Research Paper *IJBARR*
Impact Factor: 4.729 *E- ISSN -2347-856X*
Refereed, Listed & Indexed *ISSN -2348-0653*

ECONOMIC ANALYSIS OF AGRICULTURAL GROWTH AND DEVELOPMENT IN TAMIL NADU: A STUDY WITH SPECIAL REFERENCE TO SOURCES OF IRRIGATION

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Abstract
This article discusses the key developments in the agricultural sector particularly the economic analysis of agricultural growth and development in Tamil Nadu: with special focus on the sources of irrigation. Further, this paper aims to identify the land size-wise sources of irrigation used by the sample respondents and to trace out the annual income-wise sources of irrigation used by the sample respondents. The study study makes use of the primary data from the sample households have been gathered through field survey with help of a questionnaire. A standard questionnaire was developed for this purpose and a pilot survey was conducted. Based on this survey, necessary modifications were carried out in the questionnaire, which was used in the field survey the study aims to examine the land size-wise source of irrigation used by the sample respondents and annual income-wise source of irrigation used by the sample respondents of the study area. For this purpose the sample farming households who depend on different sources of irrigation in the study area have been selected and the necessary information has been gathered from these sample households. The results of among those who use canal irrigation, 79.2 per cent hold upto 5 acres of land, while 20.8 per cent possess more than 5 acres, in the case of those who adopt tank irrigation, 80 per cent hold upto 5 acres and the remaining 20 per cent own more than 5 acres; as far as the use of surface well irrigation is concerned, 80 per cent come under the less than 5 acres land size class whereas20 per cent belong to the above 5 acres land size class; among those who depend on tube well irrigation, 50 per cent possess upto 5 acres and other 50 per cent own more than 5 acres, while in the case of those who practice drip irrigation, 31.3 per cent hold less than 5 acres whereas 68.7 per cent own more than 5 acres of land.

Keywords: Economic Analysis, Agricultural Growth and Development, Land Size, Annual Income, Sources of Irrigation.

Introduction

India's already large population is expected to become the world's largest in the next 20 years, while its economy will soon overtake Japan's to become the world's third largest. The resulting increase in the demand for food will need to be met through higher agricultural productivity or by increasing food imports. India has a particularly large agricultural sector. While the sector's share of GDP has halved in the past 30 years to around 15 per cent, it still employs around half of India's workforce and accounts for much of the volatility in Indian GDP. India has the second largest area of arable land in the world and is a major producer of a number of agricultural products. Around the turn of the century, India overtook the United States as the world's largest producer of milk and is also a major producer of pulses, such as chickpeas and lentils, which are major sources of protein in vegetarian diets.

Water management is crucial to improving conditions in agriculture. India currently has around 5 000 large dams that are able to store more than 220 teralitres, which ranks seventh in the world in terms of capacity. While dams in other parts of the world are built for flood mitigation, power generation and water supply, the primary purpose of India's dams is irrigation. Around 40 per cent of crop areas are now irrigated, and these areas produce 70 per cent of India's crop output. A significant proportion of farms have limited or no access to irrigation, and therefore still rely on rainfall as their sole source of water.

With just over 80 per cent of India's rainfall occurring during the summer monsoon season, which occurs from June through to September, deficient rainfalls have often had significant effects on the Indian economy. In 2009, the summer monsoon rainfall was lower than normal, which caused a fall in grain production of 7 per cent and pushed up grain and other food prices. In the past, agricultural production has been much more dependent on the summer monsoon, with large fluctuations in rainfall accounting for most of the volatility in agricultural production. Over time, however, the effect of the summer monsoon rain season has been mitigated through drought management (including drought monitoring), increased use of irrigation, and diversification of agricultural production. These measures have made food production less vulnerable to poor weather conditions. In part, this helps explain why deficient rainfalls since the late 1990s have resulted in less significant contractions in agricultural output. In fact, variations in agricultural output, which once accounted for 60 per cent of the variation in GDP, now account for only 20 per cent, which in part reflects agriculture's lower share of GDP.

Irrigation forms the basis of agricultural sector, as it plays a direct and positive role in the productivity of any crop. However, the pressure on water resources intensifies, as population increases and development calls for increased allocations of groundwater and surface water for the domestic, agriculture and industrial sectors. The increasing stress on fresh water resources brought about by ever using demand is of serious concern. Despite the increase in water use by sectors other then

agriculture; irrigation continues to be the main water user on a global scale. Irrigated agriculture occupies 18 per cent of total arable land in the world and produces more than 32 per cent of its agricultural production. With increasing demand for food, there is an increasing pressure for water to be used more efficiently in the agricultural sectors.

Considering the water availability for future use and the increasing demand for water from different sectors, a number of demand management strategies and programmes (water pricing, water users' association, etc) have been introduce since late seventies in India to increase the water use efficiency, especially in the use of surface irrigation water. While the various strategies introduce to improve the water use efficiency have been continuing, the net impact of these strategies in increasing the water use efficiency is not very impressive as of today.

In India development of irrigation in the past had taken place as a measure of famine relief and in fact, famines gave birth to the idea of irrigation. Now with the population multiplying rapidly, irrigation has assumed greater importance for augmenting agriculture production. The importance of irrigation may be judged from protective and productive angles. The protective irrigation makes up the moisture deficiency in soil to ensure proper and sustained growth of crops. The productive irrigation enables raising of second and third crop on the land provided with irrigation which could otherwise not be cultivated efficiently, more particularly during the post and pre-monsoon period.

Problem of the Study

The area irrigated by canals which increased from 8.3 mha in 1950-51 to 15.3 mha in 1980-81 and further to 17.4 mha in 1990-91, started to decline thereafter and stood at 15.3 mha in 2005-06 (which was equivalent to the level of 1980-81). This indicates fact the Government has cut down its investment in irrigation development, especially since 1990-91 which has compelled the farmers to cater for irrigation management by themselves with their own resources. This resulted in the spurt in area under walls (especially tube wells) at the level of both All-India and Tamil Nadu. Thus expansion in well irrigation is highly capital intensive from the view point of individual farmers. All farmers cannot be expected to depend on well irrigation as wells (whether surface or tube water) need to be deepened every year, which is clearly out of reach for the tiny, marginal and small farmers who form the majority of the farming households in the country. Moreover, thus segment still remains mostly unreached by the institutional credit mechanism. Hence, it is obligatory to examine the nature and extent of agricultural development under different sources of irrigation, in order to understand the role played by them in the agricultural development of a particular region.

Significance of the Study

During the last 22 years, the rate of growth of the economy has accelerated, though not in the case of agriculture, since the main thrust for the faster growth has been fuelled by the service sector. The source of irrigation adopted by a household depends on its investment capability, nature of climate, soil, water availability and also nature of the crop. Thus, any region no single sources of irrigation are not competitive but only complementary. However, over the years, source of irrigation has undergone changes which have directly affected agricultural development. In this Endeavour, this study aims to bring out the role of different sources of irrigation in influencing the extent and nature of agricultural development through the factors like cropping pattern, yield and output of the crops, and income level of the farming households.

Review Works

Suryawanshi S.D. and Kapase P.M. (1985) have analyzed in their research paper on 'Impact of Chod Irrigation Project on Employment of female Agricultural Labour' that agricultural labour and farm cultivation as the main areas of economic activities for rural women. The National Sample Survey has shown that the percentage contribution of women in agriculture is higher than men, where most of the key operations at farm are done by them.

Labour employment depends on many factors such as irrigation potential, cropping pattern, intensity of cropping and such other labour intensive activities. Irrigation has proved beneficial to the country in the context of the above. The findings of their study are i) irrigation facilities gave them better opportunities for providing education to their children, rather than employing them in agriculture. In fact due to irrigation both male and female members got higher employment in agriculture. ii) the cropping pattern was changed and shifted in favour of cash and labour intensive crops which gave more employment. The authors have suggested that women have to be involved in the process of modernization and transfer of new technology.

However, this paper does not trace the factors underlying the increase in labour use with irrigation. How is irrigation lead to an increase in cropping intensity, a change in cropping pattern, a more intensive use of HYVs, and fertilizers, etc. These changes in turn would affect labour use. Also a disaggregation by farm size, and farm location (since head-enders usually manages to get a disproportionately large share of canal water relative to the tail-enders) would have been useful.

Navalawala B.N. (1995) stated in the article on 'Waterlogging - Problems and Solutions' that drainage is a measure to remove excess water from the soil or from the soil surface. It is known that canal irrigation upon overuse often leads to rise of water table and drainage is essential but even today adequate attentions is not being paid to this while designing and planning of canal irrigation projects. Owing to this neglect, many irrigation projects in the arid and semi-arid areas have created serious problems of water logging and of salinity and alkalinity.

Amitava Mukherjee, Avebury (1995) analysed in their book on 'Structural Adjustment Programme and Food Security: Hunger and Poverty in India' that power and irrigation have many second round positive effects on the poor. Also, irrigation in north and south India has been responsible for having enough stocks of foodgrains for the public distribution system.

Kanchan Chopra (1998) in his article on Institutions for Sustainable Agricultural Development' pointed out that introduction of paddy in the state is responsible for the increased and unsustainable demand for ground water. In view of this, it is only substitution with maize that may be the appropriate policy from the viewpoint of prudent ground water use.

Smajstrla et al. (2010) had studied "Efficiencies of Florida Agricultural Irrigation System" pointed out that in Florida seepage losses from reservoirs is the major cause of Reservoirs storage efficiency. They suggested that seepage losses may be reduced by lining reservoirs with impermeable soils (typically clays) or manmade liners such as plastic sheets, metal, plastic or fiber glass and tanks may be used as reservoirs to eliminate seepage losses. Transpiration losses from reservoirs occur as a result of vegetation growth in and around the reservoir.

Gargi Parsai (2010) reported in the title on 'Double Farm Growth Rate to Ensure Food Security Sustainable Technologies that can Produce More Need'. He pointed out that India commands about 2.3 per cent of the world's land area and about 4 per cent of the earth's fresh water resources, but feeds 17 per cent of the world population. This puts tremendous pressure on our resources and makes the need for newer and better technologies even more critical and which could produce more from less. He stressed the three fundamental principles of sustainable agriculture, viz., i. a live soil ii. Protection of biodiversity and iii. Precision farming and nutrient cycle.

Food and Agriculture Organization of the United Nations (FAO), (2013) reported on the water resources with five major rivers basins, an annual per capita water endowment of 24,000 cubic meters (more than 10 times that of China or India), and considerable potential for irrigation and hydropower generation. However, only about 10% of the available water resources are presently withdrawn, and 90% of withdrawal is for irrigation. This is partly because present irrigation withdrawal is largely by pumped systems on the main incised rivers or by run-of-river (small storage systems on their smaller tributaries). Rainfall amounts vary considerably from one region to another—from highs of 4,000–6,000 mm annually along the coastal reaches and in the mountains of Rakhine and Tanintharyi, to as low as 500–1,000 mm in the dry Central region. With such low levels of rainfall, there is insufficient precipitation to produce a rice crop. Rice cultivation in the relatively heavily populated Central region depends, therefore, on irrigation, even during the monsoon season. In contrast, excessive rainfall in other regions of Myanmar, notably in the Delta region, often results in flooding, the loss of standing crops and the displacement of significant portions of the population.

Methodology

The present study makes use of the primary data from the sample households have been gathered through field survey with help of a questionnaire. A standard questionnaire was developed for this purpose and a pilot survey was conducted. Based on this survey, necessary modifications were carried out in the questionnaire, which was used in the field survey the study aims to examine the land size-wise source of irrigation used by the sample respondents and annual income-wise source of irrigation used by the sample respondents of the study area. For this purpose the sample farming households who depend on different sources of irrigation in the study area have been selected and the necessary information has been gathered from these sample households.

Sampling

This study is based on multi-stage proportionate random sampling method. In the first stage, Thiruvallur district, as the sample district is purposively chosen, since it is one of the district in Tamil Nadu where the dominance of agriculture is still quite considerable. In the second stage, two taluks, have been selected deliberately, as both these taluks represent the district in a much better manner, as far as its agricultural activities are concerned. In the third stage, four sample villages, two from each taluk have been selected: since the farming households in these villages adopt different sources of irrigation for their agricultural activities. In the fourth and final stage, the sample households have been selected. As the basic aim of the study is to Analysis the role of different sources of irrigation in agricultural development, only the farming households in the four sample village form the population of this study.

Limitation of the Study

The main aim of the study is to trace out the land size-wise source of irrigation used by the sample respondents and annual income-wise source of irrigation used by the sample respondents of the study area. These data are expected to be accurate based on which the analysis is done. Moreover, the sample households were not quite forthcoming in providing data irrigation their size of land holding, farm income, etc, for obvious reasons. Time and monetary factors constrained the selection of number of villages and also the number of sample households.

Objectives

The present study is based on the following objectives:

1. To identify the land size-wise sources of irrigation used by the sample respondents
2. To trace out the annual income-wise sources of irrigation used by the sample respondents

Results and Discussion

The sources of irrigation are further analyzed on the basis of the size of land holding possessed by the sample respondents with the help of the data shown in Table-1.

Table 1: Land Size-wise Sources of Irrigation used by the sample Respondents

Source	Area				Total
	Upto 2 Acres	2-5 Acres	5-10 Acres	Above 10 Acres	
Canal	21 (43.8) [17.4]	17 (35.4) [16.7]	5 (10.4) [5.9]	5 (10.4) 9.6[]	**48** **(100.0)** **[13.3]**
Tank	24 (48.0) [19.8]	16 (32.0) [15.7]	3 (6.0) [3.5]	7 (14.0) [13.5]	**50** **(100.0)** **[13.9]**
Surface Well	40 (50.0) [33.1]	24 (30.0) [23.5]	7 (8.8) [8.2]	9 (11.3) [17.3]	**80** **(100.0)** **[22.2]**
Tube Well	31 (24.2) [25.6]	33 (25.8) [32.4]	51 (39.8) [60.0]	13 (10.2) [25.0]	**128** **(100.0)** **[35.6]**
Drip	5 (9.3) [4.1]	12 (22.2) [11.8]	19 (35.2) [22.4]	18 (33.3) [34.6]	**54** **(100.0)** **[15.0]**
Total	**77** **(21.4)** **[100.0]**	**87** **(24.2)** **[100.0]**	**114** **(31.7)** **[100.0]**	**82** **(22.8)** **[100.0]**	**360** **(100.0)** **[100.0]**

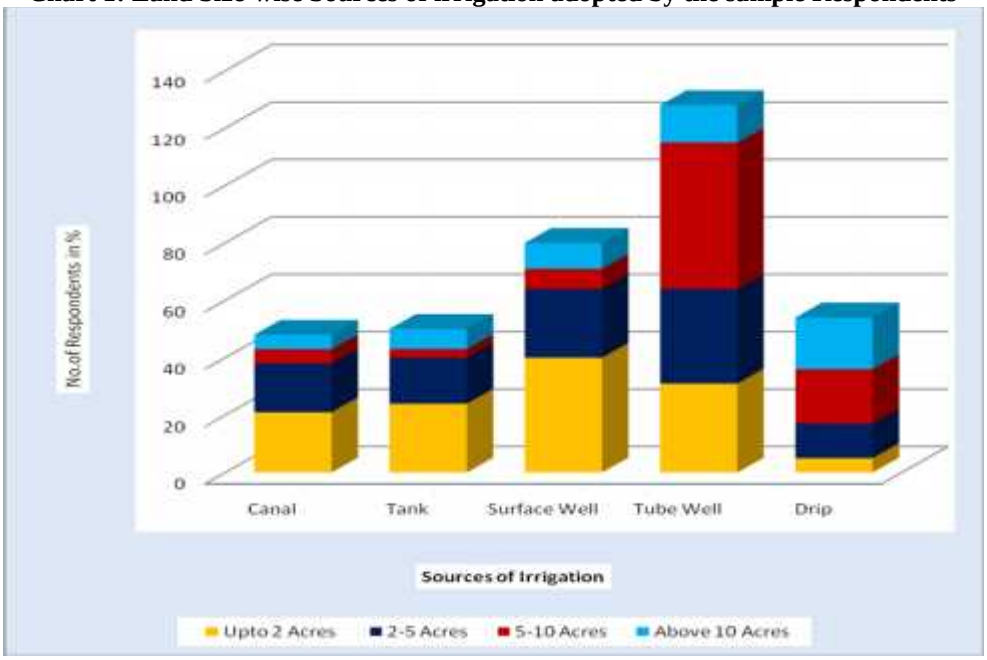
Note: Figures in round brackets are row-wise percentage and those in square brackets are column-wise percentage.
Source: Field survey

It is noted that among the 121 respondents who hold upto 2 acres of land, 21 (17.4 per cent) use canal irrigation, 24 (19.8 per cent) adopt tank irrigation, 40 (33.1 per cent) depend on surface well irrigation, 31 (25.6 per cent) practice tube well irrigation and 5 (4.1 per cent) practice drip irrigation; in the case of 102 respondents who own 2-5 acres, 17 (16.7 per cent) depend on canal irrigation, 16 (15.7 per cent) adopt tank irrigation, 24 (23.5 per cent) practice surface well irrigation, 33 (32.4 per cent) adopt tube well irrigation, while 12 (11.8 per cent) use drip irrigation; out of the 85 Respondents who possess 5-10 acres of land, 5 (5.9 per cent) adopt canal irrigation, 3 (3.5 per cent) make use of tank irrigation, 7 (8.2 per cent) depend on surface well irrigation, 51 (60 per cent) practice tube well irrigation and 19 (22.4 per cent) use drip irrigation; and in the case of 52 respondents who hold more than 10 acres of land, 5 (9.6 per cent) use canal irrigation, 7 (13.5 per cent) practice tank irrigation, 9 (17.3 per cent) depend on surface well irrigation, 13 (25 per cent) adopt tube well irrigation, who 18 respondents (34.5 per cent) use drip irrigation as their major source of irrigation.

Thus, among those who use canal irrigation, 79.2 per cent hold upto 5 acres of land, while 20.8 per cent possess more than 5 acres, in the case of those who adopt tank irrigation, 80 per cent hold upto 5 acres and the remaining 20 per cent own more than 5 acres; as far as the use of surface well irrigation is concerned, 80 per cent come under the less than 5 acres land size class whereas20 per cent belong to the above 5 acres land size class; among those who depend on tube well irrigation, 50 per cent possess upto 5 acres and other 50 per cent own more than 5 acres, while in the case of those who practice drip irrigation,

31.3 per cent hold less than 5 acres whereas 68.7 per cent own more than 5 acres of land. Thus, there is a strong relationship between the size of land holding and the source of irrigation adopted by the sample respondents in the study area. This is graphically shown in Chart-1.

Chart 1: Land Size-wise Sources of irrigation adopted by the sample Respondents



Source: Based on Table-1

The source of irrigation used by the respondents is capable of influencing their farm earnings. Table-2 presents the distribution of the respondents on the basis of their source of irrigation and annual income.

Table 2: Annual Income-wise Sources of Irrigation used by the sample Respondents

Source	Annual Income				Total
	Upto Rs.50000	Rs.50001-1 Lakh	Rs.1-2 Lakhs	Above Rs.2 Lakhs	
Canal	25 (52.1) [17.0]	18 (37.5) [14.9]	5 (10.4) [8.9]	Nil Nil Nil	**48** **(100.0)** **[13.3]**
Tank	28 (56.0) [19.0]	15 (30.0) [12.4]	7 (14.0) [12.5]	Nil Nil Nil	**50** **(100.0)** **[13.9]**
Surface Well	56 (70.0) [38.1]	12 (15.0) [9.9]	8 (10.0) [14.3]	4 (5.0) [11.1]	**80** **(100.0)** **[22.2]**
Tube Well	38 (29.7) [25.9]	68 (53.1) [56.2]	14 (10.9) [25.0]	8 (6.3) [22.2]	**128** **(100.0)** **[35.6]**
Drip	Nil Nil Nil	8 (14.8) [6.6]	22 (40.7) [39.3]	24 (44.4) [56.7]	**54** **(100.0)** **[15.0]**
Total	**147** **(40.8)** **[100.0]**	**121** **(33.6)** **[100.0]**	**56** **(15.6)** **[100.0]**	**36** **(10.0)** **[100.0]**	**360** **(100.0)** **[100.0]**

Note: Figures in round brackets are row-wise percentage and those in square brackets are column-wise percentage.
Source: Field survey

It is inferred out of the 147 respondents who earn upto Rs.50000 per annum, 25 (17 per cent) practice canal irrigation, 28 (19 per cent) use tank irrigation, 56 (38.1 per cent) adopt surface well irrigation and 38 (25.9 per cent) practice tube well irrigation, while none of them uses drip irrigation; in the case of 121 respondents who belong to the annual income range of Rs.50001-1 lakh, 18 (14.9 per cent) depend on canal irrigation, 15 (12.4 per cent) adopt tank irrigation, 12 (9.9 per cent) practice surface well irrigation, 68 (56.2 per cent) adopt tube well irrigation, while 8 (6.6 per cent) use drip Irrigation; out of the 56 respondents who came under the income class of Rs.1-2 lakhs per annum, 5 (8.9 per cent) adopt canal irrigation, 7 (12.5 per cent) make use of tank irrigation, 8 (14.3 per cent) depend on surface well irrigation, 14 (25 per cent) practice tube well irrigation and 22 (39.3 per cent) use drip irrigation; and in the case of 36 respondents who easrn above Rs.2 lakhs per annum, none of them uses either canal irrigation or tank irrigation, while 4 (11.1 per cent) depend on surface well irrigation, 8 (22.2 per cent) adopt tube well irrigation and 24 respondents (66.7 per cent) use drip irrigation. Hence, those who earn Rs.50000 per annum, 74.1 per cent use canal, tank and surface well irrigation, while the remaining 25.9 per cent use tube well irrigation, in the case of those who come under the income class of Rs.50001-1 lakh, 37 per cent use canal, tank, and surface well irrigation, while 63 per cent depend on tube well and drip irrigation; among those who earn 1-2 lakhs, 35.7 per cent adopt canal, tank and surface well irrigation and 64.3 per cent practice tube well and drip irrigation; and in the case of those who earn above Rs.2 lakhs per annum, only 11.1 per cent use surface well irrigation, and the remaining 88.9 per cent make use of tube well and drip irrigation, while none of them use canal or tank irrigation.

Conclusion

This paper have discussed and identified the land size-wise sources of irrigation used by the sample respondents sources of irrigation adopted by the sample respondents and annual income-wise sources of irrigation used by the sample respondents. Hence, the study area in terms of yield of the crops, size of land holdings, annual income This brings out the fact that many farmers still depend on erratic and seasonal irrigation sources like canal, tank and surface well. This underscores the fact that irrigation efficiency is better in the case of tube well and drip irrigation than that of canal, tank and surface well. However, moving towards tube well and drip irrigation calls for higher initial investment, which is totally out of bounds for the small and medium farmers. Irrigation being the prime mover of agricultural development, due importance should be given by the Government to the development of irrigational facilities in order to reduce the degree of dependence on seasonal and erratic sources of irrigation which will make agricultural development much more inclusive.

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