha was not encouraging. Only 7 participant farmers grew these crops. Most of the farmers were either unwilling to bear the risk or were not convinced of suitability of these crops.

Improved varieties were quite popular with the sample farmers. Out of the 60 participant farmers 57 adopted the recommended varities. A substantial part of the total acreage was still under local varieties of different crops indicating that switch over from traditional to improved high yielding varieties in general was not complete and that some more extension efforts were needed to bring this change over.

Though fertilizer use was common (about 87 per cent sample farmers used fertilizers), the position in repect of quantity applied was not satisfactory. Not only the fertilizer application was inadequate quantitatively but also the recommended method of application was not followed. The farmers did not seem to have understood the importance of proper placement and application of balanced doses of plant nutrients.

Though 25 per ceht farmers used insecticides, the per acre expenditure on insecticides and pesticides was too low (only Rs. 5.33)

fallowing, inter-cropping and low intensity of cropping. The results of the study reveal that with the adoption of dryland agricultural technology the proportion of kharif fallow and inter-cropping are decreasing.

The intensity of cropping increased with the increase in the level of adoption. Low level participant farms had the intensity of cropping of 111.17 per cent which increased to 133.14 per cent on medium level participant farms and 160.96 per cent on high level participant farms.

The average yield index also increased with the level of adoption. The results of regression analysis showed that for every one point increase in the adoption index the yield increased by 0.48 units.

Farm income (which included income from crop enterprise, cash income from sale of milk and milk products and the other farm income restricted to cash income from sale or hire out of irrigation water, bullocks, implements and family labour) was computed for each farm and the average income of participants and non-participants of each category was compared.

Income on participant farms (Rs. 6760.00) was more than double the income on non-participants farms (Rs. 3001.00). Among the participant farms income increased with the size of farms and also with the level of participation.

Income per acre of participant farms was Rs. 647.00 as compared to Rs. 371.00 on the non-participant farms. Among participants the income per acre increased with the level of participation. As a consequence of the adoption of dryland agricultural technology the farm income on participant farms increased. The per farm income of

participant farms was higher by 125.25 per cent and the income per acre was higher by 74.39 per cent over the non-participant farms.

Crop production was the major source of income on all categories of farms. It was about 90 per cent of total farm income. Income from milk production was only 7 to 9 per cent. Average employment days on participant and non-participant farms showed a difference of 389 days per farm and 28 days per acre. The difference of employment days per farm increased with the holding size but the increase in employment days per acre was inversely related to the size.

The difference of farm employment days on participant farms over the non-participant farms increased with the level of participation. On the high level participant farms the increased employment days were 766 days per farm and 47 days per acre.

From the above discussion it can be concluded that adoption of dryland agricultural technology leads to increase in intensity of cropping, higher yields, increased farm income and farm employment days. This shows that even with all the limitations and contraints, the cultivators can still derive substantial benefit by adopting the dryland agricultural technology.

Evaluation of the programme in terms of its physical progress and financial investment leads to the conclusion that progress under use of inputs had been satisfactory. The physical achievement under soil conservation, land improvement and water harvesting had been 50 to 60 per cent with 45 to 50 per cent utilisation of

funds alloted for the purpose. Expenditure on minor irrigation exceeded the alloted fund where as other items e.g. implements machinery and animal husbandary lagged behind. Participation under these items was only 40 per cent and 16 per cent respectively.

There was no consistency in participation in various items of the programme. Unawareness of several participant farmers to certain items of the programme indicated that the demonstrations laid and training given had not the desired effect in the area. Despite the fact that the adoption of dryland agricultural technology popularised under the I D A D programmes had increased the farm production and income, not only the level of adoption had been poor the natural spread of the programme had also not been smooth.

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Appendix Table No.1

Agricultural Development Blocks of Rewa District

Block	No.of Villages	Total Population	Tribal Population	% of Tribal population to Total population	Geagraphical Area	Net area sown	Special programme
1. Hanumana	281	102,000	18646	18.28	60,000	49,000	-
2. Mauganj	279	84,000	7494	8.92	90,000	35,000	-
3. Naigarhi	313	72,000	4292	5.96	41,000	27,000	-
4. Teonther	251	100,000	2005	2.01	53,000	46,000	-
5. Sawa	217	90,000	16873	18.75	43,000	33,000	-
6. Rewa	186	108,000	11299	10.46	71,000	37,000	IAAP IDAD *
7. Raipur	278	129,000	35552	27.56	76,000	46,000	-
8. Sirmaur	248	134,000	17758	13.25	94,000	48,000	-
9. Gangeo	249	105,000	9381	8.93	101,000	43,000	-
Rewa District	2302	977,000	123300	12.62	629,000	364,000	-

* Intensive Agricultural Area Programme
Integrated Dryland Agricultural Dovelopment Project

Source: Agricultural Statistics of M.P. 1977, Page 150.

Appendix Table No.2

Monthly Rainfall of Rewa from 1958 to 1976

(Rainfall in m.m.)

Year	Rainfall during different months (in m.m.)												
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1958	-	-	-	-	-	46.7	386.3	247.1	162.1	84.2	-	51.4	977.4
59	-	7.8	5.6	-	16.0	23.2	277.0	499.8	145.7	133.0	-	-	1108.1
60	28.6	29.3	3.6	-	7.7	40.6	505.1	548.6	138.4	76.8	-	-	1378.7
61	30.4	4.8	-	-	9.1	43.4	270.4	267.1	73.4	52.0	10.2	7.3	768.8
62	6.9	30.6	7.2	-	2.5	52.3	266.6	393.0	224.8	-	-	14.9	1021.3
63	26.2	8.3	10.3	6.0	4.1	44.3	238.9	262.4	196.2	2.9	22.4	2.5	824.5
64	-	-	-	-	12.0	175.0	366.8	477.5	324.4	76.3	5.0	13.1	1450.1
65	5.4	1.4	22.3	25.0	2.5	149.0	228.7	139.3	195.7	15.1	-	11.6	796.0
66	2.3	8.8	-	-	-	294.2	167.0	167.5	30.6	1.2	34.4	10.8	716.8
67	-	-	86.4	-	-	83.2	418.1	498.5	355.8	-	-	59.8	1501.8
68	52.8	19.0	-	3.6	-	94.6	267.4	125.0	76.4	12.0	-	1.0	651.8
69	9.2	13.8	5.0	-	9.6	7.0	329.4	468.7	218.0	-	67.2	-	1127.9
1970	90.4	45.8	4.0	-	6.4	72.4	83.2	381.6	297.8	9.0	-	-	990.6
71	81.2	2.0	6.0	48.6	18.0	381.0	532.0	330.6	197.6	60.0	-	-	1657.0
72	6.6	36.2	0.6	-	-	71.0	174.0	641.4	330.8	33.4	65.4	-	1359.4
73	-	19.8	-	-	13.6	37.2	258.4	388.2	100.6	35.8	-	-	853.6
74	-	7.0	0.8	-	7.0	104.0	307.2	285.4	75.2	-	17.4	-	867.0
75.	7.6	1.8	30.6	-	1.6	169.0	445.0	437.8	254.8	69.0	-	-	1417.2
76.	12.0	1.8	1.0	19.0	34.6	50.4	561.8	161.8	170.2	-	1.8	-	1014.4

Appendix Table No.3 : 3[illegible] :

Climatic Data for the Dry Farming Research Sub Centre Rewa M.P.

		Monthly mean											
		Jan.	Feb.	March	April	May	June	July.	Augu.	Sept.	Oct.	Nov..	Dec.
Normal rainfall(m.m.) (1941-1965)		23.4	20.1	11.1	2.7	6.6	187.0	427.3	257.5	117.8	17.4	8.2	4.5
Evaporation (mm)(day) (1971-1975)		4.1	5.0	18.3	13.3	17.3	13.0	4.6	3.0	5.1	4.1	4.9	4.0
Maximum Temp.C^{o} (1971-1975)		23,5	26.0	32.4	38.4	40.9	38.2	31.2	30.6	31.5	31.0	26.8	24.0
Minimum Temp.C^{o} (1971-1975)		5.6	9.5	17.2	21.8	27.2	28.6	26.3	26.0	24.7	21.8	11.8	7.5
Percent humidity 07-20hrs(1971-75)		93	51	82	58	47	63	89	93	92	92	93	94
Rainfall(mm)	1971	81.2	2.0	6.0	48.6	18.4	381.0	532.0	330.6	197.6	60.0	0	0
	1972	6.6	36.2	0.6	0	0	71.0	174.0	641.4	330.8	33.4	65.4	0
	1973	0	19.8	0	0	13.6	37.2	258.4	388.2	100.6	35.8	0	0
	1974	0	7.0	0.8	0	7.0	104.0	307.2	285.4	75.2	0	17.4	0
	1975	7.6	1.8	30.6	0	1.6	169.4	445.0	337.8	254.8	69.0	0	0
	1976	12.0	1.8	1.[illegible]	1[illegible]	-	-	-	-	-	-	-	-

Ref. Report-Dry Land Agriculture Research Sub-Centre Rewa (M.P.).

Appeneix Table - 4

Land use classification in Rewa District (1970-81)

Particulars	Area	Percentage to total Geographical Area (%)
1. Forest	1,63,086	10.49
2. Not available for cultivation		
A. Land put to non-agricultural	1,30,963	8.43
B. Barren and un-cultivable Land	1,16,137	7.47
3. Other uncultivated Land excluding fallow Lands		
A. Permanent pastures & grazing Lands	84,014	5.40
B. Land under Misc.Trees Crops and groves	4,942	0.32
4. Culturable waste land	46,949	3.02
5. Fallow Lands		
A. Current fallows	69,188	4.45
B. Old fallows	51,891	3.34
6. Cropped area Net area sown	8,87, 095	57.08
Area sown more than once	1,65,557	-
Total Cropped area	10,52,652	-
Total Geographical Area by village papers	15,54,259	100.00

Appendix Table 5

Cropping Pattern in Rewa District (1970-71)

Crops	Area	Percentage
I CEREALS :-		
Rice	2,16,212	20.54
Wheat	2,26,590	21.52
Jowar	48,926	4.65
Bajra	7,907	0.75
Barly	32,617	3.10
Maize	3,954	0.37
Kodon-Kutki	1,70,005	16.15
Sawa	4,695	0.44
II Total Cereals	7,10,906	67.52
II PULSES :-		
Gram	1,29,480	12.30
Arhar (Tur)	40,030	3.80
Moong & Moth	5,930	0.56
Urd	6,177	0.59
Masoor (Lentre)	25,204	2.39
Other Pulses	8,401	0.80
Total Pulses	2,15,222	20.44
III Sugarcane	124	0.01
IV FRUITS AND VEGETABLES		
Fruits:-		
Bananas	12	-
Mango	5,759	0.55
Citrus Fruits	5	-
Guava	59	-
Papaya	2	
Unspecified	509	0.05
Vegetables :-		
Potato	716	0.07
Ouion	222	0.02
Other Vegetables	593	0.06
Total Fruits and vegetables	7,882	0.75
Crops - Oil Seeds:-		
Linseed	97,604	9.28
Seasmeen	9,884	0.94
Rape & Mustard	3,459	0.33
Others	988	0.09
Total Oil Seeds	1,11,935	10.64
VI Fibres		
Suntemp	271	0.02
Mesta	4,200	0.40
Total Fibres	4,471	0.42
VII Drugs and Narcotics	296	0.03
Condiments and Spices	215	0.03
Mescellanious Crops	1,606	0.16
Total All Crops	10,52,652	100.00

Appendix Table - 6:

Amenities Available in Selected Villages, Rewa District

S.No.	Name of Village	Amenities available within the village						Nearest-Town and Distance in Kms.
		Educational	Medical	Power supply	Drinking water	Communi-cation	Post and Telegraph	
1.	Maddhepur	-	-	-	Well	Pucca Road	-	Rewa - 17.6 km.
2.	Chhijbar	Primary School	-	-	Well	Pucca Road	-	Rowa - 17.6 km.
3.	Kachur	Middle School	-	-	Well	Kachha Road	Post Office	Rewa - 20.8 km.
4.	Chorhata	Middle School	-	Electricity	Well	Pacca Road	Post Office	Rewa - 8 km.
5.	Sumeda	Primary School	-	-	Well	Pacca Road	-	Rewa - 16 km.
6.	Kuiyan	-	-	-	Well	Pacca Road	-	Rewa - 15 km.

Source - District Census Hand Book, Rewa district 1971

Appendix Table - 7

.1 Census Data of the Selected Villages , Rewa District

S.No.	Name of Village	Area of Village in Acres	Occupied Residental Houses	Total No.of Household-	Total Population			Scheduled Castes		Scheduled Tribes		Literate & Educated		Total workes	
					Total persons	Male	Female	Total No.	P.C. to total population	Total No.	P.C.to total population	Total No.	P.C.to Population	Total No.	P.C.to total Population
1.	Maddhepur	1,481	86	89	502	252	250	28	5.58	45	8.96	63	12.55	197	39.24
2.	Chhijbar	1,224	76	76	399	207	192	91	22.81	46	11.53	44	11.03	174	43.61
3.	Kachur	1,704	147	159	929	467	462	147	15.82	115	12.38	216	23.25	414	44.56
4.	Chorhata	1,746	188	220	1,179	594	585	95	8.06	248	21.03	240	20.36	408	34.61
5.	Sumeda	1,170	115	115	654	314	340	96	14.68	126	19.27	103	15.75	331	50.61
6.	Kuiyan	525	44	63	324	181	143	76	23.46	23	7.10	50	15.43	115	35.49

Source : Primary Census Abstract Census 1971 District Census Hand Book, Rewa District.

Appendix Table - 8 : 7 :

Agricultural Statistics of Selected Villages, Rewa District

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S.No.	Name of Village	Total Area in Acres	Land Use(Area under different types of Land use)				Irrigated	Un-Irrigated	Staple food
			Forest (Ac)	Area not available for cultivation (Ac)	Culturable waste (Ac)	Net cultivated area (Ac)	(Ac)	(Ac)	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	Maddhepur	1,481	-	319	101	1061	-	1061	Kodon-Wheat
2.	Chhijbar	1,224	-	132	60	1032	-	1032	Rice-Kodon
3.	Kachur	1,704	-	271	51	1382	-	1382	Kodon-Wheat
4.	Chorhata	1,746	-	247	25	1474	16	1458	Wheat Jowar
5.	Sumeda	1,170	-	353	25	792	-	792	Wheat-Rice
6.	Kuiyan	525	-	166	40	319	-	319	Wheat-Jowar

Source - District Census Hand Book, Rewa District, 1971.

Appendix Table 9
Yearwise Physical Progress Achieved Under the Project Rewa

Item of Work	1971-72		1972-73		1973-74		1974-75		1975-76		1976-77		Cumulative	
	T	A	T	A	T	A	T	A	T	A	T	A	T	A
Area Covered Under Inputs (Acres)	2000	1993	4000	3548	6000	6055	8000	5812	10,000	10,000	12,000	11,943	42,000	39,351 (93.69)
(No. of Cultivators Benefitted)	-	415	-	805	-	1035	-	1842	-	1350	-	1918	-	7364
2. Soil Conservation (Acres)	1500	742	N.A.	772	2000	650	750	345	210	96	99	23	4559	2618 (57.42)
3. Land Development (Acres)	140	72	140	65	140	95	140	83	160	103	247	205	967	623 (62.42)
4. Water Harvesting (No.)	3	-	-	-	10	5	-	1	14	7	6	4	33	17 (51.51)
5. Demontration Laid (No.)	50	60	100	101	100	76	100	97	-	-	100	94	450	428 (95.11%)

Appendix Table 9 Conted....

Items of Work	1971-72		1972-73		1973-74		1974-75		1975-76		1976-77		mulative Total	
	T	A	T	A	T	A	T	A	T	A	T	A	T	A
6.Training Camps (No.)	-	2	8	7	8	3	8	12	10	10	20	20	54	54 (100.00)
.No.of farmers trained)	-	436	-	792	-	430	-	972	-	1000	-	1223	-	4853
7.Irrigation wells Constructed	-	26	-	14	-	67	-	55	100	26	15	25	-	213
Repaired	-	2	-	1	-	13	-	32	25	10	10	30	-	88
8.Tube Wells	-	-	-	-	-	4	-	12	10	9	15	7	-	32
9.Irrigation-Pumps	-	6	-	19	-	76	-	36	40	34	25	34	-	205
10.Milch Cattle Distibuted	68	21	200	104	150	93	150	54	-	5	-	5	568	282 (49.64)
11.Foliar Spfay (Acres)	-	1594	-	1790	-	6005	-	1125	-	2600	-	2140	-	15254

Appendix Table 10 Conted...

Year	Demonstrations			Farmers Training			Foliar Sp	
	Allotment	Expen-diture	Percen-tage	Allotment	Expen-diture	Percen-tage	Allotment	Ex-di
1971-72	10,000	10,003	100.03	35,000	19,958	57.02	5000	49
1972-73	10,000	13,706	137.06	50,000	35,474	70.94	5000	41
1973-74	10,000	9,734	97.34	25,000	17,872	71.48	15000	10,6
Total for IV Plan Period	30,000	83,443	111.47	110,000	73,304	66.64	25000	19,7
1974-75 V Plan I Year	15,000	14,722	98.14	30,000	12,772	42.57	10,000	4,9
1976-77 V Plan II Year	20,000	15,298	91.49	35,000	34,030	97.22	10,000	9,9
Totalfor Five Years	65,000	66,463	102.25	175,000	123,106	70.34	45,000	34,67

Appendix Table 10 Conted...

Demonstrations			Farmers Training			Foliar Spray		
llotment	Expen-diture	Percen-tage	Allotment	Expen-diture	Percen-tage	Allotment	Expen-diture	Perce-ntage
,000	10,003	100.03	35,000	19,958	57.02	5000	4936	98.72
,000	13,706	137.06	50,000	35,474	70.94	5000	4117	82.34
,000	9,734	97.34	25,000	17,872	71.48	15000	10,666	71.10
,000	83,443	111.47	110,000	73,304	66.64	25000	19,719	78.87
000	14,722	98.14	30,000	12,772	42.57	10,000	4,992	49.92
000	15,298	91.49	35,000	34,030	97.22	10,000	9,968	99.68
000	66,463	102.25	175,000	123,106	70.34	45,000	34,679	77.06