



CHANGES IN EMPLOYMENT AND INCOME OF FARMERS THROUGH WATERSHED PROGRAMME – A CASE STUDY

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Water is undoubtedly a biological need of all the living things. It is one of the most important natural resources and is vital for the socio-economic system and sustainable socio-economic development. Through water availability depends on different climatic conditions it is a renewable resource. The majority of the population in rural India depends on agriculture and the agricultural rural area depends on the availability of natural resources. More water resources may be generated through the Watershed Programme in rainfed areas.

Watershed is a geohydrological unit draining at a common point by a system of streams. It is a land and water area, which contributes run-off to a common point. It is a land area that captures rainfall and conveys the overland flow and run-off to an outlet in the main flow channel. Watershed is a biological, physical, economic and social system. It is a landmass bounded vertically, by the area influenced by human activities and horizontally by water and drains into a point in the channel. Soil, water and vegetation are the most vital natural resources of the watershed. Judicious and effective management of soil, water and vegetation in the watershed can ensure the sustained productivity of food, fuel, fodder, fiber, fruit and small timber.

In the post Green- Revolution period the trust of Indian Agriculture is on enhancement of agricultural productivity through sustainable practices. To achieve this end, one of the major initiatives undertaken by the Government of India was the implementation of a national level programme for the development of rainfed areas through the watershed approach. The watershed approach aimed at augmentation and stabilization of production and productivity, minimizing ecological degradation, reduction in regional disparity, opening up on greater opportunities for employment of rural poor in the rainfed areas. In the recent years, the watershed Programme is being undertaken extensively by both national and International donors, as a means of addressing land degradation, drought and poverty. It includes developing appropriate land use and economic strategies that meet both the conservation and production needs.

The Watershed Programme is the conservation and regeneration of an entire catchment area of a drainage line through different physical and vegetative measures. The objective is to prevent soil erosion and increase soil moisture



content, increase the ground water level and conserve the biomass cover of the soil. It results in improved land productivity; ensure availability of water for protective irrigation and the increased fodder, fuel, fiber availability. Watershed programme activities may also result in doubling of the annual yields as well as in adopting improved technologies, diversified land use pattern and other economic activities like dairy development programmes.

Importance of watershed programme:

The watershed programme is the basic need for integrated development and management of the land and water resources which provide life support for rural communities and the prospects for agriculture in the dry land areas are severely constrained by the specific features of their natural resource endowment and the changed context. In a situation of low pressures on resources, viability was possible through traditional land cultivation practice. Watershed program me ensures supply of water to every field, removes hunger and poverty from poor areas, provide green cover denuded areas, bring in more rains and improve the environment. Watershed programme is also described as a programme that holds the key to solve problems of employment, economy, ecology, export and quality.

After India's Independence, the importance to execute authority at village level has gradually declined in India due to changes in policies in the democratic setup and liberalization of spirit of freedom. This led to vegetation in rural areas leading to deterioration in environment through soil degradation. Hence, Government of India and different provincial Governments took up amelioration measures such as, afforestation measures, soil conservation measures, run-off water utilization programmes etc. However, expected results did not forth come on constant and continuous basis. Therefore, Government of India launched Watershed Development Programme (WDPs) in 1983-84 in a big way to conserve and utilize natural development programme and higher socio-economic status. Up-scaling of watershed development programme was carried out by spending about Rs. 100,000 millions per annum since then till now. The impact of water shed is evaluated for evolving better strategies and policies to preserve conserve and utilize natural resources for betterment of ever growing population.

In the changed circumstances with the high pressures on agricultural resources, the required high resources use intensity for high productivity with conservation and possible through traditional measures. This requires application of modern science and technology blended with the rationale practice. The necessity for purposive measures to check soil erosion, improve the moisture retention capacity and the natural fertility of the soil. The central Government has been implementing various programmes based on watershed approach such as DPAP and DDP since 1987, IWDP in 1989 and NWDPR and Hariyali in 1995.



In the light of watershed programmes, some earlier studies are briefly reviewed below:

The concept of Watershed Development in India has been proposed by Sri (late) Y.P.Bali in 1974. Seth(2000) in his paper on “Watershed Management in India, stated watershed management would remove hunger and poverty from poor areas and watershed management would restore ecological balance, provide green cover over denuded areas, bring in more rains and improve environment.

Hanumantha Rao (2000), based on a qualitative assessment of the impact of the DPAP, noted that the Impact of the programme was positive and significant especially in drought-affected areas.

Vohra (2001) suggested that the problem of water scarcity can be eased to a great extent by water harvesting techniques which are economical and can be taken up with people’s participation.

Palanisami, et al. (2002), reported that watershed programmes did not perform well in terms of controlling reservoir siltation, mitigating the impact of drought and improving / stabilizing the production of crops (like pulses and oil seeds) generally grown in rainfed areas. The production of many rainfed crops fluctuated depending on the pattern and quality of rainfall.

Reddy et.al (2004) conducted a survey on 37 watershed locations under different agro-eco regions in India during 2001. The analysis of the survey indicated that there was an increase in all factors in watershed area villages compared to non-watershed area villages. However, they found that there are no significant differences among the project implementing agencies. The investigators recommended that non-government organizations are to be encouraged to take up watershed programme works on their own funds only.

Singh (2004) examined the performance of watershed programmer managed by Government Organizations (GO) and Non-Government Organization (NGO) in adopted areas of Ranchi district and west Singhbhoom districts of Jharkhand. The study suggested that in order to evolve participation at local level within watershed area publicity material may be used and training programmes should be organized at the village level to acquaint the farmers about the largest knowledge, improved technology and their advantages. Overall the performance of non-government organizations was found to be better than the Government Organizations.

In a seminar report on “Water Resource Management in India” Satyasundaram (2005) highlighted the role of water management in the development of Indian economy. He also stated that ground water has played a prominent role as a primary source of domestic water supplies in rural and urban



areas. He suggested that there is a great need for farmer's participation in irrigation management and urbanization.

Ramappa et al. (2008) made a micro-level study on Watershed Development and its impact in Anantapur district. The authors revealed that watershed development works alone cannot improve the position of farmers. They suggested that the efforts must be made to divert water from surplus basins to drought-prone areas and rain fall must be augmented either by cloud seeding or by some other method. So that the productivity levels of different crops grown in drought-prone areas can be enhanced.

According to the study of Lubell, Mark, William D. Leach, and Paul A. Sabatier, 2009, collaborative watershed partnerships are one of the pillars of the sustainability epoch. It is hard to argue with this statement given the massive growth in watershed partnerships in the last twenty years, with concomitant excitement about the approach from scholars, practitioners, and politicians. Kenny (2001, 188) states emphatically that collaborative partnerships are "the most significant and exciting development in natural resources management since the environmental movement of the 1960s and 1970s."

Watershed restoration requires three goals be met.

- Building human and social capital,
- Development and adoption of watershed management plans,
- Implementation of specific projects (restoration, monitoring, outreach, education).

If watershed groups focus on too narrow of an area they may ignore many of the causes of the problems they are trying to address.

According to Singh et al. 2010, despite the growth in WSD projects and funding over the past thirty years, it is unclear how successful WSD has been. Government and third party evaluations of WSD to date have lacked consistency both in data collection and methodology. The Parthasarathy Technical Committee report found that the quality of data has been highly variable across WSD projects. The Parthasarathy report also found evaluations lacked a rigorous methodology. In terms of data collection, evaluations tend to focus on aggregating project-level data, reporting on key biophysical and welfare indicators, and making recommendations. For example, the MoRD commissioned the Centre for Rural Studies (CRS) to evaluate WSD programs between 1998-2002. This study used government and third party reports and based WSD effectiveness on results from a cross-comparison of indicators including (but not limited to) groundwater level, surface water, irrigation facility, water regeneration capacity, land use pattern, cropping pattern, livestock production, employment generation, income generation, and debt reduction. Third-party evaluations have also followed this trend. While overall, evaluation efforts have been useful for gaining a general sense of WSD performance and have



justified significant expansion of funding and projects, better valuation and guidance for data collection could shed light on how to better target WSD funding, how to optimize WSD interventions to produce the greatest benefits to society, and how to stimulate local investment.

According to Ahmad et al., (2011), Watershed Development (WSD) in India has been a part of the national approach to improve agricultural production and alleviate poverty in rainfed regions since the 1970s. Watershed Development programs aim to restore degraded watersheds in rainfed regions to increase their capacity to capture and store rainwater, reduce soil erosion, and improve soil nutrient and carbon content so that they can produce greater agricultural yields and other benefits. As the majority of India's rural poor live in these regions and are dependent on natural resources for their livelihoods and sustenance, improvements in agricultural yields improve human welfare while simultaneously improving national food security.

As per Planning Commission view 2012, Watershed Development programs focus on rainfed regions because these areas represent 65.00 percent of arable land in India and 55.00 percent of the country's agricultural output, and provide food that supports 40.00 percent of the nation's population. These areas, however, are characterized by low productivity, due to both geographical and climatic conditions, and also due to a history of poor land management. Despite these challenges, the Department of Land Resources states, "While it is the rainfed parts of Indian agriculture that have been the weakest, they are also the ones that contain the greatest unutilized potential for growth, and need to be developed if food security demands of the year 2020 are to have a realistic chance of being met."

According to Talberth et al. (2013) the decision-support tools like Benefit-Cost Analysis (BCA) can be used to help development decision-makers decide on public infrastructure investments, including both ecosystem (or green infrastructure) and man-made (or gray infrastructure) components. As WSD promotes restoration and conservation of ecosystems for provision of ecosystem services, valuation can potentially be used to decide on portfolios of WSD interventions and target funding. There are well-established valuation methods that can capture both market and non-market benefits of ecosystems, including agricultural productivity increases, water filtration and storage, biodiversity and habitat improvement, and health improvements due to better nutrition and water supply. Benefit-Cost Analysis and other decision-support tools can capture these benefits and allow comparison with project costs. As a result, valuation can provide decision-makers with a more holistic picture for how to develop WSD programs.

All the above studies are highlighted in their own dimensions.



Need of the present Study:

Since the watershed programme completed 13 years of implementation, it become pertinent to examine its impact at the community and household level in terms of achievements of its objectives. Few studies have been conducted in this sphere, which points to need for a greater number of micro-level studies. The present study is a modest attempt in this direction.

The above review of literature shows that there is a gap in examining the various aspects of Watershed Programmes in a drought prone district like Chittoor. Recurrent drought and famines have been stalking this district of the past ten decades. The normal rainfall of the district is 552.0 mms, the least rainfall when compared to Rayalaseema and other parts of Andhra Pradesh.

In view of the lack of water resources, it is essential to study Changes in Employment and Income of Farmers through Watershed Development Programme in the rural community. There has been a lesser concentration by the researchers to study the various aspects of watershed programme, in Chittoor District. A detailed study is necessary to know changes in cropping pattern, Employment and Income generation of households, in the watershed areas, to examine the ground water levels after the watershed programme, and to assess the socio-economic transformation of farmers.

Objectives:

To examine the changes in employment and income of farmers through watershed programme in a drought prone mandal of Palasamuram Mandal of Chittoor district in the Chittoor District of Andhra Pradesh. An attempt is made here to undertake a 'micro-level analysis', with the objectives

- To assess the impact of watershed programme on agriculture
- To analyze the income and employment generation of farmers through watershed programme.

To assess the changes in employment and income of farmers through watershed programme, the study is considered the two periods, i.e., before and after implementation of watersheds programme.

Watershed programme was launched in 1995-96 in Palasamuram Mandal. The information related to the cropping pattern, income and employment generation before and after the implementation of the watershed programme, was collected and compared at the household level. The data was collected in the year 2013. The farmers who could receive the water for the agricultural purpose from the watershed works during the year 2010-2013, alone were selected for the present study.

Sampling:

The two stage random sampling method was adopted for collecting the primary data. In the first stage, three watersheds were selected among the 18



watersheds and in the second stage 40 beneficiaries each, altogether 120 beneficiaries were selected. The watersheds selected were Palasamuram watershed, S.Kaverirajapuram watershed and Krishnajemmapuram watershed. The data related to sample beneficiaries were collected on the different aspects like cropping pattern; employment generation (in man-days) and income (in Rs.) were collected from the samples before and after implementing the scheme.

To fulfill the objectives of the study, it is proposed to test the significance difference between the two periods before and after in case of employment and income generation. Period-t Test was used. The following formula is paired-t Test:

$$t = \frac{\bar{d}}{s/\sqrt{n-1}} \rightarrow (n-1) \quad \text{Where } d = \text{difference in income / employment}$$

$$\bar{d} = \frac{\sum di}{n}, \quad s = \sqrt{\frac{\sum d^2}{n} - (\bar{d})^2}$$

Analysis:

It was examined the effect of watershed programme in Palasamuram mandal with the help of primary data relating to category and caste wise distribution of sample. The selected farmers under the selected watersheds are collected on same aspects like category and caste of farmers, and cropping pattern (before and after implementation of watershed programme), employment and income opportunities are analyzed with the help of paired-t Test.

The farmers are classified into four categories. i.e., (i) Marginal Farmers (Below 2.47 acres) (ii) Small Farmers (2.48 acres to 4.93 acres) (iii) Medium Farmers (4.94 5 to 9.87 acres) (iv) Large Farmers (9.88 to 24.7 acres). The table 1 shows the caste wise and category wise distribution of farmers under watershed programme in Palasamuram Mandal.

Table-1: Category-Wise and Caste –Wise Distribution of Selected Farmers

S. No	Category of the farmers	Caste				Total
		SC	ST	BC	Others	
1	Marginal farmers	9 (30.00)	11 (36.7)	11 (36.7)	9 (30.00)	40 (33.30)
2	Small Farmers	9 (30.00)	6 (20.00)	6 (20.00)	13 (43.30)	34 (28.30)
3	Medium farmers	7 (23.30)	10 (33.30)	6 (20.00)	5 (16.70)	28 (23.30)
4	Large farmers	5 (16.70)	3 (10.00)	7 (23.30)	3 (10.00)	18 (15.00)
Total		30 (100.00)	30 (100.00)	30 (100.00)	30 (100.00)	120 (100.00)

Source: Primary data from the field survey. (Figures in Brackets are percentage to totals)



From Table-1 it is observed that, while considering the total farmers in each category, the highest percentage (33.30) was recorded under marginal farmers category followed by small, medium and large farmers respectively. The highest percentages (43.30) of farmers were recorded under small farmers followed by marginal, medium and large respectively under other caste. Similarly, under backward casts, marginal farmers occupied first place (36.70 percent), followed by large farmers, small farmers and medium farmers. Among the scheduled castes, the percentage of marginal farmers and small farmers are more (30.00 percent) followed by medium and large farmers respectively. In the scheduled tribes community, the Marginal farmers percentage is slight (36.70 percent), followed by medium, small and large farmers respectively.

Sources of Irrigation before and after the Implementation of Watershed Programme

The table 2 shows the sources of irrigation for selected farmers before and After the Implementation of Watershed Programme in Palasamudram mandal.

Table – 2: Source of Irrigation for Selected Farmers before Implementation of The Watershed Programme in Palasamudram Mandal

S. No	Name of the Asset	Before Watershed Programme	After Watershed Programme
		No. of Farmers	No. of Farmers
1	Open Wells	57 (45.00)	12 (10.00)
2	Bore Wells	13 (10.83)	69 (57.50)
3	M.I. Tank	18 (15.00)	35 (29.17)
4	River Stream Canals	32 (26.67)	4 (3.33)
Total		120 (100.00)	120 (100.00)

Source: Primary data from the field survey. (Figures in Brackets are percentage to totals)

As per the Table 2, it is found that 45.00 per cent of the farmers have irrigated their lands under open wells, 26.67 per cent of the farmers have irrigated their lands under river stream canals, 15.00 per cent of the farmers have irrigated their lands under Minor Irrigation Tanks and 10.83 per cent of the farmers have irrigated their lands under bore wells before the implementation of watershed programme in the mandal.

As per the Table, it is found that 10.00 per cent of the farmers have irrigated their lands under open wells, 57.50 per cent of the farmers have irrigated their lands under Bore wells, 29.17 per cent of the farmers have irrigated their lands under Minor Irrigation Tanks and 3.33 per cent of the farmers have irrigated their lands



under River stream canals after implementation of watershed programme in the mandal.

It is observed that 86.67 per cent of the farmers have irrigated their lands under bore wells and minor irrigation tanks due to increase of groundwater levels after implementation of watershed programme in the mandal.

Particulars of Cropping Pattern (Before)

The cropping pattern of selected farmers before Implementation of Watershed Programme in Palasamudram mandal is presented in table 3

Table – 3: Cropping Pattern of the Sample Farmers before Implementation of Watershed Programme on Palasamudram Mandal

S.No	Name of the crops	No. of farmers	Percentage to total
1	Rice	26	21.67
2	Jowar	32	26.67
3	Bajra	23	19.16
4	Ragi	21	17.50
5	Black Gramme	18	15.00
Total		120	100.00

Source: Primary data from the field survey.

The table 3, shows that out of 120 sample farmers 26.67 per cent of the farmers have cultivated Jowar followed by 21.67 per cent cultivated Rice, 19.76 per cent cultivated Bajra, 17.50 per cent is Ragi and 15.00 per cent of the farmers have cultivated Black Gramme before implementation of the implementation of watershed programme in the mandal.

Change in Cropping Pattern after implementation of watershed programme

The cropping pattern of selected farmers after the Implementation of Watershed Programme in Palasamudram mandal is presented in table 4.

Table – 4: Change in Cropping Pattern of the Sample Farmers after Implementation of Watershed Programme in Palasamudram

S. No	Name of the crops	No. of farmers	Percentage to total
1	Chilies	42	35.00
2	Sugarcane	21	17.50
3	Sunflower	18	15.00
4	fresh and Dry fruits	29	24.17
5	Groundnut	10	8.33
Total		120	100.00

Source: Primary data from the field survey.



The table 4 shows that out of 120 sample farmers, 42 farmers (35.00 per cent) have cultivated Chills, 29 farmers accounting to 24.17 per cent have cultivated Fresh and Dry Fruits, Sugarcane is the third major crop cultivated by 21 farmers (17.50 per cent) sunflower is cultivated by 18 farmers (15.00) and 10 farmers (8.33 per cent) cultivated Groundnut in the mandal.

It is observed that farmers have cultivated only minor millets crops and pulses before implementation of watershed programme and after implementation of watershed programme the farmers changed their cropping pattern and cultivated commercial crops due to availability of water facility. So there is tremendous change in the cropping pattern after implementation watershed programme in the mandal.

The employment generation of selected farmers before and after watershed programme is given in table -5

Table – 5: Employment Generation of the Selected Farmers under Watershed Programme

S. No	Man days of Employment	Category of the farmers				Total No. of farmers	Percentage to total
		MF	SF	MdF	LF		
Before Implementation of Watershed Programme							
1	0 to 100 days	20	7	15	6	48	40.00
2	101 to 180 days	17	22	9	8	56	46.67
3	181 to 240 days	3	5	2	3	13	10.83
4	above 240 days	0	0	2	1	3	2.50
	Total	40	34	28	18	120	100.00
After Implementation of Watershed Programme							
1	0 to 100 days	0	0	0	0	0	0.00
2	101 to 180 days	3	0	0	0	3	2.50
3	181 to 240 days	5	6	6	4	21	17.50
4	above 240 days	32	28	22	14	96	80.00
	Total	40	34	28	18	120	100.00

Source: Primary data from the field survey.

Note: SF: Small Farmers, MF: Medium Farmers, MdF: Marginal Farmers and LF: Large Farmers

From the table 5, it is found that 46.67 per cent of the farmers comprising of all categories had 101 to 180 mandays of employment. 40.00 per cent of the total farmers had below 100days of employment. 10.83 per cent of the total farmers had employment between 181 and 240 days as against 2.50 per cent of the farmers comprising all groups have employment of 240 mandays and above. It is found that



there are no marginal and small farmers with employment generation of above 240 days before implementation of watershed programme in the mandal.

From the above table, it is found that after watershed programme none of the farmers comprising of all groups have employment of less than 100 days as against 40.00 per cent of the farmers before watershed programme. It shows that there has been a shift in the mandays of employment through the watershed programme. After watershed programme 2.50 per cent of the farmers have employment between 101 and 180 days. It clearly shows that after the watershed programme 97.50 per cent of the sample farmers have an employment of 181 days and above as against 13.33 per cent have got the same number of days of employment before the watershed programme in the mandal.

Change in Employment Levels after watershed programme

The Category Wise Change in employment levels of sample farmers is given in table 6.

Table -6: Changes in Annual Employment of the Selected Farmers after Implementation of Watershed Programme in Palasamudram Mandal

S.No	Man days of employment	Category of the farmers				No. of farmers Benefited (+)
		MF	SF	MdF	LF	
1	0 to 100 days	-20	-7	-15	-6	-48
2	101 to 180 days	-14	-22	-9	-8	-50
3	181 to 240 days	+2	+1	+4	+1	+8
4	above 241 days	+32	+28	+20	+13	+93
Total		+34/40	+29/34	+24/28	+14/18	+101/120
Paired t – test was calculated for the above categories						
1	Mean Value	16232.5	13391.2	16271.4	13488.9	15025.0
2	Std. Deviation	48.35	45.13	72.21	55.69	56.17
3	Std. Error Mean	7.64	7.74	13.65	13.12	5.13
4	t - Value	21.23	17.30	11.92	10.27	29.30
5	t – table value	1.96	1.96	1.96	1.96	1.96
6	Sig. (2 tailed)	0.00	0.00	0.00	0.00	0.00

Source: Primary data from the field survey.

Note: SF: Small Farmers, MF: Medium Farmers, MdF: Marginal Farmers and LF: Large Farmers

Table 6 shows the employment levels of the selected farmers before and after the implementation of watershed programme in the selected mandal. The farmers with employment level below 240 days have been decreased and with high employment level i.e., above 241 days have been increased.



In order to know whether the increased employment of the farmers after the implementation of watershed programme is significant or not, Paired t-test was applied to all the categories. By the t-test statistic, it is inferred that there exists a significant difference in mean employment of farmers before and after implementing the scheme at 5% probability level. As the calculated t value for Marginal Farmers, Small Farmers, Medium farmers and Large Farmers categories is positive and it is statistically significant. It is inferred that, the watershed programme have significant change on the employment levels of the selected farmers in the mandal. Therefore, it is inferred that by launching the watershed programme employment may be generated in farm community at significant level. Hence, it is suggested that rigorous implementation of watershed programming the farm community may be uplifted.

Income Generation before and after implementation of Watershed Programme

Table 7 shows that the Income levels of selected farmers before and after implementation of watershed programme in Palasamudram mandal.

Table – 7: Income Generation of the Selected Farmers before Implementation of Watershed Programme in Palasamudram Mandal

S. No	Income level	Category of the farmers				Total of farmers	Percentage of total
		MF	SF	MdF	LF		
Before Implementation of Watershed Programme							
1	Below 25000	5	7	8	0	20	16.67
2	25000 to 50000	34	26	19	14	93	80.00
3	50000 to 75000	0	0	1	3	4	3.33
4	75000 to 100000	1	1	0	1	3	2.50
5	100000 above	0	0	0	0	0	0.00
	Total	40	34	28	18	120	100.00
After Implementation of Watershed Programme							
1	Below 25000	4	2	0	0	6	5.00
2	25000 to 50000	2	7	0	0	9	7.50
3	50000 to 75000	1	3	2	0	6	5.00
4	75000 to 100000	19	22	15	5	61	50.83
5	100000 above	14	0	11	13	38	31.67
	Total	40	34	28	18	120	100.00

Source: Primary data from the field survey.

Note: MF: Marginal Farmers, SF: Small Farmers, MdF: Medium Farmer and LF: Large Farmer

As per the Table 7 it is found that 16.67 per cent of the farmers have less than Rs.25000/- annual income, 80.00 per cent of the farmers have income between Rs.25000/- to Rs.50, 000/- annual income, 3.33 per cent of the farmers have income between Rs.50,000/- to Rs.75,000/- and 2.50 per cent of the farmers have income between Rs.75,000/- to Rs.100,000/-. It is found that there is no farmer with income level of above Rs.100000/- before implementation of watershed programme in the mandal.



As per the above table, it is found that 5.00 per cent of the farmers who have an annual income of less than Rs.25,000/- and same percentage of farmers have an income between Rs.50,000/- to Rs.75,000/-, 7.50 per cent of the farmers have income between Rs.25,000/- to Rs.50,000/- 50.83 per cent of the farmers have income between Rs.75,000 to Rs.1,00,000 and 31.670 per cent of the farmers have income of Rs.1,00,000/- and above.

It is found that after implementation of watershed programme all the farmers have been receiving more income through agriculture. After watershed programme, nearly 50.83 per cent of the farmers annual income ranges between Rs.75,000 to Rs.100,000 whereas the same income group percentage was only 2.50 per cent before the watershed programme and after watershed programme, 31.67 per cent of the farmers annual income is more than Rs.100000/- whereas the same income group percentage was zero per cent before the watershed programme in the mandal.

Changes in income Levels after Implementation of Watershed Programme

The Category wise Changes in income Levels of sample farmers is shown in table 8.

Table -8: Changes in Annual Income of the Selected Farmers after Implementation of Watershed Programme in Palasamudram Mandal

S. No.	Income Levels	Category of the farmers				No. of farmers Benefited (+)
		MF	SF	MdF	LF	
1	Below Rs.25000	-1	-5	-8	0	-14
2	Rs.25000 to Rs.50000	-32	-19	-19	-14	-84
3	Rs.50000 to Rs.75000	+1	+3	+1	-3	+5
4	Rs.75000 to Rs.100000	+18	+21	+15	+4	+58
5	Rs.100000 above	+14	0	+11	+13	+38
		+33/40	+24/34	+27/28	+17/18	+101/120
Paired t – test was calculated for the above categories						
1	Mean Value	52068.8	35067.6	62228.6	62588.9	51200.4
2	Std. Deviation	26778.44	19764.65	14459.49	17161.10	23573.28
3	Std. Error Mean	4234.04	3389.60	2732.58	4044.91	2151.93
4	t - Value	12.29	10.35	22.77	15.47	23.79
5	t – table value	1.96	1.96	1.96	1.96	1.96
6	Sig. (2 tailed)	0.00	0.00	0.00	0.00	0.00

Primary data from the field Survey

Note: MF: Marginal Farmers, SF: Small Farmers, MdF: Medium Farmer and LF: Large Farmer



Table 8 shows the income range of the selected farmers before and after implementation of watershed programme in selected mandal. The beneficiaries with income range of below Rs.25,000/- have been decreased and with high income range i.e., above Rs.25,000/- have been increased.

In order to know whether the increased income of the farmers after the implementation of watershed programme is significant or not, Paired t-test was applied to all the categories. By the t-test statistic, it is inferred that there exists a significant difference in mean employment of farmers before and after implementing the scheme at 5% probability level. As the calculated t value for Marginal Farmers, Small Farmers, Medium Farmers and Large Farmers categories is positive and it is statistically significant and it is inferred that, the watershed programme have brought significant change in the income levels of the selected farmers in the mandal. Therefore, by implementing the watershed programme in drought- prone regions it is noticed that the average income of the farmers is increasing. It is advised, to many watersheds may be constructed to rise the income of farmers in drought-prone areas in Chittoor Districts of Andhra Pradesh.

Conclusion

A Sustainable socio-economic development of rural areas depends on the availability of natural resources. The sustainable economic development is also possible through the agricultural development generation / optimal usages of water resources are the main factor for the development of agricultural sector. More water resources maybe generated through the watershed program in rainfed areas. It is the conservation and regeneration of entire catchments area of a drainage line. Through the different physical and vegetative measures. The present study reveals that the farmers living in the Palasamudram Mandal, Chittoor district benefits a lot from the watershed programme in terms of cropping pattern, Employment and income generation. It is observed that farmers have cultivated only minor millets crops and pulses before implementation of watershed programme and after implementation of watershed programme the farmers changed their cropping pattern and cultivated commercial crops due to availability of water facility. So there is tremendous change in the cropping pattern after implementation watershed programme in the mandal.

Rising of income levels are depending on raising levels of employment of sample beneficiaries. The employment is divided in four categories (table-5). The percentage of employment was decreased in first two categories and increased in the next two categories. By paired t-test statistic the significance of the difference in average employment was tested and it is inferred that there exists cum significant different in mean employment before and after the scheme. Therefore launching of watershed programme may generate significant employment to farm community. Hence, the farm community may be uplifted. Therefore it is noticed that the generated employment is uniform among caste and among the categories. Hence,



the Government may be advised to construct as many as watersheds in the drought prone areas like Palasamudram mandal of Chittoor district.

To analyze the changes in the income generation for selected farmers under watershed management programme in the study area, the generated income is divided into five levels (given in table-7). Comparing the income levels of farmers it is observed that the percentage of farmers decreased in first two levels from 16.67 per cent to 80.00 per cent and 5.00 per cent to 7.50 per cent where as in the next three income levels the percentage of farmers might be increased from 3.33 per cent, 2.50 per cent and 0.00 per cent to 5.00 per cent, 50.83 per cent and 31.67 per cent. By T-test statistics, income, before and after watershed programme, it inferred that there is significant increase in average income of farmers in study area. It is advised, to raise the income levels of the farmers the government may construct too many watersheds in drought prone area in Chittoor District.

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