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Impact of micro irrigation subsidies on natural resources and environment: experiences from World Bank funded Tamil Nadu Iamwarm project

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Abstract
Agricultural subsidies help the farmers to increase their welfare and increase production of various crops. There is an indirect link between the micro irrigation subsidies and the natural resources. The micro irrigation subsidies to the farmers increase the yield as well as reduce the water usage for various crops. This study analyzes the impact of micro irrigation subsidies on natural resources and environment. The results revealed that the yield of coconut, tomato, onion and maize was increased by 50 per cent, 26 per cent, 43 per cent and 36 per cent respectively also the of the percentage of water saved in maize, tomato and onion is around 25 per cent, 34 per cent and 32 per cent respectively. Thus this study shows the impact of micro irrigation subsidies in natural resources and environment.

Keywords: Agricultural subsidy, water usage, impact on natural resources

Introduction

A progressive agriculture serves as a powerful engine of economic growth of any country. In India agriculture represents a core part of our economy and provides food and livelihood activities to much of the Indian population. Agriculture and allied sectors accounted for around 14 per cent of the GDP in 2020 whereas during 1950-51 is was 51.9 per cent shows a steady decline of its share in the GDP, Still agriculture is the largest sector playing a major role in shaping the overall growth trajectories of the Indian economy since independence (Central Statistics Office, 2013).

Agricultural policy is the set of government decisions and actions relating to domestic agriculture and imports of foreign agricultural products. Governments usually implement agricultural policies with the goal of achieving a specific outcome in the domestic agricultural product markets. Subsidy the most powerful mechanism, that balance the growth rate of production and trade in various sectors and regions and for an equitable distribution of income for the protection of weaker sections of society. The value of sector wise estimated major subsidies in India were about Rs. 231083.52 crores for the year 2013-14. The cost of India's agricultural input subsidies as a share of agriculture output almost doubled from 6.0 percent in 2003-04 to 11.6 percent in 2009-10, driven mostly by large increases in the subsidies to fertilizer and electricity.

Agricultural Subsidies

Agricultural subsidies can play an important role in early phases of agricultural development by addressing market failures and promoting new technologies (Fan, 2008). [1] The farm subsidies are integral part of the policies supporting farming and farmers. Especially governments of developing countries like India give importance to subsidies to promote agriculture. The government policy of subsidy is very well for protection of the weaker sections and marginal farmers.The Indian farmers being poor and they were not in a position to buy the expensive inputs. Then the Indian government started the scheme of subsidies on the purchase of various agriculture inputs to facilitate the farmers. Fertilizer, Electricity, Irrigation and Insurance are the major subsidies given to farmers in India.Government of India pays fertilizer producers directly in exchange for the companies selling fertilizer at lower than market prices. Irrigation and electricity, on the other hand, are supplied directly to farmers by Government of India at prices that are below the cost of production.

India's expenditure on input subsidies has increased sharply in recent years. Fertilizer, electricity and irrigation were the major subsidies to the Indian farmers. In 1993-94 the value of fertilizer, electricity and irrigation subsidy was Rs. 4562 crore, Rs. 2400 crore and Rs. 5872 respectively at 1993-94 prices series. During the year 2009-10 the value of fertilizer subsidy was Rs. 52980 crore at 1999-00 price series. In 2008-09 the electricity and irrigation subsidies was Rs. 27489 crore and Rs. 23665 crore respectively.

TN-IAMWARM Project

The Tamil Nadu Irrigated Agriculture Modernization and Water Bodies Restoration and Management (TN IAMWARM) is a unique World Bank funded project implemented with the prime motive of maximizing the productivity of water leading to improved farm incomes and products. The broader objective of the project is to achieve sustainable economic growth as well as poverty alleviation through maximizing productivity of water. The IAMWARM project will support the investment in (1) Improving irrigation service delivery including adoption of modern water-saving irrigation technologies and agricultural practices (2) Agricultural intensification and diversification (3) Enhancing market access and agri-business opportunities, and (4) Strengthening institutions dealing with water resources.

Objectives of the study

The present study was made to find out the impacts of micro irrigation subsidies given in Tamil Nadu-IAMWARM scheme on farm and farmers with the focus on trade and environment. The specific objectives of the study were i) to find out the yield difference between the scheme and non-scheme farmers for major crops, ii) to find out the water usage in various crops and iii) to find out the impact of natural resources and environment.

Methodology

Study Area

The present study was conducted in Udumalpet region of Tiruppur district of Tamil Nadu where the TN-IAMWARM project implemented successfully. The total area under crop cultivation in Udumalpet block was 29595.21 ha among that 24469.69 hectares comes under irrigated area and the remaining 5125.54 hectares was rain fed area. So, majority of the study area were covered by irrigated conditions. Paddy, maize, onion, tomato, brinjal, Bengal gram and other pulses were the major crops cultivating in this region.

Sampling

Based on the objectives and for the purpose of study both primary and secondary data were collected. The farmers were categorized into TN-IAMWARM scheme (drip) and non-scheme (conventional) farmers. Separate questionnaires were prepared and the data regarding this study were collected from the farmers by administering pre-tested interview schedule. Five villages were selected purposively where the adoption of the scheme is widespread. From each village 6 scheme farmers and 6 non-scheme farmers were identified. Finally came up with the sample size of 60. The scheme drip farmers were identified through Water Technology Centre, TNAU and the non-scheme farmers were collected randomly in the same region.

Descriptive statistics

The simple percentages and averages were used to analyze the yield differences in cmajor crops.

Water use in each Crop

One of the objectives is to find out the water usage level in various crops between scheme and non-scheme farmers. The water applied for a particular crop in a season is estimated by using the following conversions and express in ha-cm (Singh, 1990) [5]. In order to examine the changes in the water applied for a particular crop in the season is estimated by the formula explained below.

$$\text{Water applied for a crop (ha-cm)} = \frac{\text{Area irrigated} * \text{No.of irrigation/crop} * \text{No.of hours/irrigation} * \text{Average water in liters L/H}}{101171.26}$$

Results and Discussion

Yield Differences

The differences in yield were calculated for coconut, tomato, onion and maize. The averages were taken and the results were shown in Table 1. The yield of coconut, tomato, onion and maize was increased by 50 per cent, 26 per cent, 43 per cent and 36 per cent respectively.

Table 1. Yield of study crops in the farms of scheme and non-scheme farmers

Sl. No	Coconut (nuts/year)		Tomato (tones/acre)		Onion (tones/acre)		Maize (tones/acre)	
	N S	S	N S	S	N S	S	N S	S
1.Yield	100	150	17.9	22.53	7.03	10.03	2.61	3.54
2. Percentage increasing	50		26		43		36	

NS – Non-Scheme, S – Scheme

Water Use in Various Crop (ha-cm)

To assess the water usage, the water usage level for some major crops like maize, tomato and onion were calculated. Compare to non-scheme farmers the water usage is low in scheme farmers. The results were shown in Table 2 and it depicted that the scheme (drip) farmers were using low quantity of water in a particular season. Comparing non-scheme farmers the water usage in maize, tomato and onion was reduced up to 25 per cent, 34 per cent and 32 per cent respectively.

Table 2. Water Usage of scheme and non-scheme farmers

Sl. No	Crop	Water Usage (ha-cm)		
		Scheme farmers (drip)	Non-Scheme farmers (non-drip)	Percentage saving
1.	Maize	26.33	35.27	25
2.	Tomato	20.34	30.92	34
3.	Onion	25.50	37.58	32

Impacts of Micro Irrigation Subsidy on Natural Resources and Environment

The effect of micro irrigation subsidy shows positive impact not only in individual farms but also there are positive impacts on the environment also. In conventional irrigation the wastage of water is more. Sivanappan (1994) [3], indicated that water saving is about 40–80% and the yield increase is up to 100% for different crops by using micro-irrigation. Table 3 shows the water usage level for various crops between the drip irrigated and conventional farms. The saving percentage of water in maize, tomato and onion is around 25 per cent, 34 per cent and 32 per cent respectively. Suresh Kumar, D and Palanisami, K. (2010) [4] also revealed that drip method of irrigation found significant in terms of resources saving, cost of cultivation, yield of crops and

farm profitability. The total area under crop cultivation in the study area is 29595.21 ha among that the area under maize, tomato and onion were 4330.09 ha, 434.42 ha and 489.39 ha respectively. The tomato and onion were growing only under irrigated conditions. Presently our state policy has focusing towards the full area of garden lands under drip irrigation. If the total area comes under drip irrigation in the study area for tomato and onion, the water usage level is 8836.10 ha-cm and 12479.44 ha-cm respectively whereas in conventional irrigation it is 13432.26 ha-cm and 18391.27 ha-cm respectively. We can save 4596.16 ha-cm and 5911.83 ha-cm of water if both tomato and onion comes under drip irrigation in the study area alone. In case of maize, if the total area comes under drip irrigation the water usage level is 114011.27 ha-cm whereas in conventional irrigation it is 152722.27 ha-cm. From that we can save 38711 ha-cm of water in maize cultivation. Narayanamoorthy (2010) [10] revealed that the drip irrigation, reduced consumption of water helps reducing the over-exploitation of groundwater, which is a serious problem of the country today. So, if the total area comes under drip irrigation we can save water. This will lead to natural resource saving and benefit to the environment by using the saved water for any other purpose.

Impacts of Micro Irrigation Subsidy on Production and Trade

Apart from saving water in crop cultivation, micro irrigation subsidy has positive impacts inmarketing and trade also. Table 2 shows the average yield of various crops under drip and conventional irrigation. In the study area mainly the high value crops were growing. If the total area under maize, in the study area comes under drip irrigation the production will be 15328.51 tonnes whereas in conventional irrigation it is 11301.53 tonnes. The difference is 4026.98 tonnes. In case of tomato and onion, if the total area comes under drip irrigation the production will be 9787.48 tonnes and 4908.58 tonnes respectively whereas in conventional irrigation it is 7776.11 tonnes and 3503.68 tonnes respectively. The difference in total yield is 1404.9 tonnes and 2011.37 tonnes for tomato and onion respectively. So,apart from conventional irrigation, if the total area comes under drip irrigation we can increase the yield and it will increase the marketable surplus of the farmers and there creates a positive impact on trade also.

Apart from the increase in the yield, by drip irrigation the farmers are able to grow crops in the off season and get higher prices. The normal market prices were Rs.10 for maize, Rs.10 for tomato and Rs.12 for onion per kilogram. During off seasons, the price of maize, tomato and onion were going up to approximately Rs.14, Rs.25, and Rs.25 per kilogram respectively. By producing maize, tomato and onion in the off season under drip irrigation the farmers can get Rs.4, Rs.15. and Rs.13 more per kilogram of maize, tomato and onion respectively. This will increase the income of the farmer.

Summary and Conclusions

By subsidizing drip irrigation the small and marginal farmers also can go for the same. This will lead to increase the production, productivity and saving of natural resources in general. It could be concluded that because of farm subsidies there are multiple benefits to the farms and farmers. From the study, if the total area were comes under drip irrigation we can save 38711 ha-cm, 4596.16 ha-cm and 5911.83 ha-cm of water in maize, tomato and onion cultivation respectively. Apart from water usage level, if the total area comes under drip irrigation we can increase the production by 4026.98 tonnes, 1404.9 tonnes and 2011.37 tonnes in maize, tomato and onion respectively. By producing maize, tomato and onion in the off season, through drip irrigation, where the availability of water is less for surface irrigation, the farmers can get additional of Rs.4 for maize, Rs.15 for tomato and Rs.13 for onion per kilogram. However, incorporating the issues like free electricity, cropping system dynamics, land use, water harvesting, agriculture – non-agriculture tradeoff etc., while drafting policies towards subsidizing irrigation water would be more effective and realistic.

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