Research Paper *IJBARR*
Impact Factor: 3.072 *E- ISSN -2347-856X*
ISSN -2348-0653

COST, RETURNS AND RESOURCE USE EFFICIENCY IN GARLIC CULTIVATION IN DINDIGUL DISTRICT

Dr.M.Manoharan* **Mrs.T.Ramalakshmi****
**Associates Professor and Research Advisor, PG and Research Dept. of Commerce, CPA. College,. Bodinayakanur ,India.*
***Fulltime Ph.D Research Scholar, PG and Research Department of Commerce, CPA. College, Bodinayakanur, India.*

Abstract
The cost of cultivation of garlic was the maximum to marginal farmers and the minimum to medium farmers. The output of garlic was the maximum to the medium farmers and the minimum to the marginal farmers. Net income was the maximum to the medium farmers. Production functional analysis revealed that reallocation of significant input is possible to optimize the return of income from garlic cultivation. Important constraints identified in the cultivation of garlic in the study area were erratic climate and rain pattern, incidence of pests and diseases, labour scarcity and the high cost of input.

Keywords: Cost and Return, Cobb-Douglas Production Function, Resource use efficiency.

INTRODUCTION

Garlic is one of the most popular spices in the world and it is extensively used in all the countries. Garlic is one of the important bulb crops grown and is used as a spice or condiment not only in India but also throughout the world. This crop is another foreign exchange earner for India. Garlic is a native of south Europe and west Asia and it is cultivated throughout India as an important crop. Dindigul District which is bestowed with the most suitable climatic condition and traditional farming community residing across the region is already vanguarding the entire state of Tamil Nadu in the production and marketing of garlic and has vast potential for expansion.
Statement of the Problem

Garlic is one of the most important spices that have been cultivated throughout the world from the antique past. It has been used extensively both as an important food ingredient and as a component in pharmaceutical preparations. There is no in-depth study relating to cost and return and resource-use-efficiency in garlic cultivation in this region and the problems associated with both production and marketing of this crop from cultivators point of view. This may attract the attention of policy makers to frame suitable remedial measures which will in turn encourage the present garlic growers to expand their activities and to attract more potential growers in the cultivation of garlic. The researcher felt that a detailed study of this nature is socially relevant which will ultimately have a positive impact on overall economic development of the district and the state. Hence the present study.

REVIEW OF RELATED STUDY

Mittal and Saxena (1974) defined fixed cost in agricultural as that which was independent of the level of production where as the variable cost varied with the level level of output.

According to Tandon and Dhondyal(1978), the variable costs are prime costs and related to the variable resources.

Driver and Desai (1958) defined 'farm business income' as the real measure of earnings, of the farmer and his family for management, risk, labour and use of land and capital. It is obtained by deducting cost A2 from the value of inputs.

Kandasamy et al., (1980) used the term 'Gross return' to mean the value of the total produce. Net return is the remainder after subtracting total expenditure from gross income.

According to Murugadas, (1990) 'gross income' is the actual amount realised on the sale of the produce. He arrived at the net income by deducting cost of cultivation from the gross Income.

Ferguson (1982) has defined production function as a schedule showing the maximum amount of output that can be produced from any specific set of inputs, given the existing technology or stage. In short the production function is a catalogue of output possibilities.

OBJECTIVES OF THE STUDY

The following are the specific objectives of the present study.

1. To analyze the Cost and Returns of garlic production in Dindigul district.
2. To assess the Resource-Use-Efficiency and to compute the returns to scale in Garlic Cultivation in Dindigul district.

METHODOLOGY

Dindigul district ranks first in area and production of garlic contributing about 2/3 of total garlic production in Tamilnadu. Dindigul district consists of three blocks of which Kodaikanal division was selected based on concentration of garlic cultivation in this region. There are sixteen panchayat in Kodaikanal division, out of these, eight panchayats were selected by simple random sampling. From each panchayat two villages were selected. The researcher decided to collect data from 25 respondents from each selected village. Thus, a total of 400 respondents areforming part of the sampling size for the present study. Based on the area used for garlic cultivation the respondents were classified in to three categories. Accordingly, there were 160 marginal farmers 160 small farmers and 80 medium farmers. The field survey was undertaken during the months of September to December 2010.

TOOLS OF ANALYSIS

1. To analyse cost and return, simple average analysis was used.
2. Cobb-Douglas type of production function in log form was used to analyse the determinants of gross returns.
3. To find the resource-use efficiency of factor inputs, marginal value productivity of each of the significant input variable for marginal, small and medium farmers was analysed.

RESULTS AND DISCUSSION

Garlic is recognized all over the world as a valuable condiment for foods and popular remedy of medicine to various ailments and physical disorders. This condiment has been an important ingredient in most of the culinary and pharmaceutical preparation for ages. An attempt is made in this chapter to evaluate the cost of production and returns in garlic cultivation.

COST OF GARLIC CULTIVATION

The cost of cultivation of garlic included both variable cost and fixed cost. The total variable cost included the cost of labour, seed and seed materials, manure, fertilizer, plant protection, cost of irrigation and interest on working capital. The fixed cost included rental value of land, depreciation on fixed assets and interest on fixed capital. The annual average annual cost of garlic cultivation for different farm a group per acre was worked out and the results are presented in Table 1.

Table - 1,Annual Average Cost of Garlic Cultivation

Sl. No.	Particulars	Size of Farmers					
		Marginal Farmers		Small Farmers		Medium Farmers	
		Rs./acre	Per cent	Rs./acre	Per cent	Rs./acre	Per cent
A	**VARIABLE COST**						
1.	Human labour	10270.78	16.84	9250.39	15.69	8260.65	14.52
	a. Family labour	1311.25	2.15	865.63	1.47	646.78	1.14
	b. Hired labour	8959.53	14.69	8384.76	14.22	7613.87	13.39
2.	Tractor power& Bullock power	989.38	1.62	906.55	1.54	810.37	1.42
3.	Seed and seed materials	11040.12	18.10	11410.65	19.36	10880.26	19.13
4.	Manure	4510.00	7.39	3865.00	6.56	3700.00	6.51
5.	Fertilizer	5445.25	8.93	4770.38	8.09	4340.98	7.63
6.	Plant protection	8305.15	13.62	7640.33	12.96	7020.87	12.34
7.	Cost of irrigation	356.12	0.58	295.61	0.50	258.87	0.46
8.	Miscellaneous cost	1830.53	3.00	2030.65	3.45	2280.14	4.01
9.	Interest on working capital	1603.02	2.63	1506.36	2.56	1408.21	2.48
10.	**Total variable cost**	**44350.35**	**72.71**	**41675.92**	**70.70**	**38960.35**	**68.50**

B	**FIXED COST**						
11.	Depreciation	1132.50	1.86	1209.40	2.05	1385.00	2.44
12.	Rental value owned land	14000.00	22.95	14000.00	23.75	14000.00	24.61
13.	Interest on fixed capital	1510.00	2.48	2059.00	3.49	2532.00	4.45
14.	**Total fixed cost**	**16642.50**	**27.29**	**17268.40**	**29.30**	**17917.00**	**31.50**
15.	**TOTAL COST(A+B)**	**60992.85**	**100.00**	**58944.32**	**100.00**	**56877.35**	**100.00**

Source: Primary data

The cost of garlic cultivation worked out Rs.60,992.85 per acre in the case of marginal farmers of garlic, Rs.58944.32 per acre in the case of small farmers of garlic and it was Rs.56877.35 per acre in the case of medium farmers of garlic. The total variable cost worked out at Rs.44350.35, Rs.41675.92 and Rs.38960.35 respectively for marginal, small and medium farmers. In other words, the variable cost accounted for 72.71 per cent in the case of marginal farmers, 70.70 per cent in the case of small farmers 68.50 per cent of the total cost in the case of medium farmers in garlic cultivation. The contribution of the fixed cost to the total cost of production was Rs.16642.50 (27.29%) for marginal farmers of garlic, Rs.17268.40 (29.30%) for small farmers of garlic and Rs.17917 (31.50%) for medium farmers of garlic.

In the case of marginal farmers of garlic, among variable costs, seed and seed materials accounted for the maximum share of Rs.11040.12 (18.10 %), followed by human labour Rs.10270.78 (16.84 %). The cost of plant protection, fertilizer, manure, family labour, tractor and bullock power, and cost of irrigation were estimated at Rs.8305.15 (13.62 %), Rs.5445.25 (8.93 %), Rs.4510.00 (7.39 %), Rs. 1311.25 (2.15 %), Rs.989.38 (1.62 %), and Rs.356.12 (0.58 %) respectively. Besides the costs, miscellaneous costs accounted for Rs.1830.53 which contributed only to 3.00 per cent of the total operational cost.

In the case of small farmers of garlic, seed and seed materials contributed the highest share of Rs.11,410.65 (19.36%), followed by human labour Rs.9250.39 (15.69%), plant protection Rs.7640.33 (12.96%). The expenditure on fertilizer, manure and miscellaneous costs were accounted for Rs.4770.38 (8.09%), 3865.00 (6.56%) and 2030.65 (3.45%) respectively. The interest on working capital accounted for Rs.1506.36 which contributed to 2.56 per cent of the total variable cost.

In the case of medium farmers of garlic, the maximum share of Rs.10,880.26 (19.13%) was contributed by seed and seed materials followed by human labour Rs. 8260.65 (14.52 %) and plant protection Rs.7020.87 (12.34%). The cost of fertilizer, manure and miscellaneous cost worked out of Rs.4340.98 (7.63%), Rs.3700.00 (6.51%) and Rs.2280.14 (4.01%) respectively. Interest on working capital was accounted for Rs.1408.21 (2.48%).

Among the fixed cost components, the rental value of owned land constituted the major share of Rs.14000.00 (22.95%) in the case of marginal farmers of garlic, Rs.14000.00 (23.75%) in the case of small farmers of garlic and Rs.14000.00 (24.61%) in the case of medium farmers of garlic. The interest on fixed capital was Rs.1510.00 (2.48 %) for marginal farmers of garlic, Rs.2059.00 (3.49%) for small farmers of garlic and Rs.2532.00 (4.45 %) for medium farmers in garlic cultivation.

The cost of depreciation was Rs.1132.50 (1.86%) for marginal farmers of garlic, Rs.1209.40 (2.05%), for small farmers of garlic and Rs.1385.00 (2.44%) for medium farmers of garlic.

From the aforesaid analysis, it could be observed that the variable cost was more than the fixed cost in all the cases. In the case of medium farmers of garlic, the percentage share of variable cost was lower than that of other categories of farmers of garlic. It might be due to efficient utilization of resources and comparatively large area of cultivation. It is also observed from Table 5.1 that the total cost was also lower for medium farmers of garlic. This indicates that the medium farmers of garlic are conscious of the economic methods of cultivation.

PRODUCTIVITY AND UNIT COST OF PRODUCTION OF GARLIC

The average annual productivity and unit cost of production of garlic were worked out and the results are presented in Table 3.

Table- 3, Productivity and Unit Cost

Sl.No.	Particulars	Farm size		
		Marginal	Small	Medium
1.	Cost of Cultivation (Rs./acre)	60,992.85	58,944.32	56,877.35
2.	Yield (Kgs/ acre)	1142.500	1179.800	1240.000
3.	Cost of Production (Rs./ Kgs)	53.39	49.96	45.87

Source: Primary data

It is observed from Table 3 that the cost of cultivation per acre was the maximum of Rs.60992.85 in the case of marginal farmers of garlic and the minimum of Rs.56877.35 in the case of medium farmers of garlic. The yield of garlic per acre ranged from 1142.50 kilograms in the case of marginal farmers of garlic to 1240.00 kilograms in the case of medium farmers of garlic. The cost of production was Rs.53.39 per kilogram of garlic in the case of marginal farmers of garlic, Rs.49.96 per kilogram in the case of small farmers of garlic and Rs.45.87 per kilogram in the case of medium farmers of garlic. Large scale operation of garlic cultivation was the main reason for less cost of production.

INCOME MEASURES OVER DIFFERENT COST CONCEPTS

The various measures of return over different cost concepts were arrived at with the following equations.

1. Gross Returns = Value of main product and by product
2. Farm Business Income = Gross Returns – Cost A_1
3. Owned Farm Business Income = Gross Returns – Cost A_2
4. Family labour Business Income = Gross Returns – Cost B_2
5. Net income = Gross Returns – Cost C_2
6. Investment Income = Net Income + Rental Value of Owned Land +Interest on fixed capital

The income measures were worked out and the details are presented in Table 4.

Table- 4, Returns under different Cost Concepts

(Rs./Acre) Sl. No.	Particulars	Farm size		
		Marginal	Small	Medium
1.	Gross Returns	78215.55	83211.29	88684.80
2.	Farm Business Income	32732.70	40325.98	48339.45
3.	Owned Farm Business Income Family Labour	32732.70	40325.98	48339.45
4.	Business Income	17222.70	24266.98	31807.45
5.	Net income	15911.45	23401.35	31160.67
6.	Investment Income	31421.45	39460.35	47692.67

Source: Primary data

It could be observed from Table 4 that gross return ranged from Rs.78215.55 for marginal farmers of garlic to Rs.88684.80 for medium farmers of garlic in the study area. Both the farm business income and owned farm business income were the highest at Rs.48339.45 in medium farmers of garlic and lowest at Rs.32732.70 among marginal farmers of garlic. Family labour business income ranged between Rs.1,7222.70 among marginal farmers of garlic and Rs.31807.45 among medium farmers of garlic.

Net income was the highest in the case of medium farmers of garlic at Rs.31160.67 and the lowest at Rs.15911.45 in the case of marginal farmers of garlic. Investment income was the maximum at Rs.47692.67 in medium farmers of garlic and the minimum at Rs.31421.45 in marginal farmers of garlic.

Determinants of Gross Returns and Resources - Use - Efficiency

The determinants of gross returns, returns to scale and resource - use - efficiency were analyzed, using Cobb – Douglas type production function.

Estimated Production Function of Garlic for Marginal Farmers

The Cobb – Douglas type production function is fitted to test the relationship between the yield of garlic and the independent variable for marginal farmers of garlic. The results are presented in Table 6.

Table -6, Estimated Cobb-Douglas type Production Function for Marginal Farmers of Garlic

S.No.	Variable	Notation	Elasticity Co- efficient	Standard Error	t-Statistics
1.	Yield (Kgs. Per acre)	Y	-	-	-
2.	Constant	b_0	7.761**	0.653	11.876
3.	Human Labors (man days / acre)	X_1	0.162**	0.052	3.115
4.	Seeds & Material Cost (Rs./ acre)	X_2	0.105^{NS}	0.129	0.813
5	Cost of Manure (Rs./ acre)	X_3	0.299**	0.027	11.074
6.	Fertilizer Cost (Rs./ acre)	X_4	0.540**	0.131	4.122
7	Cost of Pesticides (Rs./ acre)	X_5	0.086*	0.035	2.466
8.	Cost of Irrigation (Rs./ acre)	X_6	0.112^{NS}	0.152	0.736

Source: Primary data

Sum of elasticity co-efficient: 1.304

R^2 : 0.882

F-test : 190.785**

** Significant at one per cent level

*Significant at 5 per cent level

NS- Not Significant.

It is observed from Table 6 that the co-efficient of multiple determinations (R^2) of the function was 0.882 which indicated that 88.20 per cent of variation in the yield of garlic was explained by all the six independent variables considered for the study. F-test shows that the estimated Cobb-Douglas type production function was statistically significant at one per cent level.

Among the independent variables, human labour, cost of manure, cost of fertilizer and cost of pesticide were found to be statistically significant. It could be inferred that the yield of garlic was significantly influenced by the level of human labour utilized. One per cent increase in the level of labour used, keeping all other factors constant, would increase the yield by 0.162 per cent from its mean level.

The elasticity co-efficient for the variable cost of fertilizer was 0.540 which indicates that by increasing the expenditure on fertilizer by one per cent, there would be an increase in yield of garlic by 0.540 per cent, **ceteris paribus**. The yield of garlic was also influenced by the cost of manure applied. The co-efficient of cost of manure was 0.299 which was significant at one per cent level. This shows that one per cent increase in the cost of manures would increase the yield by 0.299 per cent from its mean level.

The co-efficient cost of fertilizer and pesticide were positive but statistically not significant indicating that these two variables had no influence on the garlic yield.

Estimated Production Function of Garlic for Small Farmers

The estimated results of Cobb-Douglas type production function for small farmers of garlic are furnished in Table 7.

Table -7, Estimated Cobb-Douglas type Production Function for Small Farmers of Garlic

S. No.	Variable	Notation	Elasticity Co-efficient	Standard Error	t-Statistics
1	Yield (Kgs. / acre)	Y	-	-	-
2	Constant	b_0	11.275**	2.002	5.633
3	Human Labors (man days / acre)	X_1	0.246**	0.046	5.347
4	Seeds & Material Cost (Rs./ acre)	X_2	0.002^{NS}	0.007	0.285
5	Cost of Manure (Rs./ acre)	X_3	0.192**	0.059	3.305
6	Fertilizer Cost (Rs./ acre)	X_4	0.171**	0.061	2.803
7	Cost of Pesticides (Rs./ acre)	X_5	0.492*	0.113	4.346
8	Cost of Irrigation (Rs./ acre)	X_6	0.075^{NS}	0.098	0.765

Source: Primary data

Sum of Elasticity co-efficient : 1.19
R^2 : 0.678
F-test : 21.741**
**Significant of one per cent level
*Significant of 5 per cent level
NS- Not significant

Table 7 shows that the value of co-efficient of multiple determination (R^2) was 0.678 which indicates that 67.80 per cent of the variation in the yield could be explained by all the six independent variable included in the production function. The F-value indicates that the fitted Cobb-Douglas type production function was significant at one per cent level and it is valid to draw inference.

Regarding production elasticties, out of six independent variables, four measures of variable namely human labour, cost of manure, fertilizer cost and cost of pesticides were found to be significant statistically. The elasticity co-efficient for the human labour was 0.246 per cent which indicates that an increase in the expenditure on human labour by one per cent level, would affect an increase in the yield of garlic by 0.246 per cent **ceteris paribus**.

The garlic yield was also significantly influenced by the level of manures applied .The analysis indicates that every one per cent increase in the cost of manure could increase the yield by 0.192 per cent from its mean level.

The garlic yield was also influenced by the value of fertilizers applied. The co- efficient of fertilizers was 0.171 per cent which was significant at one percent level. This shows that one percent increase in the value of fertilizers would increase the yield by 0.171 per cent from its mean level.

The variable cost of pesticides is one of the important inputs contributing to the yield of garlic. Its co-efficient was 0.492 and it was significant at five per cent level, indicating that one per cent increase in cost of pesticides would increase the output of garlic by 0.492 per cent from mean level.

The co- efficient of seed and material cost and cost of irrigation were positive but statistically not significant indicating that these two variables had no influence on the garlic yield.

Estimated Production Function of Garlic for Medium Farmers

The Cobb-Douglas type production function was estimated for medium farmers of garlic and the results are presented in Table 8

Table- 8, Estimated Cobb-Douglas type Production Function for Medium Farmers of Garlic

Sl.No.	Variable	Notation	Elasticity co-efficient	Standard Error	t-Statistics
1	Yield (kgs./ acre)	Y	-	-	-
2	Constant	b_0	11.329**	0.242	46.875
3	Human labour (man days/acre)	X_1	0.168**	0.015	10.951
4	Seeds &material (Rs./acre)	X_2	0.010^{NS}	0.027	0.370
5	Cost of Manure(Rs./acre)	X_3	0.186**	0.048	3.875
6	Fertilizer cost (Rs./acre)	X_4	0.467**	0.035	13.172
7	Cost of pesticides (Rs./acre)	X_5	0.222*	0.091	2.439
8	Cost of Irrigation(Rs./acre)	X_6	0.121**	0.0096	12.568

Source: Primary data

Sum of Elasticity co-efficient : 1.174
R^2 0.883
F-test : 495.414**
**significant at one per cent level
*significant at five per cent level
NS- Not significant.

It is seen from Table 8 that the co-efficient of determination (R^2) was 0.883 indicating that 88.30 per cent of the variation in the output of garlic could be explained by all the variables included in the production function. F-test shows that the estimated Cobb-Douglas type production function was statistically significant at one per cent level.

Among the six independent variables human labour, cost of manure, cost of fertilizer, cost of pesticide and cost of irrigation were found to be statistically significant at one per cent level. It could be inferred that the yield of garlic was influenced significantly by the level of human labour utilized. One per cent increase in the level of human labour used, keeping all other factors constant, would increase the yield by 0.168 per cent from its mean level.

The elasticity co-efficient for the variable cost of irrigation was 0.121 which indicates that by increasing the expenditure on irrigation by one per cent there would be an increase in yield of garlic by 0.121 per cent, **ceteris paribus**. The variable cost of manure is one of the important inputs contributing to the yield of garlic. Its co-efficient was 0.186 and it was significant at one per cent level, indicating that one per cent increase in cost of manure would increase the output of garlic by 0.186 per cent from its mean level.

The elasticity co-efficient for the variable cost of fertilizer was 0.467 which indicates that by increasing the expenditure on fertilizer by one per cent, there would be an increase in yield by 0.467 per cent **ceteris paribus.**

The garlic yield was also influenced by the cost of pesticides applied. The co-efficient of pesticides was 0.222 which was significant at five per cent level. This shows that one per cent increase in the value of pesticides would increase the yield by 0.222 per cent from its mean level.

RESOURCE - USE - EFFICIENCY

The Marginal Value Productivity of resources and the cost of those resources would give an indication for the reallocation of resources to maximize returns. Optimization principles in the resource allocation suggest that the application of a resource should be increased till marginal value product of a factor equals its marginal cost.

Resource -Use -Efficiency among Marginal Farmers

The resource - use - efficiency among marginal farmers of garlic was worked out from the production function analysis and the results are presented in Table 9.

Table- 9, Marginal Value Productivity (Marginal Farmers)

Sl . No.	Particulars	Geometric Mean	Average Physical Product (Kgs)	Elasticity Co-Efficient	Marginal Physical Product (Nos)	Marginal Value Product (Rs.)	Marginal Input Cost (Rs.)	MVP/MIC
1	Yield (kgs./acre) (y)	1142.466	--	--	--	--	--	--
2	Human labour (man days/acre) (X_1)	45	25.388	0.162	4.113	281.57	230	1.22
3	Cost of manure (Rs./acre) (X_3)	4509.46	0.253	0.299	0.076	5.19	1	5.19
4	Fertilizer cost (Rs./acre) (X^4)	5444.43	0.210	0.540	0.113	7.76	1	7.76
5.	Cost of pesticide (Rs./acre) (X_5)	83040.59	0.138	0.086	0.012	0.81	1	0.81

Source: Primary data

It could be observed from Table 9 that, the ratio of marginal value products to the factor cost was 1.22 for human labour, 5.19 for cost of manure, 7.76 for fertilizer cost and 0.81for cost of pesticide. It is inferred from the table that there was a wide scope for increasing the use of human labour, manure and fertilizer to increase the yield of garlic as the ratio of marginal value product to factor cost was more than unity. It also revealed that, every rupee additionally spent on manure, fertilizer and pesticide would yield Rs.5.19,Rs.7.76 and Rs.0.81 worth of output respectively. The increased use of human labour would augment the income by 1.22 times the factor cost.

This analysis also indicated that the marginal physical product of human labour, cost of manure, fertilizer cost and cost of pesticide were 4.113, 0.076,0.113 and 0.012 respectively.

Resource - Use - Efficiency in Small Farmers

The marginal value products of the significant variables for small farmers of garlic were estimated and the details are presented in Table 10.

Table -10, Marginal Value Productivity (Small Farmers)

Sl . No.	Particulars	Geometric Mean	Average Physical Product (Kgs)	Elasticity Co-Efficient	Marginal Physical Product (Nos)	Marginal Value Product (Rs.)	Marginal Input Cost (Rs.)	MVP/ MIC
1	Yield (kgs./acre) (y)	1178.561	--	--	--	--	--	--
2	Human labour (man days/acre)(X_1)	40	29.464	0.246	7.248	511.21	230	2.22
3	Cost of manure (Rs./acre) (X_3)	3856.47	0.306	0.192	0.060	4.20	1	4.20
4	Fertilizer cost (Rs./acre) (X^4)	4668.71	0.252	0.171	0.043	3.04	1	3.04
5	Cost of pesticide (Rs./acre) (X_5)	7659.33	0.154	0.492	0.076	5.35	1	5.35

Source: Primary data

It is revealed from Table 10 that the ratio of marginal value product to the factor cost was 2.22 for human labour, 4.20 for cost of manure, 3.04 for fertilizer cost and 5.35 for cost of pesticide. This indicates that there is a wide scope for increasing the use of human labour, manure, fertilizer and pesticide to increase the yield of garlic, as the ratio marginal value product to factor cost was greater than unity. It is also inferred that every rupee additionally spent on manure, fertilizer and pesticide would yield Rs 4.20, 3.04 and Rs.5.35 worth of output respectively. The increased use of human labour would augment the income by 2.22 times the factor cost.

Resource - Use - Efficiency in Medium farmers

The marginal value product of the significant variables for medium farmers of garlic was estimated and the details are presented in Table 11.

Table- 11, Marginal Value Productivity (Medium Farmers)

S.N	Particulars	Geometric Mean	Average Physical Product (Kgs)	Elasticity Co-Efficient	Marginal Physical Product (Nos)	Marginal Value Product (Rs.)	Marginal Input Cost (Rs.)	MVP / MIC
1	Yield (kgs./acre) (y)	1238.41	-	-	-	-	-	-
2	Human labour (man days/acre) (X_1)	36	34.400	0.168	5.779	413.33	230	1.8
3	Cost of manure (Rs./acre) (X_3)	3699.46	0.335	0.186	0.062	4.45	1	0
4	Fertilizer cost (Rs./acre) (X_4)	4339.84	0.285	0.467	0.133	9.53	1	4.4
5	Cost of pesticide (Rs./acre) (X_5)	7019.6	0.176	0.222	0.039	2.80	1	5
6	Cost of rrigation(Rs./acre) X_6)	259.65	4.769	0.121	0.577	41.38	1	9.5 3

Source: Primary data

It is revealed from Table 11 that the marginal physical products of human labour, cost of manure, fertilizer cost, cost of pesticide and cost of irrigation were 5.779, 0.062, 0.133, 0.039 and 0.577 respectively in numbers.

These results also reveal that the ratio of marginal value product to the factor cost was 1.80 for human labour 4.45 for cost of manure, 9.53 for fertilizer cost, 2.80 for cost of pesticide and 41.38 for irrigation. This indicates that there is a wide scope for increasing the use of human labour, manure, fertilizer, pesticide and irrigation to increase the yield of garlic, as the ratio of marginal value product to factor cost was greater than unity. It is also inferred that every rupee additionally spent on cost of manure, fertilizer, pesticide and irrigation would yield Rs.4.45, Rs.9.53, Rs.2.80 and Rs.41.38 worth of output respectively. The increased use of human labour would augment the income by 1.80 times the factor cost.

RETURNS TO SCALE

The sum of elasticity's of resources is an indicator of the returns to scale. The analysis of the returns to scale for different farmers of garlic was made and the results are furnished in Table 12.

Table- 12, the Nature of Returns to Scale

S. No.	Particulars	Sum of the Production Elasticity	Nature of Returns to Scale
1.	Marginal Farmers of garlic	1.30	Increasing
2.	Small Farmers of garlic	1.18	Increasing
3.	Medium Farmers of garlic	1.17	Increasing

Source: Primary data

It is observed from Table 12 that the sum of the production elasticity's were 1.30 for marginal farmers of garlic, 1.18 for small farmers of garlic and 1.17 for medium farmers of garlic in Dindigul district. It indicates that the sum of elasticity was greater than unity in all the categories of the farmers of garlic. The results show that there was an increasing return to scale and hence it may be concluded that garlic cultivation in this area is economically viable.

CONCLUSION

The cost of cultivation of garlic was the maximum to marginal farmers and the minimum to medium farmers. The output of garlic was the maximum to the medium farmers and the minimum to the marginal farmers. Net income was the maximum to the medium farmers. Production functional analysis revealed that reallocation of significant input is possible to optimize the return of income from garlic cultivation. Important constraints identified in the cultivation of garlic in the study area were erratic climate and rain pattern, incidence of pests and diseases, labour scarcity and the high cost of input.

REFERENCE

1. Athibudhai, Chankaravarthy, N.M.I., and Singh J.P., "An Economics Analysis of Rice based Cropping Systems in Orissa" Agricultural Situation in India, 16(2), 1993.

2. Brubala, S.D., Sharma and Sharma, K.K., "Garlic cultivation: An Emerging Crop Enterprises in Kulu Valley of Himachal Pradesh and its Economic Thereof', Agricultural Situation in India, March 2007.
3. Sujit, K.S., and Sujit kumar Mishra, Agricultural productivity and Fertilizer demand in India- An economic Analysis".Agricultural situation in India, July 2002.
4. Ravichandran, L., "Economics of Marketing of Chillies in Kamarajar District", Unpublished M.Sc.(Agri) Dissertation submitted to Tamil Nadu Agricultural University, Coimbatore. 1990.
5. Sathial, S. and Hiremath, G.K., "Resource-use efficiency in beer orchards", Agricultural Bankar, July-September, 1995.
6. Peter, K.V., "Diversification Vital", Survey of Indian Agriculture 2000.The Hindu, 2000.
7. www.garlicfarm.ca.
8. www.gar1ic.mistra1.co.uk.