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A CASE STUDY OF  
**AGRICULTURE IN THE  
DRY RAINSHADOW REGION OF KERALA WITH  
SPECIAL REFERENCE TO O. R. P. ON WATERSHEDS**

BY

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**Kerala Agricultural University**

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## FOREWORD

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**T**he Indian Council of Agricultural Research sanctioned an Operational Research Project for resource development on watershed basis in 1984 under Kerala Agricultural University. Seven watersheds were identified in the Vadakarapathy Panchayat of Palakkad District for the above project. The project aims to demonstrate and test techno-economic viability of the watershed concept. It also aims to refine, modify and adopt location-specific technology appropriate to various agroclimatic regions for large scale expansion in subsequent phases.

The Kerala Agricultural University introduced high-yielding varieties to replace in a phased-manner the traditional low-yielding crops. The bench-mark survey on demography, linguistics and literacy of population, land distribution pattern, average family income, livestock population, credit facilities, marketing facilities marketing channels etc, made in the present case study would be useful to agricultural administrators and planners. Being a unique publication of this nature, I commend the authors who have taken pains to bring out this useful publication,

DR. E. G. SILAS  
Vice - Chancellor

## O. R. P. OZHALAPATHY - A RESUME

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The Operational Research Project at Ozhalapathy was initiated in 1984. This is essentially a watershed management project to develop dryland on watershed basis. Seven watersheds were identified in the drought-prone area of Palakkad district for land development, introduction of remunerative crops and packages of practices, use of land according to its capability, collection and recycling of surface run-off, control of soil erosion by providing ground cover over degraded land through pasture development and agro-forestry. The financial support for the project is by the Indian Council of Agricultural Research (ICAR). The development works are done by the State Department of Agriculture, Soil Conservation, Forests and Animal Husbandry. Monitoring is done by the state and district level co-ordination committees, and the scientific consortium. The Kerala Agricultural University has been a change agent in the transfer of technology relevant to the dryland tract of Palakkad District.

A bench-mark survey of the seven watersheds were made. Demography of Panchayats in Kozhinjampara firka was studied. Linguistics and literacy of population in the firka were assessed. The main linguistic group is Tamils with a literacy percentage of only 44.4 to 47.9. The land distribution pattern indicated that 46.91% of the total holdings have sizes ranging 2-3 ha. The average annual family income ranged from Rs.2,255/- to Rs.4,858/- with a mean of Rs.3,542/-. The major share is from farming. The average labour use per holding was 382 mandays of which 254 mandays (69.4%) were family labour. Hardly 4.25% of the school going children reach above high - school level. Marketing system is monopolised by commission agents.

The Kerala Agricultural University introduced new high-yielding varieties of crops like tomato, chilli, cowpea, bhindi, groundnut, cotton and cereals. The impact of these introduction has been substantial. The present bulletin surveys the seven watersheds lying in the Kozhinjampara firka of Palakkad District in its totality. Being a continuous exercise the present publication gives a vivid introductory picture of the ORP.

I appreciate the scientists led by Mr. K. C. Rajan who have taken immense pains for the effective work and its subsequent monitoring.

DR. M. ARAVINDAKSHAN  
Director of Research

## ACKNOWLEDGEMENT

The authors wish to place on record the deep sense of gratitude to Dr. M. Aravindakshan, Director of Research for the constant inspiration given for the publication of this report on the problems and potentialities of Agriculture in the rainshadow region in Palakkad District.

The authors are extremely grateful to Dr. K. V. Peter, Professor of Horticulture for editing the report and for his valuable suggestions in improving the quality of the report.

Dr. A. G. G. Menon, Director of Extension has critically evaluated the report and the authors are thankful for the comments he offered in improving the presentation of this report.

The valuable services rendered by Shri. M. C. Narayanankutty, Junior Assistant Professor (Hort.) in collecting the additional information for bringing out this publication is gratefully acknowledged.

The authors express sincere thanks to Shri. P. H. Latif, Associate Professor who was in-charge of the Project and took pains to collect the basic information on the agricultural situations in the area.

The valuable guidance given by the Scientists of Central Soil and Water Conservation Research and Training Institute (I. C. A. R.), Ootacamund in the conduct of this study is duly acknowledged.

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AUTHORS

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Kerala is endowed with a warm humid tropical climate suited to a large number of economic crops including cereals, pulses, oil seeds, fruits, vegetables, ornamentals, industrial crops and plantation crops. An intensively multi-dimensional crops based farming system is unique to this state. The cropping is done under both rainfed and irrigated condition. Cut-off from this main stream of agriculture, there is a vast stretch of land receiving scanty rainfall and technically under rainshadow regions. The area is characterised by low average annual rainfall (1213 mm), compared to 3004 mm for Kerala. Lying close to western Ghats in Palakkad District adjacent to Coimbatore District of Tamil Nadu, this stretch of land is cultivated by subsistence farmers of Tamil origin. Farm labour being plenty and cheap, agriculture is the main occupation of the populace. The present case study was conducted to document the level of agriculture and its potential so as to evolve an appropriate planning process for the upliftment of the area in particular. This would also reveal problems, constraints and would help to develop working models of technology transfer in similar situations. Water, being the main constraint of the area, emphasis has been given on different watersheds and their management.

An operational Research Project for resource development on watershed basis was sanctioned for this low rainfall tract by the Indian Council of Agricultural Research

and started functioning in 1984. Conceptually the Operational Research project is a multidisciplinary, multi-agency co-ordinated programme dealing directly with farmers to tackle on farm problems specific to the region based on need, resources and time. The project embodies the following specific objectives.

- 1) To demonstrate and test the techno-economic viability of the project concept.
- 2) To refine, modify and adopt location-specific technology appropriate to various agro-climatic regions, for large scale expansions in subsequent phases
- 3) To work out the credit worthiness of the technology.
- 4) To quantify and document socio-economic and ecological benefits which may accrue in terms of stable and elevated production, improved productivity, reduced drought risk, control of flood and sedimentation.
- 5) To study and document the project impact on restoration of ecological balance through development of water resources, conservation of flora, and fauna, reduced aridity etc. in the watershed.
- 6) To optimise the productivity of all available resources in watershed, to verify all available alternate farming systems for efficient utilisation of available natural resources, to identify

and analyse gaps and constraints in the adoption of resource development programmes on watershed basis

- 7) To create additional employment potential for small and marginal farmers and agricultural labourers

## LOCATION

The operational Research Project (ORP) covers seven watersheds identified in the Vadakarapathy Panchayat of Palakkad Dist of Kerala. The seven watersheds are Atteyampathy, Anipur, Bavajinagar, Kalliampara, Kerampara, Sathram and Vellachikulam. The possible beneficiaryneigh-

bouring panchayats are Kozhinjampara and Eruthempathy.

The Vadakarapathy Panchayat has five villages, Vadakarapathy, Eravattaparapathy, Ozhalapathy, Thenampathy and Atteyampathy. The Eruthempathy panchayat has 3 villages Eruthempathy, Manchikunompathy and Kozhipathy. The Kozhinjampara panchayat has Kunnamkattupathy, Valiyavallampathy and Kozhinjampara as villages. The project headquarters is at Ozhalapathy. The village-wise area of the Kozhinjampara Firka is given in Table 1. A location map of the Kozhinjampara Firka is given in Fig. 1.

Table 1. Villagewise area of the Kozhinjampara Firka

Panchayats	Name of village	Area in hectares			
		Wet	Dry	Tarisu	Total
Eruthempathy	Eruthempathy	243.6	559.2	63.4	869.2
	Kozhipathy	148.4	1486.4	168.8	1803.6
	Machikunnampathy	241.2	604.8	139.2	1075.2
Kozhinjampara	Kozhinjampara	418.4	542.4	132.4	1093.2
	Kunnamkattupathy	150.4	991.6	141.6	1283.6
	Valiyavallompathy	496.4	1320.0	139.2	1955.6
Vadakarapathy	Atteyampathy	47.6	414.0	20.8	482.4
	Eravattaparapathy	164.4	288.0	70.8	523.2
	Ozhalapathy	148.4	949.6	53.6	1151.6
	Thenampathy	89.2	530.4	44.4	664.0
	Vadakarapathy	416.0	1576.8	79.8	2072.6
	Total	2564.0	9353.2	1057.0	12974.2



# MAP OF PALGHAT DISTRICT



The operational area of ORP, Ozhalapathy is representative of this dry belt and is confined to seven watersheds identified in the Vadakarapathy Panchayat. Areas under these watersheds are given in Table 2. The seven watersheds cover an area of 742 ha. constituting 2.9% of the total area of dry belt and 0.019% of total area of the state. The detailed location descriptions of the seven watersheds are as follows:-

The Atteyampathy watershed lies between latitude 10°-48'-5" and 10°-48'-48" North and longitude 76°-51'-45" East. Major portion of watershed lies in Thenampathy village. The watershed ext-

ends over an area of 115.2 ha.

The Bavaji Nagar watershed lies between latitude 10°-48'-0" and 10°-48'-32" North and longitude 76°-51'-5" and 76°-51'-50" East. It contains portions of Thenampathy and Vadakarapathy villages. It is bound on North and South by private lands and East and west by Velanthavalam-Vadakarapathy road and Velanthavalam-Sathram road. The watershed area is 118.8 ha.

The Anipur watershed lies between latitude 10°-46'-10" and North and longitude 76°-54'-30" and 76°-55'-30" East. The watershed falls in Ozhalapathy Village and covers an area of 98.0 ha.

Table 2. Area under the seven watersheds in Vadakarapathy Panchayat

Sl. No.	Name of watersheds	(Area ha.)
1	Atteyampathy	115.2
2	Bavajinagar	118.8
3	Anipur	98.0
4	Kerampara	143.2
5	Kalliampara	127.2
6	Sathram	68.8
7	Vellachikulam	70.8
Total		742.0

The Kerampara watershed lies between latitude 10°-46'-50" and 10°-46'--40" North and longitude 76°-52'-10" and 76°-53'-30" East. The watershed is located in Atteyampathy and Ozhalapathy Villages and extends over an area of 143.2 ha.

The Kalliampara watershed lies between latitude 10°-46'-0" and 10°-46'-50" North and longitude 76°-52'-10" and 76°-52'-10"

East. The area falls in Vadakarapathy and Atteyampathy Villages covering an area of 127.2 ha.

The Sathram watershed lies between latitude 10°45'-20" and 10°-46'-0" North and longitude 76°-51'-0" and 76°-51'-50" East. The watershed falls in Vadakarapathy Village and extends over an area of 68.8 ha.

The Vellachikulam watershed lies between latitude 10°-48'-35" and 10°-47'-50" North and longitude 76°-51'-50" East. It is situated in Vadakarapathy Village and covers an area of 70.8 ha.

### Physiography

The land mass in the area exists as long stretches of almost level lands. There are natural basins of land formed by surro-

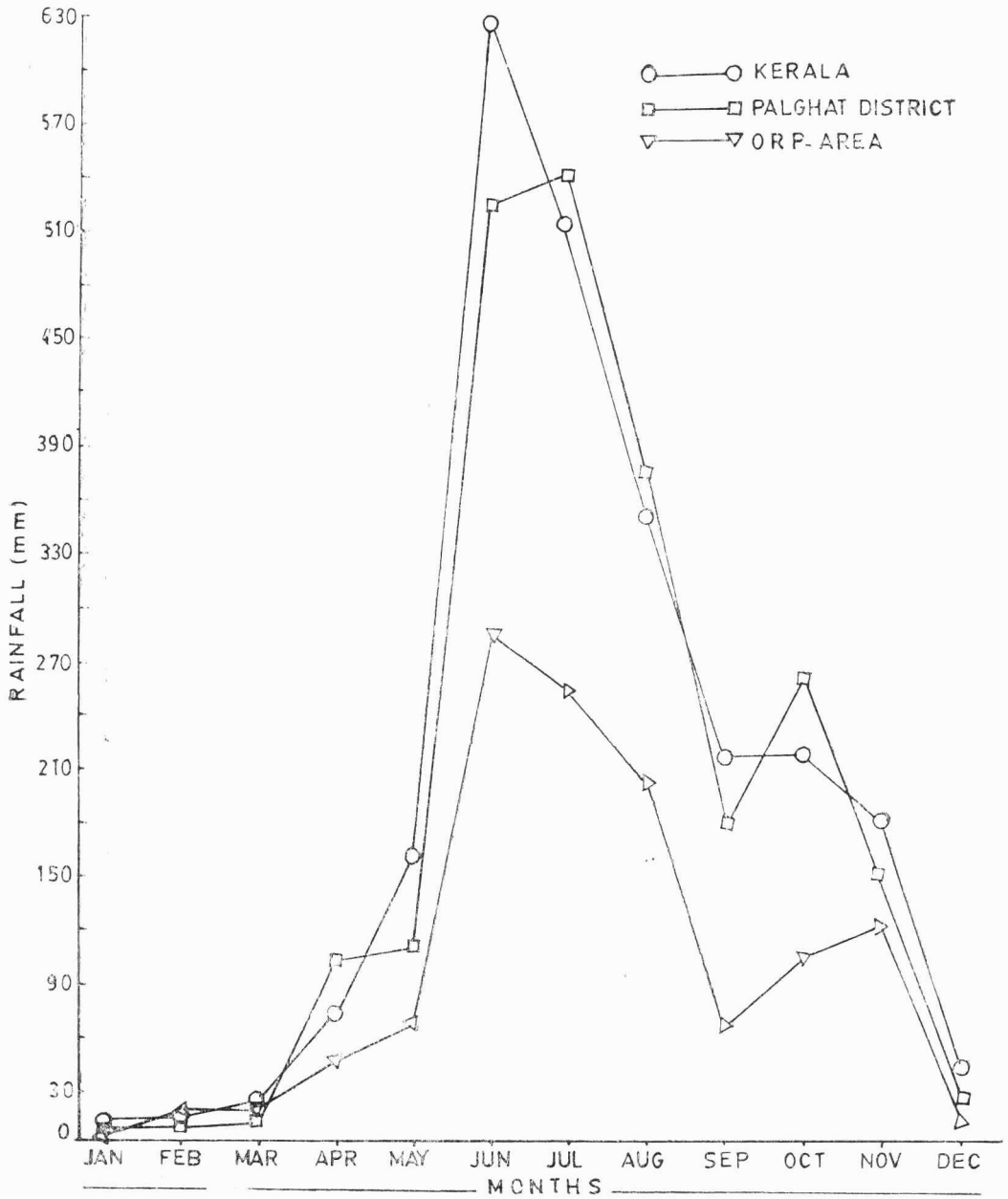
unding sloping fields. Those areas contributing to a common drainage point comprise a watershed. This situation is more often seen in Ozhalapathy and adjacent Villages, Thenampathy and Atteyampathy. The altitude of the area is 67 metres above MSL. Slope of the land is 5-10%. Most of the sloping fields are levelled, terraced and field bunds strengthened to minimise runoff and soil erosion. The drainage of the land is towards Bhadakali river flowing through Southern part of Vadakarapathy panchayat.

Table 3. Mean maximum and minimum temperatures at Kozhinjampara Firka

Months*	1988 Temperature*		1989 Temperature	
	Maximum °C	Minimum °C	Maximum °C	Minimum °C
January	33.0	18.0	31.7	20.8
February	34.2	21.08	34.4	19.6
March	32.05	27.15	35.4	22.2
April	33.6	24.0	35.6	26.0
May	32.22	26.96	33.3	24.9
June	30.0	24.5	28.5	22.9
July	28.64	23.22	27.6	23.1
August	28.03	23.21	23.4	23.3
September	29.4	24.2	21.9	22.8
October	30.70	24.96	30.6	23.4
November	31.93	22.73	31.6	22.8
December	31.72	21.22	31.4	21.8

\*Source: ISD Farm, Eruthempathy

Average monthly rainfall of the ORP area, Palakkad District and Kerala State (1978-88)



## CLIMATE

The area comes under the low rainfall drought prone rainshadow region of the state. The annual precipitation average around 100cm. The actual rainfall is often much less in many years, highly erratic and do not conform to a definite pattern. The average annual rainfall received in the area, is given in Fig. 2, alongwith rainfall in Palakkad District and Kerala state as a whole. Most of the crops grown here are rainfed and hence crop production is a gamble with nature. More than 65% of the rainfall is received in June-July and August. The watershed area receives rainfall through South-West and North-East monsoon. The seasonal distribution is 7.6% during December - April, 66.4% during May-August and 26% during September-November. South-West monsoon showers during May-August is obviously the main rainy season. Maximum temperature is observed during March-April, the minimum temperature during January-February (Table 3).

## SOIL

The soil is mainly loamy and sandy clay in texture. Black soils are found in patches and are considered as extension of the black cotton soils in the adjacent Coimbatore district of Tamil Nadu. The soil is generally dark in colour, low in

organic matter, calcareous, neutral to alkaline in reaction, high in clay and cation exchange capacity and is very sticky and plastic. Electrical conductivity is normal. The soil is medium in available phosphorus and organic carbon and high in available potash (Table 4).

## SOCIO - ECONOMIC CHARACTERISTICS:

### Demography

People of the locality are mainly of Tamil origin, and comprises of Gounders, Chettiars, Pillais, Christians and Chakkliyans. The Chakkliyans, belong to Scheduled Caste Community and are landless agricultural labourers. They constitute the major work force of the area (14.0% of the total population). Besides, people of Kerala origin also constitute a sizeable part. The demography of panchayats in Kozhinjampara Firka is given in Table 5. Male - Female ratio is 50:50 in all the panchayats. Density of population in Eruthempathy is 408/km<sup>2</sup>, 559/km<sup>2</sup> in Kozhinjampara and 213/km<sup>2</sup> in Vadakarpathy. The linguistic and literal levels of population are given in Table 6. The highest literacy percentage of 47.9 is in Kozhinjampara panchayat, the lowest in Eruthempathy (44.4%).

Table 4, Basic properties of soil in watersheds

Sl. No.	Name of watersheds	Texture	pH	Electrical conductivity ds/m	Organic carbon (%)	Available P kg/ha	Available K kg/ha
1	Bavajinagar	Sandy clay	7.5	0.09	0.46	24.89	243.1
2	Vellachikulam	Sandy clay	7.7	0.10	0.49	24.14	376.75
3	Atteyampathy	Sandy clay	7.8	0.10	0.47	15.33	274.45
4	Anipur	Sandy clay	7.5	0.12	0.52	31.86	444.96
5	Sathram	Clay loam	7.8	0.13	0.42	19.15	359.70
6	Kalliampara	Sandy clay	8.0	0.13	0.61	20.43	242.55
7	Kerampara	Sandy clay	6.9	0.08	0.53	15.06	309.1
	Mean		7.6 (Alkaline)	0.10 (Normal)	0.5 (Medium)	21.55 (Medium)	320.81 (High)

The number of households, population and total geographical area under ORP are given in Table 7.

The literacy percentage in the three panchayats well below 50% indicates need for intensive drive for more literacy programmes. The main constraints in the faster acceptance of modern technology may be due to the lower literacy.

#### Land distribution pattern

Agriculture is the main occupation of the People in the area. Of the 328 farmers surveyed in the seven watersheds, 112 were large farmers, 137 small farmers and 79 marginal farmers ( Table 8 ). All the families in the watershed have land ownership.

#### Socio-economic conditions

The system of joint family still exists in the area. The average family size is 5. Agriculture is the main source of income. The annual family income of the seven watersheds was Rs. 3,542/- in 1987 (Table 9).

#### Farm labour

The members of a family engage themselves in all operations of their farm throughout the year. During peak cropping season farm labour is employed mostly through exchange between neighbouring

farms. The average labour use per holding is 382 mandays of which 254 mandays (69.4%) is family labour. Men labourers are paid at the rate of Rs. 15/-per day and women labourers Rs. 7/-per day on an average. The total labour use during the year was computed by taking 2 women labourers equivalent to 1 man labour based on the wage ratio.

#### Education

Children go to school at the age of five but begin to dropout from the first year itself. More dropout is among girls. (Majority of the girls terminate studies at lower primary itself). when elders go for work, management of the family, grazing of livestock and other family works are the responsibility of young girls.

Average family size and educational status of family members of ORP. Ozhala-pathy are given in Table 10. There is one nursery school, 2 lower primary schools, one upper primary school and one high school in the area. The Government college, Chittur is the nearest college, 30 kms away from Ozhalapathy. Of the total population 28.2% are illiterates 29.89% have received lower primary education, 15.2% upper primary education, 22.42% high school education and only 4.3% education above high school level.

Table 5. Demography of panchayats in the Kozhinjampara firka of Palakkad district

Panchayats	Area (km <sup>2</sup> )	Population		Total
		Male	Female	
Eruthempathy	36.93	7534	7458	14992
Kozhinjampara	43.83	12181	12345	24526
Vadakarapathy	49.51	10664	10592	21256

Source: Census, 1981

Table 6. Linguistics and literacy of population in the Kozhinjampara firka of Palakkad Dist.

Panchayats	Main linguistic group	Literacy (%)
Eruthempathy	Tamils	44.4
Kozhinjampara	Tamils	47.9
Vadakarapathy	Tamils	45.4

Table 7. Population, number of households and total geographical area of ORP Ozhalapathy

Name of watersheds	Number of households	Total population	Total geographical area (ha.)
Atteyampathy	49	216	115.2
Bavajinagar	55	275	118.8
Anipur	28	138	98.0
Kerampara	66	319	143.2
Kalliampara	54	269	127.2
Sathram	45	234	68.8
Vellachikulm	31	131	70.8
Total	328	1582	712.0



## Livestock and poultry

Households in the watershed maintain milch animals, draught animals and poultry (Table 11). Milch animals include cows, buffaloes and goats. Milk is sold locally after home use. On an average, cross bred cows yield 8 litres of milk per day. The milch animals and poultry form a subsidiary source of income to farmers. There are no milk marketing societies in the area but there is considerable scope for one. Maintenance of livestock poses a great challenge to the farmers of the area. No exclusive grazing lands are available in the area. Animals are fed with groundnut bhusa and paddy straw. During periods of crop failure, farmers experience acute shortage of animal feed. This forces them to keep a part of

the farm for fodder crops. Bullocks are maintained for farm operations and for pulling carts to transport men and materials.

## Credit

Farmers depend both on co-operatives and commercial banks for their credit requirements (Table 12). The Chittur Co-operative Sugar factory extends crop linked loan facility to the sugarcane growers of the area. 51% of the farmers are indebted to any one of the financial institutions for credit. Purchase of bullock, pumpsets, digging and deepening of wells are the major purposes of borrowal. Crop loans are also common and are repaid after a successful crop. It is gratifying to note that the loans are utilised for the purpose, for which they are sanctioned. Each farmer had a debt of Rs.3,430/- during 1986-'87 in the ORP area.

Table 8. Land distribution pattern at ORP Ozhalapathy

Size in hectares	Number of holdings	Percentage of total	Area (ha.)	Percentage of total
0-1	72	21.91	18.32	2.47
1-2	10	3.04	12.04	1.62
2-3	160	48.77	348.07	46.91
3-4	46	14.13	165.60	22.32
above 4	40	12.15	197.97	25.68
Total	328	100.00	742.00	100.00

## Marketing

Groundnut, cotton and vegetables are the main products the farmers usually have as marketable surplus. Paddy is grown to meet family needs only. In the case of groundnut, the usual practice is to sell raw produce to commission agents immediately after harvest. Marketing facilities at Kozhinjampara Firka are indicated in Table 13. The Prevailing marketing channels at ORP area are similarly depicted in Table 14. The main marketing channel is producer to commission agent. The farmers cultivate vegetables as a ready source of income to meet their day to day needs. Vegetables are harvested, packed in baskets and brought to the main market at Velanthavalam in buses, bullock-carts or even as headloads. The commission agents sell

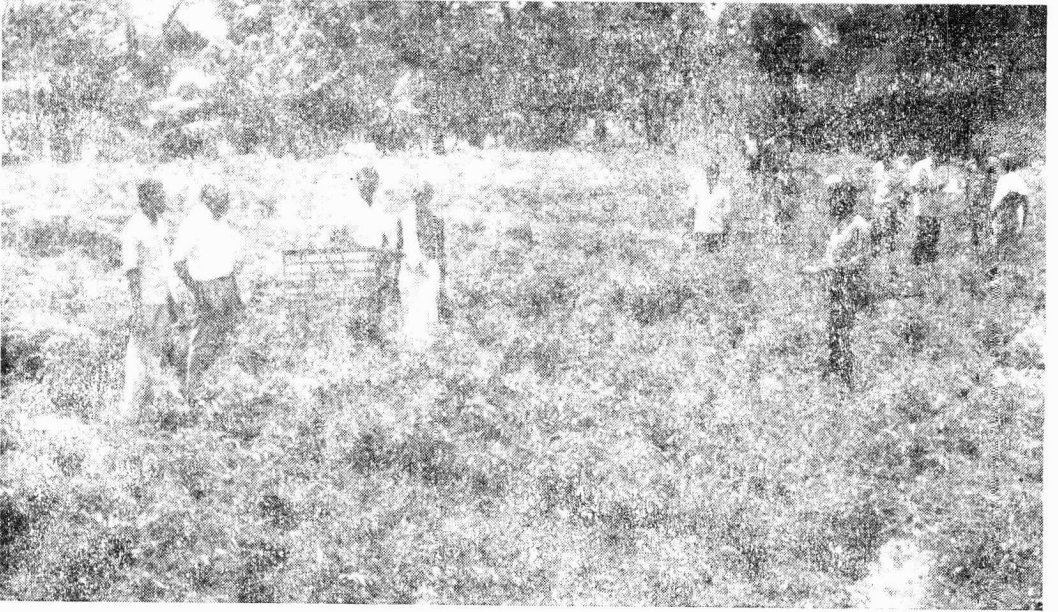
the produce by bidding. There are all ills and demerits associated with this type of marketing facilities. Co-operative societies in this area, do not have a sound marketing system for vegetables. Many farmers in the area having taken loans from the Co-operative Societies apprehend that they will not get reasonable price for their produce if produce is sold through Societies. The Society may also try to collect the loan amount from the sale proceeds. A systematic organizational set up for vegetable marketing and utilisation of vegetables through processing would considerably benefit the farmer.

### Major crop enterprises

Paddy, groundnut, cotton, sugarcane and vegetables are the major crops grown in this area. Present productivity of these

Table 9. Average family income of households in watersheds during 1986-'87

Name of watersheds	Family income (Rs. per annum)		Total
	Farm	Non-farm	
Atteyampathy	2681	448	3129
Anipur	3600	258	3858
Bavajinagar	3144	514	3658
Kerampara	3116	581	3697
Kalliampara	3200	55	2255
Sathram	3047	280	3335
Vellachikulam	3052	1806	4858
Pooled	2977	565	3542



*Scientists and farmers in a tomato experimental plot.*

crops at ORP Ozhalapathy are given in Table 15. The area has high potential for tomato, cowpea, groundnut, bhindi and cotton. The cropped area under different enterprises are given in Table 16. The maximum area is under groundnut, followed by paddy, millets, cotton, vegetables and sugarcane.

Paddy is grown during kharif only. Both broadcasting and transplanting methods are followed depending upon sources of irrigation and availability of water. The popular varieties are IR-50 and Bala. A tendency for reduction in area under paddy is recently noted. Bacterial leaf blight is the common disease. Leafroller, stemborers and rice bugs are main insect pests.

Groundnut is grown during kharif and rabi. The kharif crop is sown in April and harvested in July end or in early August. TMV-2 is the popular variety. Farmers produce their own seeds. Use of seeds carried over for last 20 or 30 years are not uncommon. The rabi crop is in August-September and harvested in December. Application of fertilizers are seldom in groundnut. Cattle manure (2.5 tons/ha) and gypsum (200 kg/ha) are commonly applied. Red-hairy caterpillar is the most serious pest of the crop. Tikka leafspot is the common fungal disease. The average yield of groundnut is 1.7 tons/ha.

Cotton is a major rabi crop, sown in the middle of August. The popular varieties are MCU - 5, LRA - 5166 and MCU - 9.

Table 10. Family size and educational status of families of ORP Ozhalapathy

Sl. No.	Name of watersheds	Average family size	Educational status				
			Illiterate	Lower primary	Upper Primary	High school	Above High school
1.	Atteyampathy	4	34.72	27.31	18.51	14.35	5.09
2.	Bavajinagar	5	25.45	34.54	9.45	24.45	1.09
3.	Anipur	5	16.66	47.10	7.24	21.74	7.24
4.	Kerampara	5	31.17	29.44	22.94	16.01	0.44
5.	Kalliampara	5	27.78	23.04	21.56	24.16	3.35
6.	Sathram	5	38.88	22.65	14.53	20.08	3.85
7.	Vellachikulam	4	22.90	25.19	12.21	31.24	8.34
	Pooled	5	28.22	29.89	15.20	22.44	4.25

Table 11. Livestock population at ORP, Ozhalapathy

Name of watershed	Bull-ocks	Cows	Calves	Buffa-llows	Goats	Poultry	Total
Atteyampathy	147	73	98	25	12	24	379
Anipur	110	39	55	16	20	50	290
Bavajinagar	56	18	28	10	10	32	154
Kalliampara	132	48	24	18	8	41	271
Kerampara	108	40	54	14	8	5	229
Sathram	45	34	45	11	16	4	155
Vellachikulam	62	23	31	18	20	25	179
Total	660	275	335	112	94	181	1657

Table 12. Credit facilities at Kozhinjampara Firka

Name of panchayat	Name of agency	Remarks
Eruthempathy	Canara Bank, Eruthempathy	
Kozhinjampara	Chittur Agriculture Co-operative Society Kozhinjampara State Bank of Travancore, Kozhinjampara	The agriculture Development Bank, Thattamangalam also provides credit facilities to
Vadakarapathy	Indian Bank, Vadakarapathy, Canara Bank, Velanthavalam, Velanthavalam Service Co-operative Bank.	farmers in these panchayats

Table 13. Marketing facilities at Kozhinjampara Firka

Panchayats	Location of markets	Main crops	Periodicity of markets
Eruthempathy	Gopalapuram	Vegetables	Daily
Kozhinjampara	Kozhinjampara	All crops except cotton Sugarcane	Daily and weekly
Vadakarapathy	Velanthavalam	Vegetables	Daily

Table 14. Marketing channels at ORP, Ozhalapathy

Panchayats	Nearest location of market/ processing centre	Crops	Channels
Eruthempathy	Gopalapuram	Vegetables	B
	Neelam Katchi	Groundnut	F
	Menonpara	Sugarcane	E
	Pollachi/Coimbatore	Cotton	F
Kozhinjampara	Kozhinjampara	Vegetables	B
	Kozhinjampara	Groundnut	F
	Menonpara	Sugarcane	E
	Pollachi/Coimbatore	Cotton	F
Vadakarapathy	Velanthavalam	Vegetables	B
	Kozhippara	Groundnut	F
	Kuppanda Koundanar	Groundnut	F
	Kalliampara	Groundnut	F
	Velanthavalam	Groundnut	F
	Menonpara	Sugarcane	E
	Pollachi/Coimbatore	Cotton	F

A = Producer to Consumer

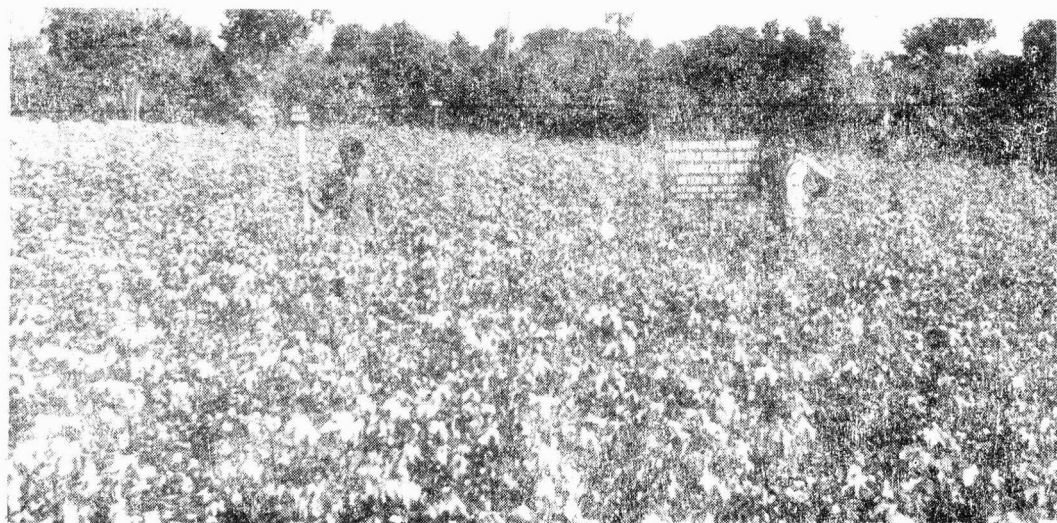
B = Producer to Commission agent

C = Producer in wholesaler

D = Producer to Retailer

E = Producer to Processing centre

F = Producer to Middleman to processing centre



*A Demonstration Plot on Cotton variety R. K. R - 4145*

The variety DCH-32 is also grown. Bollworm, jassids and whitefly are common pests. Cotton yields 1.1 tons seed cotton/ha. on an average. Sugarcane is grown under assured water supply. Seed setts are supplied by the nearby sugar factory at Menonpara. Harvesting starts from July onwards. Farmers prepare jaggery from the cane and sell at Pollachi. Cane is also supplied to sugar factory. The relative price of jaggery at Pollachi and price of cane offered from the factory are compared and marketing decisions made. Average yield of sugarcane is 90 tons/ha.

The watersheds in ORP Ozhalapathy are major areas for vegetable production. Good soil, availability of irrigation water and low humidity make vegetable cultivation a remunerative enterprise. Tomato is a major crop. The varieties like PKM-1, Marutham and Pusa Ruby are popular among farmers. Private seed companies supply major quantity of seeds. Farmers

use both organic manures and inorganic fertilizers for tomato cultivation. Leafcurl and early blight are the major diseases. Fruitworm and epilachna beetle are the common insect pests. The average yield of tomato is 18 tons/ha.

Bhindi is a major kharif crop. Pusa Sawani and MDU-1 are the popular varieties. Yellow-vein mosaic is a serious disease in this area. Fruit and shoot borer is the major insect pest. Average yield of bhindi is 4 tons/ha.

Cowpea is another important vegetable crop during kharif. Local varieties are grown here. Average yield is 3 tons/ha.

Besides chilli, brinjal and cucurbits are also grown in a sizeable area.

Sericulture is a growing enterprise in the locality. The Central Silk Board has an effective network for supply of layings and purchase of silkworm cocoons in addition to extending adequate technical guidance to farmers. The Indian Institute of

Table 15. Present productivity of crops at ORP, Ozhalapathy

Crops	Productivity (kg/ha)
Bhindi	4000
Cotton	1135
Cowpea	3000
Paddy	2463
Sugarcane	90000
Tomato	18000
Ground nut	1703

Table 16. Main crops and their area in the ORP and Kozhinjampara Firka of Palakkad Dist

Crops	Area (ha)	
	ORP	Kozhinjampara Firka
Coconut	24.60	581.72
Cotton	61.12	2064.04
Fodder	22.80	NA
Groundnut	307.72	3854.14
Millets	105.72	1475.82
Mulberry	1.20	12.30
Paddy	144.36	4584.24
Pulses	25.44	789.06
Sugarcane	33.68	2576.03
Vegetables	66.72	533.26
	793.36	16470.61





*A Cotton Experimental Plot in Cultivators field.*

Management, Bangalore conducted a study on feasibility of sericulture and reported that income from sericulture is Rs. 6,400/- per ha. which is above the net income obtained from crops like jowar, pulses, maize and potato. Still there are only a few farmers who practice sericulture with seriousness.

### **CRITICAL ASSESSMENT OF THE LOCATION**

The Kozhinjampara Firka is being assessed for potential for high technology transfer. Availability of labour, reasonable labour productivity, physical facilities, roads and market places and main occupation of the people were considered (Table 17). Except for irrigation facilities all around the year, other physical resources are very congenial for technology transfer. The natural resources favouring agriculture in the ORP area are given in Table 18. The confirmed constraints limiting productivity

of crops at the three panchayats are irrigation, good seeds, and non-availability of scientific package of practices (Table 19). The productivity of labour is relatively high at this tract (78 kg/manday). The cost of labour/manday being low compared to other parts of state, cost benefit ratios in crop production are definitely favourable (Table 20).

A good number of Governmental agencies are operating at Kozhinjampara Firka (Table 21). Availability of farm credit at door steps is a positive factor for better technology transfer. The unit cost of production of different vegetables and other crops are relatively favourable (Table 22).

### **IMPACT OF OPERATIONAL RESEARCH PROJECT**

The operational research project completed three years of its function. A benchmark survey covering all farm families in

watershed area was initially conducted. A few aspects on which the ORP made some impact are given below:

### Soil and water conservation

During 1984 to 1987, about 536 ha. of cultivated land were levelled and terraced, 1.29 lakh running meters of farm bunds were strengthened and 209 farm wells, renovated in the watershed area. The land development works benefitted the cropping scenario considerably. The yield of groundnut and tomato improved remarkably during this period (Table 23). There are at present 252 wells in the area. The average depth of a well comes to 20 m. Most of the wells remain dry during major part of the year.

### Crop demonstrations

Several adaptive trials were conducted in the ORP area using promising varieties of crops like maize, sorghum, redgram, ragi,

cotton and vegetables. These varieties recorded increase in yield by 78% over the traditional varieties. Mean performance of a few promising varieties and local checks are given in Table 24.

### Crop introduction

The selection of crops and varieties in the past was governed by needs of the farm family rather than suitability of crop for the area. The demonstrations conducted by Operational Research Project, Ozhalapathy played a significant role in popularising crops which are comparatively low in their water requirement. The area under these crops have increased significantly in the recent years (Table 25).

### Farm forestry

Lands not suitable for crop production can be utilised for raising pastures, agro-forestry etc. with an intention to

Table 17. Potentials of Kozhinjampara Firka for Agriculture

Resources	Eruthempathy	Kozhinjampara	Vadaharapathy
Availability of labour	+	+	+
Resonable labour productivity	+	+	+
Roads and other transporting facilities	+	+	+
Nearness to markets	+	+	+
Irrigation facilities	—	—	—
Drainage facilities	+	+	+
Main occupation of people	+	+	+

+ = Positive,

- = Negative

Table 18. Water resources favouring agriculture in the ORP area

Name of watersheds	Irrigation system		Soil type
	Borewell/well	Ponds	
Anipur	23	2	Sandy clay
Atteyampathy	40	2	Sandy clay
Bavajinagar	34	3	Sandy clay
Kalliampara	34	4	Sandy clay
Kerampara	55	5	Sandy clay
Sathram	35	4	Clay loam
Vellachikulam	31	3	Sandy clay

educate farmers on alternate land use systems, two farm forestry demonstrations were laid out in the ORP area. Three thousand casuarina seedlings were planted in two plots, Casuarina plants yielded fuel wood of 2 tons/ha. in a sample harvest after three years. These demonstrations provided the impetus for undertaking farm forestry plantings and in 1986-'87 sixteen farm forestry planting programmes came up.

### Cropping pattern

The main crops grown in the ORP area are groundnut, cotton, and vegetables. The cropping patterns found are

- 1) Groundnut-Groundnut-Groundnut
- 2) Groundnut-Cotton-Groundnut

- 3) Paddy-Groundnut-Pulses
- 4) Groundnut-vegetables-Groundnut
- 5) vegetable-Cotton-Pulses

ORP played a vital role in changing the cropping pattern of the area to one that approaches optimum for the area. Increase in area under vegetables and millets is a remarkable achievement. Farmers usually grow long-duration varieties of paddy to meet their grain and fodder requirements. Crop failure in paddy is common due to erratic monsoon showers in kharif. At present the area under short-duration varieties of paddy have increased (Table 26).

Presently the ORP is concentrating on the introduction of high-yielding varieties of remunerative vegetable crops and oil

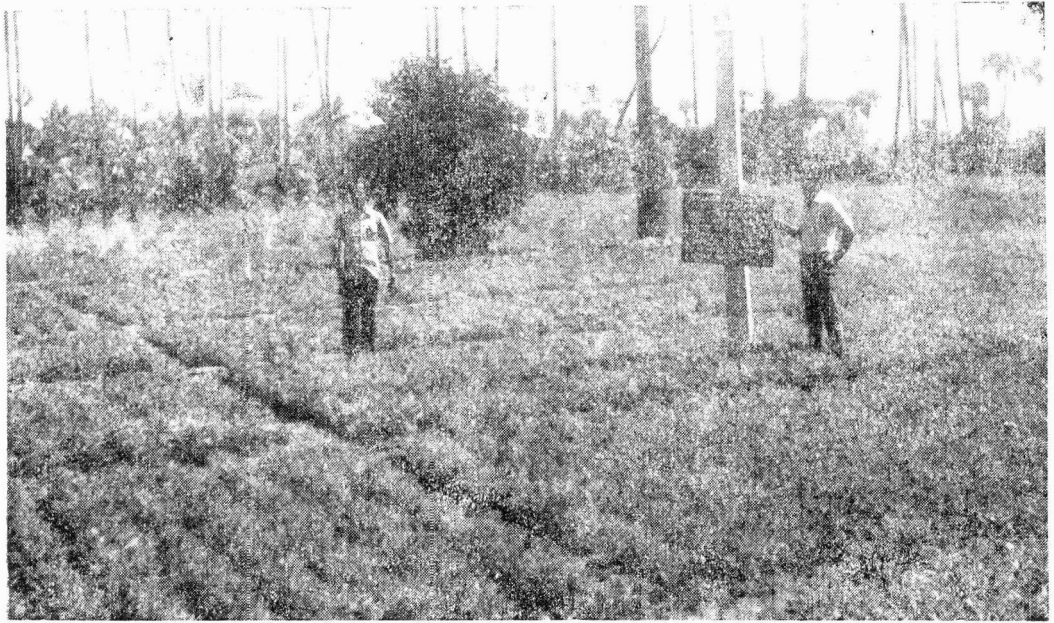
Table 19. Constraints limiting productivity of crops at Kozhinjampara Firka

Panchayats	Constraints		
	Irrigation	Non-availability of scientific Package of practice	
		Seeds	scientific knowhow
Eruthempathy	+	+	+
Kozhinjampara	+	+	+
Vadakarapathy	+	+	+

+ Confirmed constraint

Table 20. Productivity of labour in different crops at ORP Ozhalapathy

Crops	Productivity (Kg/manday)	Productivity (Rs./manday)	Cost of labour/ manday (Rs.)
Bhindi	53	53	15
Cotton	10	100	15
Cowpea	41	62	15
Groundnut	17	51	15
Sugarcane	232	65	15
Tomato	140	84	15



*A Fertilizer Trial Plot of Groundnut*

seed crops. The feasibilities for mixed farming, multiple cropping and relay cropping are being tested for enhancing farm income with the available resources. Expansion of area under sericulture is also being looked into. Efforts are also being made to introduce and popularise drought-tolerant fruit crops like ber, pomegranate and guava in the watersheds.

Theoretical exercises were done to substantiate economic viability of agriculture programmes in operation at ORP Ozhala-pathy. The data for the above exercises were collected from farmers/fields. The major vegetable crops being tomato,

cowpea and bhindi, data on these crops were utilised. The nutritional requirement of about 442 people could be met from 1ha. of tomato per year (Table 27). There is high prospects for growing tomato in the location. Data are also collected on components of total cost of cultivation for bhindi, cotton, cowpea, groundnut, sugarcane and tomato. Cost of labour ranges from 43.28% in cotton to 63.38% in sugarcane. Vegetables are the highly manured crops. Plant protection cost is negligible in groundnut, but the highest in cotton (Table 28).

Table 21. Agencies involved in rural development at Kozhinjampara Firka

	Agency	Location	Remarks
Agriculture	Krishi Bhavan	Eruthempathy, Kozhinjampara, Vadakarapathy.	
Animal husbandry	Veterinary hospital	Eruthempathy, Kozhinjampara, Vadakarapathy.	
Health	Govt. Hospital	Kozhinjampara	
	Primary health centre	Ozhalapathy	
	India population project office	Kuppanda Koundanur	
	Integrated child development scheme	Offices in all wards	
Forestry	Forest Range office	Walayar	No office in Kozhinjampara Firka
Finance	Agriculture Development Bank	Thattamangalam	No office in Kozhinjampara Firka
	Canara Bank.	Velanthavalam Eruthempathy	
	Chittur Agri. Co-operative society	Kozhinjampara	
	Indian Bank	Vadakarapathy	
	Velanthavalam Service Co-operative Bank	Velanthavalam Ozhalapathy	

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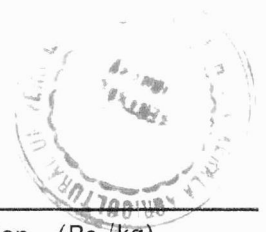


Table 22. Unit cost of Production of crops at ORP, Ozhhalapathy

Crops	Cost of production (Rs./kg)
Bhindi	0.73
Cotton	4.35
Cowpea	0.87
Groundnut	1.76
Sugarcane	0.15
Tomato	0.25

Table 23. Yield of groundnut and tomato in the watershed area before and after land levelling

Crop	Average yield (kg/ha.)		% increase in yield
	Before land levelling	After land levelling	
Groundnut	1002	1703	70
Tomato	14800	18100	22

Table 24. Performance of promising varieties of crops in the ORP area

Sl. No.	Crop and variety		Yield (kg/ha.)	Percentage of increase in yield	
1.	Maize	—	Local check (Co-1)	2856	54.69
			Pioneer - 1	4418	
2.	Sorghum	—	Local check (Co-25)	1518	55.40
			Koilpetty tall	2359	
3.	Redgram	—	Local Co-3	423	49.87
				604	
4.	Ragi	—	Local Co-12	1955	77.80
				3476	
5.	Cotton	—	Local check (MCU-5)	1343	61.95
			DCH-32	2175	



A Varietal Trail Plot of Chillies

Table 25. Level of adoption of new crop varieties

Sl. No.	Name of crop	Area adopted (ha)		No. of participating farmers	
		1983-'84	1986-'87	1983-'84	1986-'87
1.	Sorghum	—	16.0	—	48
2.	Maize	—	24.8	—	95
3.	Fodder sorghum	8.16	22.8	40	64
4.	Redgram	—	8.8	—	52
5.	(Ragi Co-12)	—	4.16	—	22

Table 26. Change in area under different crops in the watersheds

Sl. No.	Name of crop	Area in hectares	
		1983-'84	1986-'87
1.	Paddy	227.4 (LD)	144.36 (SD)
2.	vegetable	31.0	66.72
3.	Millets	21.2	105.72



Table 27. Carrying capacity of different vegetables grown at ORP, Ozhalapathy

Nutrients	FAO/WHO Requirements (g)		Contribution of vegetables (g) per year	Number of consumer/ha/year		
	Per day	Per Year		Tomato*	Cowpea	Bhindi
Calcium	0.5	183.00	61.00	118	78	86
Iron	0.009	3.30	1.70	381	88	70
Carotene	0.0015	0.50	0.50	—	—	—
Vitamin C	0.03	11.00	11.00	1014	70	94
Protein	37.00	13,500	2700.00	253	95	56
			Average	442	83	77

\* No. of consumers is arrived by taking average yield of tomato equal to 18 tons/ha., Cowpea 3 tons/ha., Bhindi 4 tons/ha. and by assuming that two crops are grown in a year



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## CONCLUSION

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Intensive research in dry land areas has clearly established that success of dry land technology depends on effective rain water management. Watershed management is the only answer for the effective utilisation of rain water. The major activities in the watersheds include land treatment, conservation structures, crop production, afforestation and pasture development, runoff harvesting and use and creation of income generating activities.

In this O. R. P. major thrust was given on land treatment and crop production. Under land treatments 72% of the area in the watersheds were levelled, 1.29 lakh running metres of field bunds were strengthened and 82% of the wells were renovated using the funds under the National watershed Development Programme (N. W. D. P.) implemented by the State Department of Agriculture and Soil Conservation. These land development activities have helped to conserve the rain water in the watershed area to a great extent.

As a part of the crop production programme many adaptive trials, crop demonstrations and demonstrations on water saving irrigation methods like drip irrigation were conducted by this O. R. P. Based on the results of adaptive trials seeds of crop varieties suited to the tract were procured and distributed to the beneficiaries in the watershed area by the State Department of Agriculture under N. W. D. P. Improved technologies disseminated through crop demonstrations have had its impact and the

farmers show interest in adopting such practices. The percentage increase in yield ranged from 55 to 78% for different crops. Some major components of watershed management like afforestation and pasture development and livestock improvement could not be covered satisfactorily due to administrative reasons.

During the course of implementation of the project it became evident that newly introduced components of work, required research support. Dearth of facilities for conducting crop based research was felt since technologies suitable for the rainshadow region are to be generated afresh. The technological package going into the watershed should conform to the socio-economic requirements of the beneficiaries. This would ensure participation of farmers and make the project successful.

Since watershed development aims at developing the area in an integrated manner proper co-ordination between different line departments is essential. Each activity is interlinked with the other and has a definite role in creating an impact on the overall development.

The facts and figures in this study will form a base for the future developmental activities in the rainshadow region. More over this study will help in identifying lacunae in the implementation of watershed development projects which can be avoided while implementing such projects in future.

