IMPACT OF INCREASE IN WAGE RATE AND COST OF FERTILIZERS IN RICE PRODUCTION IN THIRUVANANTHAPURAM DISTRICT

By

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THESIS
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DECLARATION

I here by declare that this thesis entitled "IMPACT OF INCREASE IN WAGE RATE AND COST OF FERTILIZERS IN RICE PRODUCTION IN THIRUVANANTHAPURAM DISTRICT" is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship fellowship or other similar title of any other University or society.

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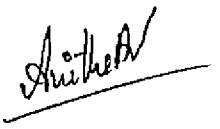

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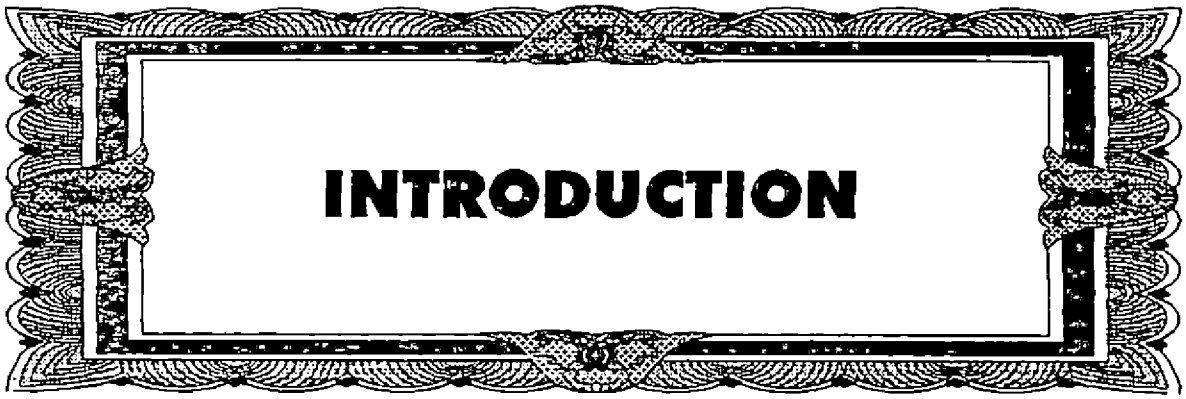

INTRODUCTION

CHAPTER 1

INTRODUCTION

Agriculture is the backbone of India's economy. This sector provides direct employment to about 70 per cent of the working population of the country contributes a third to national income and accounts for a sizeable share of the foreign exchange earnings by way of exports.

The total geographical area of Kerala is 38.9 lakh hectares which is about 1.18 per cent of the total geographical area of the country with a population of 2.90 crores (1991 census) which is nearly 3.4 per cent of the population of the country. The agriculture sector is of great importance to the Kerala economy. Out of the state income of Rs. 18133.44 cores at current prices during 1993-94, the share of agriculture was estimated as Rs. 6102.18 crore (33.65 per cent) and allied sectors, another 5.7 per cent (Economic Review, 1994).

Rice, the principal food crop of the state is cultivated in an area of 5.30 lakh hectares (Statistics for

Planning, 1993) which forms only 24 per cent of the net area sown in the state. The crop which had a coverage of around 8.75 lakh hectares in the mid seventies suffered severe setback in area resulting in a total loss of more than 3 lakh hectares over a period of 15 years. Even though the rising trend shown by the crop during the period was not adequate to compensate the loss in production on account of the steep fall in area. Rice cultivation is becoming less and less attractive as a result of the remarkable increase in cost of production without a commensurate increase in the product prices. Even though the switch over from rice to more remunarative crops like rubber coconut etc. are justifiable from the point to view of income, the state cannot ignore the adverse consequences on the availability of food, employment support and ecological balance.

As stated above continuous decline in rice area is mainly attributed to the reduced profitability due to increasing cost of production compounded by the problems arising out of fragmented holding. The average size of holding in Kerala is 0.31 hectare and that of Thiruvananthapuram district is 0.16 hectare (Statistics for Planning 1993).

Prices of agricultural commodities play an important role in India's economic planning. Price stability and price incentives are thus important for economic progress particularly in agriculture sector. Nearly 37 per cent of the population still live below the level considered necessary for just sustenance. Thus as a policy measure for making available the food grains to the masses of people, a comprehensive network of fair price shops fed by are effective procurement and distribution systems is functioning all over the country. The public distribution system in Kerala very efficient and within the reach of almost all households in the state through a well designed net work of ration shops.

Considering the fact that the agricultural commodity prices cannot be raised beyond certain levels, fertilizer prices have necessarily to be maintained at reasonably low level to ensure an attractive input - output price ratio. In view of this, Government of India introduced subsidy on fertilizers with effect from November 1, 1977. There after the subsidy on fertilizers rose sharply because the indigenous production cost of fertilizers went up three fold with the prices of raw materials used for production

like naphtha gas, fuel, oil, coal and various duties and taxes charged on fertilizer manufacturing agencies increased considerably. Since the consumer price of fertilizer prices had remained almost the same, with the increasing burden of fertilizer subsidy on the exchequer, the Government of India was forced to reduce the quantum of subsidy. All phosphatic and potassic fertilizers were decontrolled with effect from 25-08-92. The selling price of urea was reduced by 10 per cent and urea continued to be within the purview of price control and subsidy scheme. This resulted in a significant increase in the selling price of potassic and phosphatic fertilizers.

The Department of Economics and Statistics in a study on the cost of cultivation of rice during 1990-1991 observed that 80 to 90 per cent of the labour requirement is met from hired human labour and the same accounted for 51 per cent of the total cost of production. Around 17 per cent of the cost of production is accounted for fertilizers and manures.

If we examine the inflationary trend in the prices of agricultural inputs over a decade, we could observe an exorbitant rise in their prices. But there was not a

Table 1.1. Trends in prices of agricultural inputs and output during the past decade in Kerala

Sl.	Items	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
1.	Urea (Rs/qtt)	215	215	235	235	235	235	235	235	306	276	276
		(100)	(100)	(109.30)	(109.30)	(109.30)	(109.30)	(109.30)	(109.30)	(142.3)	(128.37)	(128.37)
2.	Factamphas	240	240	260	260	260	260	260	260	338	682	574
	(Rs/qtt)	(100)	(100)	(108.33)	(108.33)	(108.33)	(108.33)	(108.33)	(108.33)	(140.83)	(284.17)	(239.17)
3.	Muriate of	120	120	130	130	130	130	130	130	174	497.3	390.8
	Potash (Rs.qtt)	(100)	(100)	(108.33)	(108.33)	(108.33)	(108.33)	(108.33)	(108.33)	(145)	(414.42)	(325.67)
4.	Wage rate	15.86	23.6	26.08	28.36	30.36	31.95	33.31	35.77	41.38	48.4	54.26
	Men (Rs/day)	(100)	(148.80)	(164.44)	(178.81)	(191.42)	(201.45)	(210.02)	(225.54)	(260.91)	(305.17)	(342.12)
5.	Wage rate	11.02	11.89	15.10	16.39	17.68	18.59	19.63	21.11	26.12	32.31	35.49
	Women (Rs/day)	(100)	(107.89)	(137.02)	(148.73)	(160.43)	(168.69)	(178.13)	(191.56)	(237.02)	(293.19)	(322.05)
6.	Farm price	253.87	230.78	225.18	242.25	248.24	277.43	302.79	299.61	374.77	420.88	414.53
	Rice (Rs/day)	(100)	(90.90)	(88.70)	(95.42)	(97.78)	(109.28)	(119.27)	(118.02)	(147.62)	(165.78)	(163.28)

Figures in parenthesis denote the index number taking 1983 as the base

Source : FACT Central Depot & Department of Economics and Statistics

proportionate increase in the farm prices of agricultural commodities. The trends in the prices of agricultural input and farm prices of rice during the past decade is furnished in Table 1.1.

It could be seen from the table that the wage rate of men labourers increased by 242 per cent and that of women labourers by 222 per cent in 1993 over 1983. The price of muriate of potash increased by 314.42 per cent and that of factamphos by 184.17 per cent in 1992 over 1983 and thereafter its price was reduced. The price of urea also recorded an increase of 28.37 per cent. While the farm price of rice had increased only by 63.28 per cent during this period. From this we can infer that the prices of inputs especially potassic and phosphatic fertilizers and labour have increased in a much greater proportion than that of the output.

In these circumstances the present study was under taken to analyse the changes in the pattern of labour use and fertilizers intake consequent on the hike in input prices and their impact on cost of production and productivity of rice in Kerala with reference to a particular district viz. Thiruvananthapuram.

The main objectives of the study were

1. To examine the changes in the pattern of labour intake and fertilizer use consequent on the increase in wage rate and cost of fertilizers.

2. To study the impact of increase in price of fertilizers and wage rate in production and productivity of rice.

3. Besides these an attempt was also made to work out the economics of rice cultivation and the resource use efficiency in rice cultivation.

Need for the study

Rice, the staple food of the people in the state had showed a declining trend in its performance both in area and production. From August 1992, the price of certain fertilizers have been considerably increased, simultaneously the wage rate of agricultural labourers have also increased at a faster rate. The impact of this will lead to a negative trend in production potential.

At this juncture, a research investigation into these aspects to analyse the impact of price hike in

agricultural inputs especially fertilizers and labour on the production potential was felt quite meaningful. This would help the planners and policy makers to formulate suitable policy measures to protect the interest of the rice growers by taking suitable measures to give them some incentives and thereby encourage them to continue rice cultivation.

Scope of study

During the past decade the input prices increased exorbitantly when compared to that of output prices. It is generally hypothesized that farmers respond to price changes. The results obtained from the study could be developed to identify the extent of variation in fertilizer prices and wage rate and how the farmers responded to this. Also it may help to understand the impact of the increase in the input cost on production and productivity of rice. This study may help planners and administrators to formulate and implement appropriate price policy measures with regard to input and output for protecting the intrest of the farmers.

Limitations of the Study

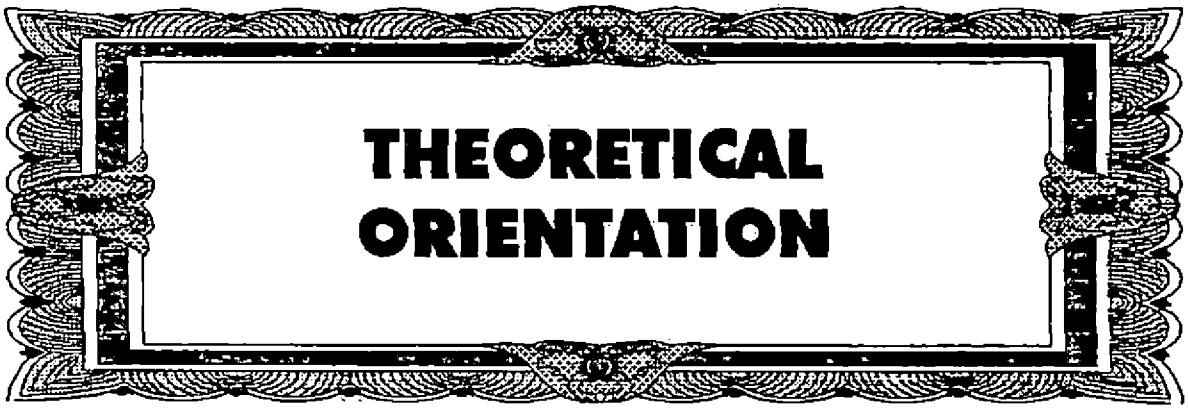
Due to the limited time and resources it was not possible to conduct the study in all parts of the state.

Since this formed only a partial fulfillment of the M.Sc (Ag.) programme the study was confined to Thiruvananthapuram district only. The results of the study were based on the farm level data generated through sample survey. Since the farmers were not maintaing any field records, the information were collected from their memory. These limitations are likely to narrow down the scope of generalisation of the results. Subject to the above mentioned limitations the study may be useful for policy decisions.

Presentation of the Report

The study is presented in five chapters. The introduction part of the study is dealt in Chapter I. Chapter 2 deals with theoretical orientation. Chapter 3 covers the methodology followed for the study. The results, the interpretation of the findings and their discussion are given in detail in Chapter 4. In Chapter 5 the summary of the entire study emphasising salient findings are given.

The references, appendices and the abstract of the thesis are given at the end.


THEORETICAL
ORIENTATION

CHAPTER 2

THEORETICAL ORIENTATION

Theoretical orientation helps in classifying the important concepts studied with theoretical definition and explanation.

This chapter is intended to furnish a proper orientation to the study, by associating available research findings with the proposed research problem. The review of previous works attempted in this chapter may assist in the delineation of new problem areas and may provide a basis for formulating a theoretical frame work for the study, by which empirical investigation is facilitated. The discussion will be useful to select relevant hypotheses against which the empirical evidence could be interpreted.

The available literature was perused and the review is presented under the following headings.

2.1 Impact of increase in fertilizer prices on production

2.2 Impact of increase in wage rate on production

2.3 Review on cost of cultivation and resource use efficiency.

2.1 Impact of increase in fertilizer price on production

Larson and Sanches (1974) in a study examined the economic factors affecting the use of fertilizers in SaoPaulo, Brazil. They opined that price is important in explaining the demand for fertilizers and low prices stimulated the use of modern inputs especially fertilizers and increased agricultural production. They observed that increase in fertilizer price will lead to long term reduction in its use and so more subsidised credit and even subsidised fertilizer price is needed to maintain its use and agricultural production at a higher level.

Singh (1974) pointed out that the most crucial problem faced by Asian agriculture was fertilizer subsidy and crop losses. He argued that financial assistance was required in the form of long term low interest credit, planned exploitation of under ground water resources, new sources of energy supply and more domestic fertilizer production in Asian countries.

Anonymous (1976) in a study conducted by the Marketing Research Corporation of India observed that

substantial rise in fertilizer consumption can be obtained only if prices were reduced by about twenty per cent.

Bakshi and Naidu (1976) compared the cost of production of rice for the years 1971-72 and 1975-76 for three size group of farmers viz, upto 2 hectares, 2-3 hectares and 3-4 hectares. They observed that due to the increase in the price of fertilizer during 1975-76 the quantity of fertilizers used by the three size groups were at a fairly low rate in 1975-76 when compared to 1971-72. The expenditure on fertilizers decreased by 18 per cent and 11 per cent in the first two size groups and increased by 57 per cent in the third size group. However the price of rice had increased simultaneously so the difference created due to low yield was almost made up by the increase in the price of rice.

Bhatty (1976) examined the impact of the recent rise in prices of oil based inputs for agriculture on the production of wheat and rice in the agricultural year 1974-75. He observed that a rise in fertilizer price led to a fall in the quantity of fertilizer used per unit of land. This rise in fertilizer price also resulted in a rise in the

cost of fertilizer per unit of output as well as land and a fall in the farmers net return.

David (1976) estimated fertilizer demand as a function of fertilizer rice-price ratio by means of demand models. He observed that difference in Fertilizer Rice price ratio and fertilizer response function contributed significantly to variations in fertilizer demand.

Gangwar and Singh (1976) analysed the impact of price changes on profitability of major agricultural commodities. They observed that the share of purchased input to the total cost has increased over time, where as contribution of farmer's own resources had declined. The percentage change in the use of inputs was maximum in the case of fertilizers followed by implements and machinery, irrigation charges etc. He concluded that rise in input price has eroded the production incentives of the farmers.

Grewal and Rangi (1976) examined the impact of increase in the prices of some key inputs on the production and profitability of wheat and rice during 1974 over the year 1973. He observed that the prices of fertilizer, pesticide,

casual labour and diesel oil increased by about 90, 88, 12 and 18 per cent respectively during 1974 over 1973. Rice production has increased despite sharp increase in fertilizer prices and slight fall in fertilizer consumption during the year 1974-75. Both for rice and wheat there was an increase in the cost of production due to price hike in inputs but the product price was enhanced. So there was no reduction in net profit margin per hectare.

Jha and Kumar (1976) observed that between 1968-70 and 1975-76 the cost of production per quintal went up by about 70 per cent for wheat and 45 per cent for Bajra. Human labour and fertilizer inputs accounted for 35 per cent of the total cost in 1968-70 and this rose to 54 per cent in 1975-76. The prices of both these inputs have doubled. But the use of fertilizer went up by about 49 per cent in the case of wheat and it remained almost stable in the case of Bajra.

Lee (1976) cited that one of the major constraints in fertilizer use among farmers in developing countries was fertilizer price in comparison to output price. He opined to link fertilizer distribution, credit and marketing of output with price policy to increase fertilizer use.

Marothia (1976) examined the changes in prices of purchased and non purchased inputs, the changing levels of input use and their impact on the production and profitability for the period 1967-68 and 1970-71. The increase in the price of fertilizer was about 12 to 45 per cent and the cost of fertilizer input increased 1.72 times in the case of rice. He opined that the substantial increase in the prices of inputs was offset by high productivity of land and rapid adoption of high yielding variety since the average yield of rice increased by 55 per cent and the gross return by 42 per cent.

Nandal and Grover (1976) examined the impact of increased input prices in production and profitability in Haryana. They observed that the share of chemical fertilizers went up from 2.73 per cent in 1968-69 to 13.06 per cent in 1975-76 and they attributed this increase to larger increase in the prices of this factor and partly to an increase in their use. They cautioned that with the steep falling trend in the prices of agricultural products there would be another set back in the use of improved inputs whose demand had been already sluggish.

Pal (1976) studied the impact of increase in fertilizer prices on production before and after the change in the price of fertilizers in 1972-73 and 1974-75. He observed that the gross cropped area decreased by 11 per cent. The total fertilizer consumption decreased by 14 per cent. The production of rice decreased by 21.2 per cent inspite of an increase in the area under HYV.

Patil (1976) found that the increase in the per unit price of rice offered scope for application of more nitrogen indicating good response to nitrogen. But an increase in the per unit price of nitrogen lowered the optimum levels of nitrogen.

Rebello *et al.*, (1976) observed that in the case of high yielding varieties of rice inspite of an increase in the price of all fertilizers, the use of nitrogen increased by 14 per cent while that of potash and phosphorous reduced by 24 and 17 per cent respectively during 1975-76 when compared to 1972-73. In the case of local variety of rice the use of nitrogen and phosphorous increased by 16 and 13 per cent respectively while that of potash reduced by 5 per cent during 1975-76 over 1972-73.

Sheshan (1976) analysed the trends in the consumption of chemical fertilizers from 1955-56 to 1973-74. In his view excise duty on fertilizers, unfavorable cost price relationship, lack of supplies, lack of credit, impact of oil crisis on the prices of fertilizer etc are some of the causes for decrease in fertilizer consumption.

Singh and Goel (1976) observed that in the case of rice the reduction in yield due to low application of fertilizers when there was an increase in the price of fertilizers varied from 0.5 quintal per hectare to 3 quintals per hectare. The yield of wheat also decreased substantially due to an increase in the price of fertilizers but the decrease in yield was less fluctuating in the case of wheat than in the case of rice. They opined that if a rise in fertilizer price was compensated by a corresponding increase in the price of the produce then the profit of farmers would increase at all levels of applications.

Singh *et al.*, (1976) observed that due to exorbitant rise in prices during 1973-74, the input cost increased from Rs. 991.06 per hectare during 1967-68 to Rs. 2310.29 per hectare in 1973-74 with-lower level of

utilisation of inputs and this resulted in lower level of net income in 1973-74. They also observed that the level of utilisation of manures and fertilizers was highest in 1970-71 but it declined in 1973-74. They have observed that the rise in the prices of farm production inputs adversely affected the level of its utilisation and level of farm productivity.

Tewari and Swarup (1976) studied the effect of increased input prices on net return and on the cost of production of hybrid maize. The study revealed that the net return per hectare was directly related to yield levels and the farmers of the very low level group barely met the production cost. They concluded that an increase in the price of output was necessary to compensate for the price rise of inputs inorder to maintain the profit level stable.

Thiruvenkatachari (1976) in his study in the impact of increase in input prices on profitability and production of rice in Tamilnadu observed that the prices of fertilizers increased by about 58.5 per cent to 91 per cent and that of pesticide by 100 per cent during 1970-1971 to 1975-76. All these resulted in the doubling of cost but the production had gone up only by 40 per cent. Thus the profits

were too low in the case of marginal farmers and negligible for small farmers.

Salam (1977) observed that the relative prices of nitrogenous fertilizers were quite important in influencing its demand ie a relative decline in the prices of fertilizer was an important factor in encouraging fertilizer use. The increased acreage under high yielding variety was another reason for increased use of fertilizers.

Tewari *et al.*, (1977) observed that an increase in the prices of input with price of output remaining constant resulted in a lesser dose of nitrogen application. Similarly an increase in prices of both inputs and output with more than proportionate increase in input price also resulted in a lesser dose of nitrogen application. But the reduction in nitrogen application was comparatively less as compared to the condition when input price alone was increasing keeping the price of output constant.

Ramesh (1978) opined that though adopted farmers did not decrease the level of fertilizer use inspite of its price hike, the price of fertilizers should be reduced to encourage farmers to apply regularly larger doses.

Sidhu and Baanante (1979) opined that output price is a more powerful policy instrument than fertilizer price to influence fertilizer use, output supply and returns to fixed farm resources based on a study conducted in Punjab, India.

Kambistsis (1980) reported that fertilizer consumption reduced substantially during the period 1977 to 1980 in Greece due to a reduction in fertilizer subsidy.

Paranavitana (1982) studied the major determinants of fertilizer consumption in coconut industry in Srilanka. He found that the price elasticity of demand for fertilizer was in the range of 0.4 to 0.7 and output elasticites with respect to fertilizer consumption was in the range of 0.8 to 0.9.

Singh and Tomer (1983) observed that during 1975-76 to 1981-82 fertilizer consumption rate increased more than the rate of increase in the prices ie, 16.1 per cent against 7.3 per cent. They also observed that the share of fertilizer cost had decreased for major crops in Haryana, like rice, wheat, cotton etc from 12.64 per cent in 1975-76 to 8.8 per cent in 1981-82.

Singh *et al.*, (1983) observed that the sharp rise in the prices of all inputs had adversely affected the level of their use in HYV of wheat and rice which in turn had an adverse effect on their level of output and income. The elasticity of substitution between chemical fertilizers and farm yard manure was quite high compared to the elasticity of substitution between human and bullock labour in both the crops. They concluded that to maintain the tempo of increased productivity and income the prices of input factors should not be allowed to rise beyond the reach of majority of the farmers.

Singh *et al.*, (1983) observed that the growth rate of utilisation for manure, fertilizers and irrigation were lower during the period 1971-79 as compared to 1966-70. They attributed this decline to the abrupt rise in their prices which resulted in their limited utilisation.

Abdullah (1985) opined that the withdrawl of fertilizer subsidies would affect 65-70 per cent of all farmers and they would lose on an average 2.3 per cent of their income. He also pointed out that the hardest hit would be the marginal farmers followed by small farmers.

Hossain (1985) analysed the impact of price on fertilizer consumption in Bangladesh. He reported that the unfavourable movement in relative fertilizer/crop prices appeared to have an adverse effect on fertilizer consumption, particularly since 1977-78 when the fertilizer prices at the grower's level increased at a rapid rate. He also pointed out that there was a growth in fertilizer consumption despite the adverse price movement and it was mainly due to a rapid expansion of irrigation and HYV coverage. But without the adverse price movement the growth in fertilizer use would have been faster.

Sidhu and Sidhu (1985) reported that fertilizer subsidy policy was more beneficial than price support and they recommended that fertilizer prices should be reduced by 27 per cent to achieve self sufficiency. They observed that low price elasticity of output, high price elasticity of fertilizer and high production elasticity of fertilizer contributed to the relative superiority of fertilizer subsidy policy over price support policy. They found that distribution and inflationary implication indicated that the fertilizer subsidy policy was more egalitarian than the price support policy and also was anti inflationary.

Yahanpath and Agrawal (1985) observed that the important indicators determining aggregate demand for fertilizer were the price of produce, price of nutrients and the irrigated area under the crop in a given year. These variables accounted for 85-90 per cent of variation in demand of fertilizers.

Couston (1986) opined that the subsides had been effective in increasing fertilizer use. He observed that many of the developing countries have attempted to stabilise domestic producer and consumer price by giving subsidy. By this measure they succeeded in increasing fertilizer consumption and crop production. But because of the increase in financial burden of fertilizer subsidies to the government it was obvious that subsides should be phased out. This however must be done in such a way as not to affect adversely farmer's incentive to produce and to sustain and further increased production.

Ramasamy *et al.*, (1986) observed that the amount spent on fertilizer was large for big farmers due to their high purchasing power and better liquidity practices. They were of the opinion that continuing the present level of

fertilizer subsidy will help majority of farmers to buy costly fertilizers.

Panchal (1987) in a study in the effect of fertilizer price reduction on fertilizer use observed that price reduction led to an overall increase of 1.6 per cent in fertilizer expenditure of sample farmers. The increase in fertilizer use was highest among small farmers followed by medium farmers.

Abeysinghe (1990) in a study on the consequences of withdrawl of fertilizer subsidy argued that the effects of the subsidy withdrawl will lead to a shift away from rice to other cash crops leading to the necessity to import rice. He also added that rich farmers would be able to consolidate land holdings. The subsidy resulted in increased rice production but at an overall cost higher than at which rice could have purchased on the international market. He opined that the effects on the production of other crops such as tea, rubber and coconut had been much less significant.

Himayatullah (1990) observed that the overall consumption of fertilizers per hectare had increased in

Pakistan but was still on of the lowest in the world. He attributed the recent decline in the rate of fertilizer consumption to the substantial increase in the price of fertilizer the reduced subsidy rate, inflationary trends and rising cost of energy. He opined that the withdrawl of the subsidy and decontrol of fertilizer prices have created a dampening effect on fertilizer demand.

Bajpai and Srivastava (1991) studiesd the impact of various factors on the consumption of fertilizer in Indian agriculture. They observed that for increasing fertilizer consumption, the use of high yielding variety seeds will have to increase along with assured irrigation. They opined that subsidy on the cost of fertilizers may be necessary in the initial period to attract the farmers, where as in the long run sufficient conditions such as irrigation, incentive for HYV use etc will have to be created. He concluded that subsidy was necessary but not a sufficient condition to increase fertilizer consumption in agriculture.

Subramaniyam and Nirmala (1991) studied the factors affecting fertilizer demand at macro level using static and dynamic models. They pointed out that a reduction in the relative price of fertilizers was needed to boost its demand.

They also suggested that high yielding varieties should be sown on a larger scale and more area should be brought under irrigation so as to boost fertilizer consumption.

Singh *et al.*, (1992) observed a shift in cropping pattern ie, from wheat to mustard crop in 1991-92 as compared to 1990-91 was due to an increase in fertilizer prices and it was largely taken place in the largest size group of holding which showed that these farmers were relatively more sensitive to price changes. They also observed that the consumption of fertilizers per hectare of wheat and mustard showed a considerable increase during this period due to the remunerative prices of wheat and mustard in the previous year, thus making fertilizer use more profitable.

Agarwal *et al.*, (1993) examined the impact of increase in price and the dual pricing system of fertilizers on cropping pattern and on the demand and consumption of fertilizers during Kharif season 1992-93. They observed that the overall consumption of fertilizer was reduced by 6.3 per cent during this season and all classes of farmers reduced fertilizer use because of the inordinate increase in fertilizer price.

Krauss (1993) opined that the reduction in subsidies of fertilizer prices steeply decreased consumption. He pointed out that states predominantly growing annual crops suffered more than those under plantation crops after the price hike. He observed that the farmers required almost twice the quantity of rice to purchase 1 Kg of phosphate or potash while less rice is required for nitrogen and this will make the farmers to go in for unbalanced fertilizer application.

Mahatvaraj (1993) assessed the extent of change in fertilizer use during the immediate post decontrol period September to November 1992 and the likely changes during karif 1993. He observed that there was a reduction in the consumption of all the three nutrients, the maximum being in the case of `K' (51 per cent) followed by `P' (27 per cent) and `N' (11 per cent) during Rabi 92-93. The survey has also revealed that the consumption will not be normal even during kharif 1993 and the study revealed that a definite switch over among farmers from the use of P and K to N.

Majumdar and Modi (1993) observed that even if fertilizer prices are raised, a corresponding increase in

output prices or procurement prices to maintain the input output price ratio will not significantly result a decline in fertilizer demand.

Marwaha and Gaur (1993) pointed out that decontrolling of phosphatic and potassic fertilizers will lead to the decrease in the use of phosphorus and potash to an extent of 17.8 and 10.2 per cent respectively in the case of large farm and 37.6 per cent and 34.7 per cent respectively in the case of marginal farmers in wheat during rabi 1991-92. They opined that decontrolling of fertilizer would hit adversely all categories of the farmers in general but small and marginal farmers will be the main sufferers.

Pathak *et al.*, (1993) observed that in Gujarat there was a slight shift in the cropping pattern from high fertilizer response crops to less responsive crops during rabi 1991-92 following the changes in fertilizer policy. They also observed that during the rabi season 1992-93 the consumption of phosphatic fertilizers declined by 30 per cent and potash by 54 per cent.

Sarin (1993) in a study to assess the impact of decontrol in Bihar observed that the decontrol of phosphatic

and potassic fertilizers and the consequent price hike came at a time when the pesticide cost increased by 50 per cent along with the increase in labour cost by 25 per cent. The farmers reduced the fertilizer application of the decontrolled items by 40 per cent and this would reflect in a 22 per cent drop in the national consumption of phosphatic fertilizers and 34 per cent drop in the consumption of potash.

Sharma (1993) reported that growth in fertilizer demand was due to shift in technology and measures undertaken to remove physical and institutional bottle necks. He pointed out that non-price factors explained 80 per cent of increase in fertilizer use and more than 60 per cent of post growth was explained by 4 factors viz. irrigation retail outlets, credit and area under high yielding varieties.

Shrotriya and Gupta (1993) observed that due to the decontrol of phosphatic and potassic fertilizers there was an overall reduction in fertilizer consumption ranging from 6.4 to 14 per cent during rabi 1992-93 over 1991-92. Nitrogen consumption was almost stagnant even after its price reduction. The adverse impact of depletion in the soil

fertility on crop production was not immediately noticed and the yields were bound to be adversely affected after a gap of 2.3 crop seasons. He cautioned that widening nutrient consumption ratio would adversely affect both crop productivity and soil fertility.

2.2 Impact of increase in wage rate on production

Nair (1967) opined that wages stood for the payment due to labour whether hired or family labour. The wages paid to hired labour including perquisites and imputed wages of family labour were added together to derive the total wage bill in Indian agriculture. He found the share of labour in agriculture income was around 22 per cent for the period from 1950-51 to 1953-54.

George and Singh (1971) in a study examined recent trends in input-output prices and their impact on farm income. He observed that the wages increased by 21 per cent and thus the cost of human labour input has increased by more than double indicating higher intensity in its use. Its share in total cost had declined from 24 per cent to 13 per cent for wheat and from 23 per cent to 16 per cent for bajra.

The share of bullock labour input per hectare to total cost also declined by 50 per cent in the case of wheat. Where as the share of mechanical labour had gone up from 2 to 2.1 per cent in wheat and 3 to 16 per cent in bajra. This indicated that human and bullock labour were being replaced by mechanical labour.

Agarwal and Yadav (1976) assessed the impact of green revolution on the extent and seasonal pattern of labour employed, the resource use efficiency and marginal value productivities of labour resource. They observed that the labour use was 55 per cent higher per acre for HYVs when compared to non HYV areas. They have opined that if the level of mechanisation is restricted, the HYV could help to solve some rural unemployment problems. The marginal value product/factors cost ratio was greater than one for labour (2.67) and the adoption of HYV had led to a shift in MVP function for labour.

Garg *et al.*, (1976) in a study examined the level of farm productivity in relation to the level of inputs used and their prices. They observed that the per unit cost of family and hired labour increased by about 1 1/2 times in

1974-75 over 1966-67 and the per pair bullock labour cost rose from Rs. 1.00 in 1966-67 to Rs. 1.50 in 1974-75. They concluded that the rise in prices of production inputs adversely affected the level of their use and productivity.

Grewal and Rangi (1976) observed that the price of casual labour and diesel oil increased by about 12 and 18 per cent respectively during 1974 over the year 1973. Thus there was an increase in the cost of production of wheat and rice. But the product price was also increased simultaneously, so there was no reduction in net profit margin per hectare.

Jha and Kumar (1976) observed that human labour and fertilizer inputs which accounted for 35 per cent of the total cost in 1968-70 rose to 54 per cent in 1975-76. The prices of these inputs have doubled and the use of labour declined by 24 per cent and the factor demand analysis revealed that for wheat the relative price movement had affected the use of labour.

Marothia (1976) found that the price of non purchased inputs like human labour and bullock labour increased by 50 per cent and 43 per cent respectively during

1967-68 to 1970-71. He observed that the cost share of human labour declined by 42 per cent for rice and bullock labour by 63 per cent during this period and this ultimately led to farm mechanisation.

Rebello *et al.*, (1976) reported that in the cultivation of sugarcane, inspite of an increase in the wage rate by 100 per cent in the case of men labour and about 133 per cent in the case of women labour the input of hired men labour increased by 36 per cent and that of women labour remained the same. But in the cultivation of high yielding variety of rice the use of hired labour decreased by 6 per cent in the case of men labour and 7 per cent in the case of women labour and the use of family men labour increased by 5 per cent.

Singh *et al.*, (1976) in a study examined the level of production inputs used on farms as a whole and that of individual crop enterprises separately. They observed that the per day cost of human labour rose from Rs. 1.60 in 1967-68 to Rs. 2 in 1970-71 and to Rs 4 in 1973-74. The per hectare utilisation of men labour in farm business was 137.12 man days in 1967-68 which rose to 146.20 in 1970-71 and declined to 141.99 in 1973.74. There was a reduction in

the level of labour use from 107.71 madays to 99.97 man days for maize, from 125.89 to 102.47 man days in Rice and from 106.11 to 102.76 mandays in wheat.

Tewari and Swarup (1976) examined the effect of increased input prices on net returns and on the cost of production of hybrid maize. They observed that if the prices of fertilizer and wage rate were increased by 100 and 25 per cent respectively, the cost of production per quintal of maize will increase from Rs. 58.48 to Rs.78.77 per hectare on the least efficient farms and this will be 77 per cent higher than the normal yield farms.

Thiruvenkatachari (1976) noted that during 1970-71 to 1975-76 wage rate increased by about 66 to 80 per cent and this resulted in very low profits for marginal farmers and small farmers. He observed a very high order of negative correlation between cost changes on one hand and changes in production and profitability on the other hand.

Besaliah (1978) studied the total employment effect of technical change in agriculture during 1967-68. He observed that the contribution of technology alone to total

change in employment was about 12 per cent. The negative employment effect of the increased wage rate was estimated to be 14.8 per cent. The effects of complementary inputs on employment was estimated to be 53.7 per cent with fertilizer alone contributing 40 per cent followed by irrigation 8.6 per cent and capital 5 per cent.

Shah (1980) analysed the effects of output prices, cost of fertilizer and machinery on demand for labour in Laguna rice farms. He observed that demand for labour was inversely related to wage rate and directly to output price. Fertilizers and machinery were found to complement labour especially hired labour.

Kalirajan and Shand (1981) in a study on the labour absorption in Tamilnadu agriculture observed that demand for hired labour is highly elastic to wage changes. A right ward shift in the supply function of labour may easily be absorbed with only a slight decrease in wage rate. They observed that an increase in commodity prices induced considerable labour absorption and suggested that pricing policy could be used as an instrument for increasing labour adsorption in agriculture with favorable socio-economic consequences in the short run.

Kumar *et al.*, (1981) observed that annual variation in price during the period 1968-69 to 1975-76 were 4 per cent for wheat, 17 per cent for fertilizer, 19 per cent for wages and 18 per cent for fixed factors. This would result in the displacement of labour to an extent of 17.14 per cent per annum as a result of negative employment response to factor price inflation. They concluded that the wheat price must be sufficiently high to induce output response to cancel the negative employment effect which occured as a result of wage and other factor prices inflation.

Singh *et al.*, (1981) examined the changes in the level of input use and extent of labour use during 1967-80. They observed that farm labour employment has been generated upto 1972-73 as a result of adoption of modern technologies in agriculture but afterwards it declined. The employment of male labour increased over time and that of female labour declined abruptly after 1972-73. The wage rate had increased during the period but the proportionate contribution attributed by one unit of labour over this period has remained the same.

Bal *et al.*, (1983) observed that the elasticities of production (in value) of human labour, draught power and

rental value of land had declined in 1980-81 over 1972-73. The per hectare use of human labour had decreased from 636.11 man hours in 1972-73 to 568.11 man hours in 1980.81. This was due to an increase in the wage rate during 1980-81. The factor share of human labour has also decreased from 43 per cent in 1972-73 to 21 per cent in 1980-81.

Chakravorty (1983) examined the impact of Minimum Wage Acts for agricultural labour in West Bengal. He observed that he higher the market wage rate, the higher would be the substitution of hired labour by self labour among the small farms which led to a shrinkage of employment opportunities for hired labour. The bigger cultivators also reacted by wage cutting policy and denial of age old practices of giving loans and advances to poor labourers during lean season which resulted in more hardships and poverty to these labourers.

George *et al.*, (1983) studied the factor shares in Indian agriculture during 1972-73 and 1980-81. They have observed that the factor share of labour has improved in all regions during this period mainly due to increase in wage rate and the only exception to this was Punjab where the

factor share of labour had declined. This was mainly due to machanisation substituting the labour force.

Kahlon and Kurian (1983) observed that the per hectare cost of labour for 4 major wheat producing states viz, Punjab, Haryana, Uttar Pradesh and Madhya Pradesh exhibited a rising trend at current prices during 1970-71 to 1979-80. They observed that the labour cost per hectare in Punjab was almost twice that of Madhya Pradesh and the labour intensity and yield per hectare showed a weak association.

Parthasarathy (1983) attributed the stagnation of rice production in Kerala to the rapid increase in wage rate than the farm price of rice. The consequences of unfavourable price ratios for rice have been adverse to the interests of labour despite the rise in the wage rates particularly in areas in which conditions were favourable for mechanization. So the cultivators were increasingly going for mechanization for specific operations such as ploughing and leveling.

Subramanyan (1986) in a study on labour demand and supply responsiveness of cotton observed that the supply of

output and labour demand were found to be highly elastic to changes in cotton prices. He observed that demand for labour is highly elastic to changes in wage rate and the labour had the share of more than 20 per cent in the total output.

Bhalla (1987) examined the labour saving technology adopted by Indian farmers. The rising real wage rate had tilted the scales in favour of labour saving technology in the early and mid seventies in Haryana and Punjab. The labour saving measures used were land augmenting, mechanisation, and mechanisation combined with a shift to chemical fertilizers, pesticides and weedicides.

Job *et al.*, (1991) observed that in the cultivation of rice the hired human labour was the most expensive item of the inputs contributing more than 50 per cent of the total expenditure. They observed that for rice, labour absorption is rising in traditional rice growing areas but it was falling in non traditional areas.

Pushpangadan (1992) observed that although Kerala had the highest unemployment rate in India it had no effect on the wage rate of rice labourer since the majority of them

were educated, unemployed and were not available due to social stagma attached to such labour and as a result there existed shortage of labour along with high unemployment during the peak season of agricultural activities. He pointed out that the degree of unionisation was the only significant variable that influenced the wage rates of rice field labourers in post land reform period.

Francis (1993) in his study on the shortage of labourers in Kuttand observed that there was surplus labour during 1970's in Kuttanad for rice harvesting. But since the mid 1980's there was dearth of labourers and this was mainly due to fact that educated youngsters between the age group of 15 to 30 preferred unemployment rather than working in the field. He observed that these aspirational changes was faciliated by improvements in the economic status of the working class who had benefited from the intervention of government and the labour union in the labour market. He opined that the behaviour of the workers in the labour market was equally determined by cultural and social factors.

2.3 Reviews on cost of cultivation and resource use efficiency

Krishna (1970) observed that the marginal productivity of land in the cultivation of hybrid maize was

far higher than that of rice, ie. it was more profitable to bring more area under hybrid maize. The marginal productivity of fertilizer was Rs. 2.38 in the case of hybrid maize and Rs. 0.15 in the case of rice which showed that application of fertilizer was beyond optimum level in rice cultivation and application of more fertilizer to maize would yield more output.

George and Singh (1971) observed that during the period from 1961-62 to 1970-71 the cost of cultivation increased from Rs. 461.3 to Rs. 1971 per hectare in the case of wheat and from Rs. 245.09 to Rs. 1276.44 per hectare in the case of bajra. They observed that with the increase in the price of inputs the cultivators experienced a cost price squeeze and a consequent fall in the net income.

Anonymous (1974) in a study conducted in Andra Pradesh Agricultural University on cost of production of rice in the state during 1971-72 observed that the total cost of cultivation per hectare of rice was Rs. 1467.33. The yield/hectare was 25.22 quintals and cost of production per quintal was Rs. 51.33. The operational cost accounted for 56.06 per cent of the total cost. Among the operational

cost human labour ranked first contributing one fifth of the total cost followed with fertilizers and manures contributing one sixth of the total cost.

Anonymous (1974) in a study conducted in GB Pant University of Agriculture and Techolonogy on cost of production of wheat in U.P during 1971-72 observed that the operational cost accounted for 63.23 per cent of the total cost of production. Human labour accounted for 18.79 per cent, animal labour 16.39 per cent and fertilizer and manure 9.3 per cent of the total cost.

Anonymous (1974) in a study conducted in Mahatma Phule Krishi Vidyapeeth on cost of Production of jowar in Maharashtra during 1971-72 observed that the operational cost contributed 49 per cent of total cost of production. The human labour was the most important component contributing 24.59 per cent followed by bullock labour 19.04 per cent, both accounting for two fifth of total cost. Fertilizer and manure contributed 6.57 per cent.

Anonymous (1974) in a study conducted in Orissa University of Agriculture and Technology on cost of

production of rice in Orissa during 1971-72 and 1972-73 observed that operational cost constituted 62.09 per cent in 1971-72 and 61.14 per cent in 1972-73. The share of human labour reduced from 30.19 per cent to 29.51 per cent and bullock labour reduced from 17.36 to 15.58 per cent during the period. The share of fertilizers and manures increased from 6.87 per cent to 7.36 per cent during this period.

Anonymous (1974) in a study conducted in Punjab Agricultural University on cost of production of wheat in Punjab during 1971-72 and 1972-73 observed that the share of operational cost reduced from 61.48 per cent to 58.96 per cent of the total cost during the period. The share of human labour reduced from 19.57 per cent to 16.77 per cent. The share of fertilizers and manures increased from 13.91 per cent to 14.73 per cent during this period.

Gangwar and Singh (1976) observed that the share of purchased inputs to the total cost had increased over time where as the contribution of the farmer's own resources had declined. The profit of the farmers on the basis of cost A_1, and cost A_2 had increased over time but it declined on the basis of cost B and it was found negative on the basis of

cost C indicating that the farmers were losers due to rise in the prices. They opined that the rise in imput price had eroded the production incentives of the farmers.

Grewal and Rangi (1976) observed that due to an increase in input price the per hectare expenditure on cost A_2 basis had increased from Rs. 1239.20 in 1971-72 to Rs. 1605.30 during 1974-75 in the case of rice where as in the case of wheat this increase was from Rs. 1020.10 to 1433.32 per hectare. But due to the enhancement of product prices there was no reduction in the net income margin rather it had improved both for rice and wheat crops.

Marothia (1976) found that the cost of working expenditure per hectare for wheat, maize and rice had significantly increased by 33, 33 and 13 per cent respectively during the period from 1967-68 to 1970-71. This increase in the cost of working expenditure was due to the increased intensity in the use of purchased inputs along with the increase in the prices of these inputs. The expenditure on purchased inputs had increased by 154.56, 122.82 and 97.89 per cent for rice, maize and wheat respectively while the cost of non purchased inputs declined by 43.18, 16.42 and 9.22 percent for rice maize and wheat respectively.

Mishra *et al.*, (1976) found that a sharp rise in input prices increased the total input cost per hectare in 1974-75 by 19.57 per cent and reduced the margin of net profit by 14.11 per cent during the same period. The per hectare expenditure on quality seeds, fertilizer, irrigation, human labour bullock labour etc was higher in 1974-75 as compared to 1970.71 because of the increase in the prices of these inputs. Thus it was concluded that the exorbitant rise in the prices of modern farm inputs had adversely affected the profitability in farming by increasing the input costs on the one hand and decreasing the level of use on the other hand.

Rathore *et al.*, (1976) studied the impact of change in prices of input and output on the progressive and traditional farms of arid region of Rajasthan from 1970 to 1974. They observed an increase in per hectare operating cost by 111.29 per cent and 84.12 per cent on the progressive and traditional farms respectively in the year 1974-75 over 1970-71. The progressive farms were affected more by increase in input price as compared to traditional farms. The increased price of labour and the level of its use raised the expenses by 245.98 and 155.93 per cent on the progressive and traditional farms respectively.

Rebello *et al.*, (1976) observed that in the cultivation of sugarcane during the period from 1972-73 to 1975-76 the total operational cost increased by 62 per cent due to the increase in the prices of inputs which was relatively higher than that of product price. Hence net return decreased by 20 per cent. In the case of high yielding variety of rice the total operational cost increased by 131 per per cent and that of local variety increased by 143 per cent.

Pandey *et al.*, (1977) studied the cost structure of some major crop enterprises during the period from 1966-67 to 1973-74. He observed that the share of purchased inputs increased with the size of the farm. In general it was higher for high yielding variety of rice and wheat as compared to the local variety. Fertilizer, water and human labour accounted for major share of the total cost.

Ram (1977) studied the resource productivity in rice cultivation on 59 modernized and 59 unmodernized farms and the variables studies were crop area, human labour, bullock labour and manures and fertilizers. He observed that 82 and 94 per cent of the variation in the value of output

for modernized and unmodernized forms respectively was explained by the combined effect of these inputs. The marginal value product of all inputs were found to be high on all forms indicating further scope for increasing income and profit by increasing the use of human and bullock labour and manures and fertilizers.

Sain and Chattopadhyaya (1977) in a study on relative productivity of inputs in production of rice observed that the marginal value product of human labour in majority of cases was less than its factor cost, while that of fertilizer, irrigation and capital were in most cases greater than its cost.

Chamak *et al.*, (1979) observed that the marginal value product of land was the highest on the small size category of farms followed by largest and medium size categories. The marginal value product of labour was found to be positively correlated with the size of holding and that of bullock labour was found to be negatively correlated with the size of holding. The marginal value product of working capital was found to be positive and high on the smallest size category followed by the medium one.

Balishter and Singh (1981) observed that in 1976-77 and 1979-80 prices of most of the inputs used for crop production had increased substantially over 1969-70. The expenditure on all purchased inputs increased significantly from 1969-70 to 1976-77 and 1979-80. They opined that the price increase adversely affected the level of input use and farm output.

Joseph (1982) in a study on resource use efficiency of rice farms of Kuttanad observed that in the input wise study, the human labour use per hectare was the most important input constituting about 45 per cent of the total cost.

Singh (1982) observed that the total cost of cultivation of Bajra which was Rs. 260 per hectare in 1977-78 increased by 20 per cent during 1979-80. Human labour accounted for the largest share of the total cost for each year. The second largest share of total cost was contributed by tractor use. Seeds and manures were the only material input used to the extent of 8 per cent in bajra cultivation.

Armenia (1983) observed that the estimate using the Cobb-Douglas production function indicated that without

irrigation neither land tenure, type of farming nor farm size had any significant effect in improving the technological efficiency in either dry or wet season in Philippines. The significant effect of irrigation in improving the productivity of resource use was attributed to the adequacy of water supply for irrigation in both seasons. In low land farms, farmers did not allocate resources efficiently, particularly the amount of nitrogen applied land cultivated and human labour employed. Farm income in low land rice farms could still be increased by adjusting the level of inputs used.

Balishter and Chauhan (1983) in a study to estimate the factor shares in farm income using a Cobb-Douglas production function observed that farm size contributed the most to farm income. It was also found that with increased farm tractorisation the relative share of land decreased as well as the share of human labour. The share of fertilizers was higher for tractor operated farms than for bullock operated farm.

Radhakrishanan (1983) in a study in the economics of rice cultivation observed the the relative as well as

absolute profitability in rice cultivation had declined considerably after 1974-75 and this led to the recent decline in area under rice and its production. The low profitability in rice cultivation contributed to the shifting of land away from rice cultivation.

Shah (1983) studied the production elasticities of inputs based on Cobb-Douglas production function separately for different types of farms on the basis of size, land tenure and degree of mechanisation. He observed that labour was not a significant variable on tenant/small/non-mechanical farms; non-draught animals were not a significant variable on large farms and fertilizer not significant variable on mechanised farms.

Dayal (1984) revealed that the spatial variation in land productivity was positively related to fertilizer use, irrigation and urban-industries development and negatively related to population density. The aggregate productivity was positively related to fertilizer and irrigation and negatively with the density of population and agricultural workers. The significant explanatory variables in the regression equation explained 61 per cent of land productivity and 42 per cent of aggregate productivity.

Herath (1984) in a study indicated that labour productivity was not high and there was no potential for using labour to increase productivity. The land variable indicated higher elasticties implying that land was a very productive resource in peasant farming. The inputs such as fertilizer could still be used with an increasing elasticity at higher levels of land and labour.

Scandizzo (1984) observed that farm factors viz, harvested land, labour, fertilizer and tractor use explained 80 per cent of variation in aggregate output. The production function analysis revealed that the capacity to produce output at a given level of factor use had increased. The output share claimed by primary factors land and labour were either stationary or decreasing. The share of fertilizer was stationary in some area and sharply increased in all other region and return to scale tended to remain constant.

Verma (1984) in a study on jute production in Hooghly district of West Bengal and Nowgong district of Assam observed that the application of factor inputs had considerable production response in jute cultivation. Constant returns to scale was observed in Hooghly and

increasing returns to scale in Nowgong. He opined that jute production could be either proportionately or more than proportionately increased by stepping up application of factor inputs at farm level.

Bastine (1985) in a study on the economics of rice-cultivation observed that the cost of cultivation of high yielding variety of rice increased from Rs. 2240.34 per hectare in 1978-79 to Rs. 3668.42 per hectare in 1981-82 where as in the case of local variety of rice it increased from Rs. 1905.07 per hectare in 1978-79 to Rs. 3403.12 in 1981-82. The benefit-cost ratio were 1.76 and 1.61 for HYV and LV respectively and the cost of production per quintal was Rs. 67.78 for HYV and 77.44 for LV. The human labour accounted for 40 and 24 per cent respectively in the case of LV and HYV.

Marothia (1985) in a study to identify factors constraining rice yields in farmer's field opined that a significant yield gap was found in rice production which could be attributed to the major constants identified viz, high price of fertilizers, small size of farms lack of capital, low price of farm produce, lack of technical

knowledge, non-availability of recommended seeds and types of fertilizers, lack of communication facilities, non availability of credit, soil problem and protective nature of irrigation.

Adinarayana (1986) opined that since the introduction of high yielding varieties there had been significant increase in rice production in Andhra Pradesh during the mid 1960's. The production function analysis revealed that the relative value shares of labour, fertilizer and capital had improved significantly. The increase in the relative share of labour indicated that farmers are benefited from the general rise in productivity. But the rural sector on the whole may lose to the urban sector in the long run through the substantial value share attributed to fertilizer and capital services.

Yadav and Gangwar (1986) observed that the adoption of technology increased the per hectare net return of high yielding varieties of rice by 78.6 per cent over local variety. They observed that with the exception of land and draught power all inputs had a higher elasticity of production for high yielding variety of rice than for local

variety. They also observed that the new technology increased the efficiency of inputs by providing higher return for each additional unit of investment.

Muraleedharan (1987) in a study on the resource use efficiency in kole lands noticed that the elasticity coefficient with respect to land, human labour, fertilizers and manures were positive as well as significant. It was also observed that the present levels of human labour, fertilizer and manures were higher than their optimum level and so it was advised to reduce the use of these inputs to the optimum level.

Job *et al.*, (1991) in a study on the cost benefit analysis of rice cultivation in Kerala observed that cost of cultivation per hectare of local varieties was Rs. 5804 and Rs. 6002 respectively during virippu and mundakan seasons where as it was Rs. 6207 and Rs. 6512 hectare in the case of high yielding varieties. They observed that hired human labour was the most expensive item of input contributing more than half of the total expenditure.

Thomas *et al.*, (1991) in a study analysed the decline of rice area in Thrissur district. They found that during a short period of 3 years from 1987-88 to 1988-89 the decline in the area under rice was about 31 per cent and the analysis showed a benefit cost ratio of 1.51.

Thomas *et al.*, (1992) observed that the labour input alone was the largest single item of the cost for both local variety (70.96 per cent) and high yielding variety (66.4 per cent) followed by fertilizers.

METHODOLOGY

CHAPTER 3

METHODOLOGY

In this chapter a detailed description of the methods and procedures followed in conducting the study is presented. The details are presented under the following six heads.

3.1 Location of the study

3.2 Sampling Procedure

3.3 Selection of variables

3.4 Procedure of data collection

3.5 Period of study

3.6 Statistical tools used in the analysis of data

3.1 Location of the study

The study was conducted in Thiruvananthapuram district of Kerala State. The district consists of three agricultural subdivision viz, Attingal, Nedumangad and Neyyattinkara. From these, Nedumangad sub division was purposively selected since it was having the maximum area

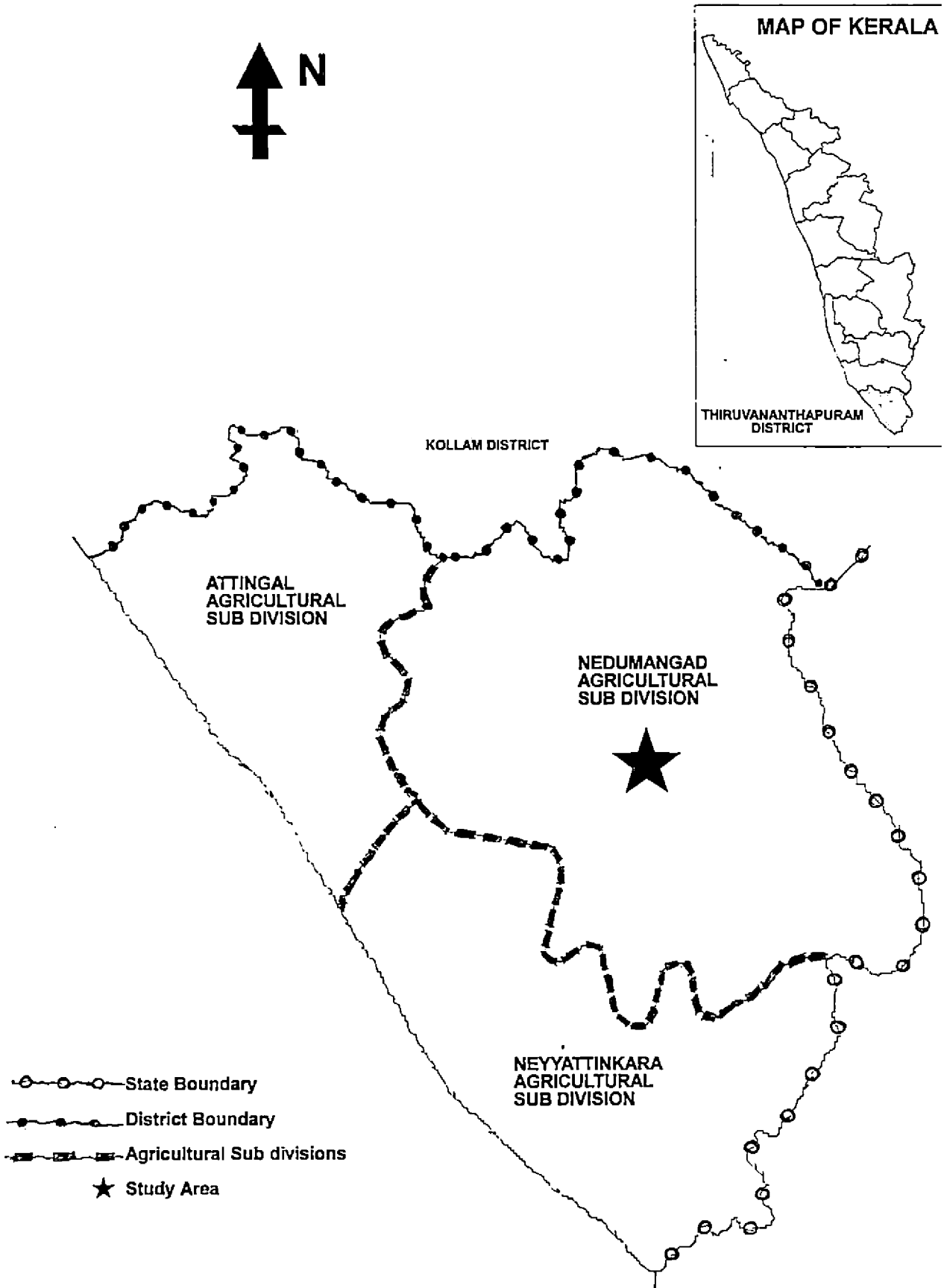


Fig. 3.1.1. Map showing the location of the study - Nedumangad Agricultural Sub division in Thiruvananthapuram District

under rice cultivation in Thiruvananthapuram district. Majority of farmers in this area were considered to be progressive farmers.

3.2 Sampling Procedure

Since the main objective of the study was to examine the impact of increase in the price of fertilizers, and wage rate in rice production, a multi stage stratified random sampling technique was employed in the selection of sample. As stated earlier Nedumangad subdivision was purposively ,selected. From this subdivision four Krishibhavans viz Aanad, Aruvikhara, Karakulam and Vattiyurkavu were selected at random.

A list of rice growers in each Krishibhavan area was prepared from the Krishibhanvan office. From this list 30 cultivators from each Krishibhanvan area were selected at random making the total sample size 120. After the collection of data selected farmers were stratified into 3 different strata based on the area under rice cultivation as shown below.

Stratum I - Area under rice upto 0.2 hectare

Stratum II - Area under rice 0.2 - 0.4 hectare

Stratum III - Area under rice more than 0.4 hectare

3.3 Selection of Variables

Based on the reviews collected on studies in similar line, discussion with experts and observations made by the researcher, a list of main variables were selected and included for the study. The variables selected were

1. Wages paid during the first and second crop seasons of 1992-93 and 1993-94
2. Labour used for different agricultural operation during the above seasons
3. Quantity of fertilizers applied in different seasons
4. Quantity of organic manure used in different seasons
5. Production obtained in different crop seasons
6. Price of inputs and output in different crop seasons (cost of cultivation)

A brief description of the variables selected for the study is given below.

1. **Wages paid during the fist and second crop seasons of 1992-93 and 1993-94**

The term wages refered to the reward obtained by the employee for his work done. Wages paid to the labourer both in cash and kind were considered for this purpose and the total wages were taken as the sum of the money wages and money equivalent of kind wages paid.

Wages paid during first and second crop seasons during 1992-93 and 1993-94 were collected for men labour, women labour animal labour and mechanical labour.

2. **Labour used for different agricultural operations**

Agricultural labourer is defined as a person either man or women doing any kind of agricultural operation for a farmer in receipt of wages in the form of either cash or kind or both for a period of 8 hours work.

Labour use for different agricultural operations such as preparatory cultivation, sowing or transplanting, manuring and fertilizer application, intercultural

operations, irrigation, plant protection operation and harvesting were collected for the two seasons during 1992 and 1993 respectivity.

3. Quantity of organic manure used

The quantity of organic manure in kilogram in the form of farm yard manure used during first and second crop seasons of 1992 and 1993 were collected.

4. Quantity of fertilizers applied

A commercial fertilizer is a material containing at least one of the primary nutrients ie N, P or K in a form assimilable or available to plants in known amounts. The quantity of fertilizers used in the kilogram in the form of straight or fertilizer mixtures applied during first and second crop seasons of 1992 and 1993 were collected.

5. Production

This indicated the quantity of grains in kilogram obtained after harvest during first and second crop seasons of 1992 and 1993.

6. Costs and Return

This refered to the total expenditure incurred for undertaking different agricultural operations and the gross return from main as well as by product in different seasons in aggregate level.

In the present study cost of cultivation included.

i) Cost of hired human labour

The actual wages paid in money terms for men and women labourers employed for various cultural operations like preparatory cultivation, sowing, intercultural operations, application of manures and fertilizers, plant protection and harvesting were included in determining the cost of hired human labour.

ii) Cost of animal labour

Animal labour was used for the initial land preparation and their hire charge was taken as the cost of animal labour.

iii) Cost of mechanical labour

In addition to animal labour mechanical labour was also used and its hire charges paid was taken as the cost of mechanical labour.

iv) Cost of seeds

Purchased seeds were evaluated on the basis of their purchase price and same price was used for evaluating farm produced seeds.

v) Cost of plant protection chemicals

The cost of plant protection chemicals were estimated at their market price.

vi) Cost of manures and fertilizers

The cost incurred for the purchase of manures and fertilizers was estimated at their purchase price.

vii) Interest on working capital

The rate of interest changed by the Primary Agricultural Credit Cooperative Societies for short term

agricultural credit which was 12 per cent per annum was charged for 4 month's duration of the crop for different seasons.

viii) Family labour

The cost of family labour was imputed based on the prevailing wage rate for hired labour in these areas during the period, under study.

ix) Miscellaneous expenses

This included the expenditure incurred for soil ameliorants like lime and other expenses incurred for post harvest operations like drying, packing storing.

Income Measures

i) Gross Income

Gross income referred to the total value of the farm receipts which included the total value of the grain and straw. This was calculated based on the farm price prevailed in the area.

ii) Net Income

Net income was the difference between the gross return and total expenditure incurred.

iii) Benefit - Cost Ratio

The production efficiency is revealed by the B.C ratio. It was calculated by dividing the total benefits by total expenditure incurred for production.

3.4 Procedure of Data Collection

The study was conducted using primary data collected from the respondents by personal interview using a well structured and pretested questionnaire. Informations about the family composition, educational status of the family members, occupation, income pattern and all other aspects of rice cultivation were collected. Necessary secondary data were also collected from various published and unpublished sources.

The data were collected during the months of March, April, May and June of 1994. All the 120 respondents were

directly intervieved by the researcher herself. The interview was conducted in a natural conversational manner and their responses for the various questions were recorded in the schedule itself. Personal care has been taken by researcher in order to eliminate biassed and incorrect informations from the respondents.

3.5 Period of Study

Since the study formed only a part of the academic programme of the reseacher and the time available was limited, the period of study was confined to two years. Data covering 4 seasons viz., S_1 - 1992 first crop season, S_2 - 1992 second crop season, S_3 - 1993 first crop season and S_4 - 1993 second crop season were collected.

3.6 Statistical tools used

The data collected from the respondents were coded tabulated and statistically analysed as follows (Snedecor and Cochran, 1967).

The impact of increase in fertilizer price and wage rate on rice production were studied by using index numbers.

Since price hike was observed from second crop season of 1992 onwards, the value in the pre - price hike season viz., first crop season of 1992 was taken as the base period.

The cost of cultivation of rice was analysed by percentage analysis.

Cobb Douglas production function model as shown below was used to estimate the resource use efficiency of selected factors.

$$Y = a \; X_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} X_5^{b_5} X_6^{b_6} X_7^{b_7} X_8^{b_8}$$

where,

Y = average yield of rice (Kg/ha)

a = intercept/constant

X_1 = Seed (Rs)

X_2 = Plant protection (Rs)

X_3 = Organic manure (Rs)

X_4 = N applied (Kg)

X_5 = P applied (Kg)

X_6 = K applied (Kg)

X_7 = Men labour (Labour days)

X_8 = Women labour (Labour days)

b_1, b_2, b_3, b_4, b_5, b_6, b_7 and b_8 are the regression coefficient showing the production elasticities of individual resources and their sum being an indicator of the nature of returns to scale.

A reliable estimate of marginal productivity is worked out by taking X_i at its geometric mean level. Also $\hat{Y}$ is the estimated level of output when each input is held at its geometric mean (Heady and Dhillon, 1961).

The marginal productivity of each input could be derived through partial differentiation of the estimated production function.

The marginal productivity of X_i, the i^{th} input in the equation is given by

$$\text{Marginal Productivity} = \frac{\partial \hat{Y}}{\partial X_i} = bi\ \hat{Y}/X_i, \quad i = 1,2...8$$

$$\text{Marginal value product} = \frac{\partial \hat{Y}}{\partial X_i} \times P_y = bi\ (\hat{Y}/X_i)\ P_y$$

where P_y is the price of output.

RESULTS & DISCUSSION

Chapter 4

RESULTS AND DISCUSSION

The results obtained were discussed under the following four heads.

4.1. General economic and social conditions of the respondent farmers.

4.2. Costs and Returns from the cultivation of rice

4.3. Impact of increase in wage rate and price of fertilizers on the production of rice.

4.4. Resource use efficiency of input factors of production.

4.1. General economic and social conditions of the respondent farmers

A brief idea about the social and economic conditions of the farmers in the study area was felt essential to have a better understanding of their farming activities. Therefore an attempt was made to examine the following socio-economic parameters viz. family size, age,

education and occupational status, size of holding and family income of the respondent farmers.

The sample farmers were stratified based on the area under cultivation in three different strata as given in table 4.1.1.

Table 4.1.1. Distribution of farmers in different strata

Holding size	Area under rice (hectare)	No. of farmers
Stratum I	< 0.20	58 (48.33)
Stratum II	0.2 - 0.4	45 (37.50)
Stratum III	> 0.4	17 (14.17)
Total		120 (100)

Figures in parenthesis denote percentage to total

It was observed that 48 per cent of the sample farmers pocessed only 50 cents of rice area and 38 per cent had 50-100 cents ie. about 86 per cent of the farmers had

upto 1 acre of land. Only 14 per cent possessed more than 1 acre of rice area.

4.1.1. Family size

The distribution of the respondent farmers based on their family size is presented in table 4.1.2.

Table 4.1.2. Distribution of the respondent farmers according to family size

Holding size	Family size			Average size of the family
	≤ 4	5-8	Total	
Stratum I	39 (67.24)	19 (32.76)	58 (100)	4.33
Stratum II	34 (75.56)	11 (24.44)	45 (100)	3.84
Stratum III	10 (58.82)	7 (41.18)	17 (100)	4.47
Total	83 (69.17)	37 (30.83)	120 (100)	4.17

Figures in parenthesis denote percentage to total

Out of 120 farmers studied 69 per cent were found to be having nuclear families with a family size of 4 members and 31 per cent had comparatively bigger family size of 5-8 members. In the stratum level the maximum percentage of nuclear families was observed in stratum II (76 per cent) followed by stratum I (67 per cent) and stratum III (58.82 per cent). The average size of the family was noticed to be 4.17. The average family size was found to be leased in staratum II (3.84) and the maximum in stratum III (4.47).

4.1.2. Age

Age wise distribution of the respondent farmers is furnished in table 4.1.3.

Table 4.1.3. Age-wise distribution of the respondent farmers

Holding size	Age (years)				Total	Average age
	≤ 30	30-45	45-60	>60		
Stratum I	1 (1.72)	21 (36.21)	35 (60.34)	1 (1.72)	58 (100)	48.33
Stratum II	1 (2.22)	16 (35.52)	26 (57.78)	2 (4.44)	45 (100)	50.38
Stratum III	0 (0)	2 (11.76)	12 (70.59)	3 (17.65)	17 (100)	54.12
Total	2 (1.67)	39 (32.50)	73 (60.83)	6 (5)	120 (100)	49.92

Figures in parenthesis denote percentage to total

It was noticed that majority of farmers (61 per cent) fell in the age group of 45-60 years. Only two farmers out of total 120 were young ie. below 30 years. About 33 per cent of the farmers fall in the age of group of 30-45 years. The number of farmers in the old group was also negligible (5 per cent). The same trend was noticed in all strata. Sixty per cent of the farmers in stratum I, 58 per cent in stratum II and 71 per cent in stratum III fell in the age group of 45-60 years.

4.1.3. Educational Status

The educational status of the sample farmers is discussed in table 4.1.4.

Table 4.1.4. Distribution of respondent farmers according to educational status

Holding size	Primary	High School	Pre-Degree	Graduate	Total
Stratum I	7 (12.07)	29 (50)	4 (6.9)	18 (31.03)	58 (100)
Stratum II	2 (4.44)	25 (55.56)	4 (8.89)	14 (31.11)	45 (100)
Stratum III	2 (11.76)	10 (58.82)	2 (11.76)	3 (17.65)	17 (100)
Total	11 (9.17)	64 (53.33)	10 (8.33)	35 (29.17)	120 (100)

Figures in parenthesis denote percentage to total

The study has revealed 100 per cent literacy in the study area. Majority of the farmers (53 per cent) were having high school standard. It was also observed that about 29 per cent of the farmers were educated up to graduate level. Farmers with primary level education were found to be 9 per cent. The same trend was noticed in the stratum level also. MAximum percentage of farmers in all strata were having high school standard, followed with graduation.

4.1.4. Occupational Status

The occupational status of the respondent farmers is furnished in table 4.1.5.

Table 4.1.5. Occupational status of respondent farmers

Holding size	Agri-culture alone	Agri-culture as main occu-pation	Agri-culture as sub occu-pation	Total
Stratum I	29 (50)	12 (20.69)	17 (29.31)	58 (100)
Stratum II	29 (64.44)	6 (13.33)	10 (20.22)	45 (100)
Stratum III	14 (82.35)	2 (11.76)	1 (5.88)	17 (100)
Total	72 (60)	20 (16.67)	28 (23.33)	120 (100)

Figures in parenthesis denote percentage to total

The study has revealed that majority of the sample farmers were mere agriculturists. For 60 per cent of them, Agriculture formed the only for 60 per cent of them. In other words, 60 per cent of the farmers depended upon agriculture along for their livelihood. Agriculture was only a subsidary occupation for about 23 per cent of the respondents and for 17 per cent agriculture was the main occupation along with other occupations such as Government service, business etc. The same trend was noticed in all the three strata also. In all strata, majority of the respondents, depended on agriculture along for their livelihood. The dependence on agriculture alone was found to be highest in stratum III (82 per cent) followed by stratum II and stratum I which were respectively 64 per cent and 50 per cent.

4.1.5. Size of holding

This referred to the net area under possession of the respondent farmers.

The frequency distribution of the house holds based on the size of holding (net area) owned by them is presented in table 4.1.6.

Table 4.1.6. Distribution of house holds according to size of holding

Holding size	Size of holding (hectare)				Total	Average size of holding (hectare)
	< 0.4	0.4-1	1-2	> 2 ha		
Stratum I	17 (29.31)	32 (55.17)	7 (12.07)	2 (3.45)	58 (100)	0.652
Stratum II	4 (8.89)	24 (53.33)	14 (31.11)	3 (6.67)	45 (100)	1.02
Stratum III	0 (0)	3 (17.65)	11 (64.71)	3 (17.65)	17 (100)	1.68
Total	21 (17.5)	59 (49.17)	32 (26.67)	8 (6.67)	120 (100)	0.94

Figures in parenthesis denote percentage to total

It was observed that the holding size of about half of the respondents were 0.4 to 1 hectare and only 6.67 per cent was having holdings above 2 hectares.

The same trend was observed in stratum I and II where as in stratum III 64.71 per cent of the house holds owned holdings with size 1 to 2 hectares.

4.1.6. Annual income of respondent farmers

The distribution of the respondents based on their annual family income is given in table 4.1.7

Table 4.1.7. Annual income of respondent farmers

Holding size	Annual income (Rs)					Average annual income
	< Rs 50000	Rs 50000-100000	Rs 100000-200000	> Rs 200000	Total	
Stratum I	38 (65.52)	16 (27.59)	2 (3.45)	2 (3.45)	58 (100)	63776
Stratum II	30 (66.67)	12 (26.67)	2 (4.44)	1 (2.22)	45 (100)	58622
Stratum III	4 (23.53)	10 (58.82)	3 (17.65)	0 (0)	17 (100)	77471
Total	72 (60)	38 (31.67)	7 (5.83)	3 (2.5)	120 (100)	63783

Figures in parenthesis denote percentage to total

In the aggregate level, it was noticed that about 60 per cent of the farmers were getting annual income of less than Rs. 50000 only. Earlier it was stated that 60 per cent

of the respondents nearly depended upon agriculture alone for their livelihood. This showed that the level of income from agriculture is comparatively low. About 32 per cent of farmers were getting annual income upto one lakhs rupees and only 8 per cent got more than rupees one lakh. The average annual income in the aggregate level was Rs. 63783/. It may be noticed that, not even a single farmer was living below the poverty line. They were living much above this level with very good standard of living. The same trend was noticed in different strata also. Majority of farmers fell in the first income group of less than Rs 50000, followed by second income group.

4.2. Costs and returns from the cultivation of rice

An input wise analysis of cost of cultivation of rice and the variation in costs and returns during the first and second crop seasons of 1992-93 and 1993-94 are furnished in table 4.2.1. and 4.2.2. respectively.

The cost of cultivation was worked out by taking into account inputs such as labour, fertilizers, organic manure, plant protection and interest on working capital.

Table 4.2.1. Cost of cultivation of rice (Rs/ha) in different seasons (Input wise analysis)

Sl. No.	Input	S_1	S_2	S_3	S_4
A.	**Labour**				
1.	Animal	1408.08 (10.12)	1418.53 (9.59)	763.30 (4.87)	775.35 (4.87)
2.	Mechanical	864.03 (6.21)	867.83 (5.87)	1352.53 (8.62)	1352.53 (8.50)
3.	Human				
	i. Family	419.03 (3.01)	435.20 (2.94)	486.0 (3.10)	524.78 (3.30)
	ii. Hired	7400.83 (53.18)	7525.63 (50.87)	8438.78 (53.80)	8615.93 (54.15)
	iii. Total human labour	7819.86 (56.19)	7960.83 (53.81)	8924.88 (56.90)	9140.71 (57.15)
	Sub total	10091.97 (72.51)	10247.19 (69.27)	11040.71 (70.39)	11268.59 (70.82)
B.	**Material inputs**				
4.	Seed	472.08 (3.39)	472.23 (3.19)	537.63 (3.43)	539.88 (3.39)
5.	Organic manure	1662.95 (11.95)	1707.98 (11.55)	1905.75 (12.15)	1905.85 (11.98)
6.	Chemical fertilizers	909.33 (6.53)	1423.73 (9.62)	1340.31 (8.54)	1187.33 (7.46)
7.	Plant protection	215.23 (1.55)	218.33 (1.48)	242.00 (1.54)	249.83 (1.57)
8.	Miscellaneous	30.30 (0.22)	154.93 (1.05)	14.75 (0.09)	147.28 (0.93)
	Sub total	3289.89 (23.64)	3977.20 (26.88)	4040.44 (25.76)	4030.17 (25.33)
C.	**Others**				
	Interest on working capital	535.27 (3.85)	568.99 (3.85)	603.25 (3.85)	611.95 (3.85)
	Total	13917.13 (100)	14793.36 (100)	15684.40 (100)	15910.71 (100)

Figures in parenthesis denote percentage to total cost

Table 4.2.2. Costs and returns from the cultivation of rice (Rs/ha)

Sl. No.	Item	Cost/Returns (Rs/ha) S_1	S_2	S_3	S_4
I.	Costs				
1.	Seed	472.08 (100)	472.23 (100.03)	537.63 (113.88)	539.88 (114.36)
2.	Farm yard manure	1662.95 (100)	1707.98 (102.87)	1905.75 (114.60)	1905.85 (114.61)
3.	Fertilizers	909.33 (100)	1423.73 (156.57)	1340.31 (147.39)	1187.33 (130.57)
4.	Plant protection	215.23 (100)	218.33 (101.44)	242 (112.44)	249.83 (116.08)
5.	Miscellaneous	30.30 (100)	154.93 (511.32)	14.75 (48.68)	147.28 (486.07)
6.	Labour				
	i. Family labour	419.03 (100)	435.20 (103.86)	486.10 (116.01)	524.78 (125.24)
	ii. Hired labour	9672.94 (100)	9811.99 (101.44)	10554.61 (109.11)	10743.81 (111.07)
	iii. Total labour cost	10091.97 (100)	10247.19 (101.44)	11040.71 (109.40)	11268.59 (111.66)
7.	Total cost	13917.13 (100)	14793.36 (106.30)	15684.40 (112.70)	15910.71 (114.32)
II.	Returns				
1.	Grain	12888.75 (100)	11477.30 (89.05)	14378.90 (111.56)	11894.20 (92.28)
2.	Straw	3141.33 (100)	3936.33 (126.31)	3604.70 (114.75)	4580.68 (145.82)
3.	Gross return	16030.08 (100)	15413.63 (96.15)	17983.60 (112.19)	16474.88 (102.77)
4.	Net return	2112.92 (100)	620.27 (29.36)	2299.2 (108.81)	564.17 (26.70)
5.	BC ratio	1.17	1.05	1.16	1.03

Figures in parenthesis denote index numbers

Fixed cost components such as depreciation rental value on land etc. were not taken into consideration since they were not found relevant to the objectives of the study.

During the first crop season of 1992, the total cost of cultivation was found to be Rs. 13917.13 per hectare. The maximum share of the total expenditure was contributed by labour (72.5 per cent). Out of this the share of human labour was about 56 per cent to the total cost which was found to be maximum followed with animal labour (10.12 per cent) and mechanical labour (6.21 per cent). Next major input factor in terms of cost was manures and fertilizers, which contributed 11.95 per cent and 6.5 per cent respectively to the total cost. The contributions of other inputs like seed and plant protection chemicals were comparatively less, which accounted to 3.39 and 1.55 per cent respectively.

The gross return obtained by the cultivator during the first crop season (S_1) was estimated to be Rs 16090/. Thus the net profit received by the cultivator was only Rs. 2112/-.

During the subsequent seasons an increasing trend in the total cost was noticed. In S_2 season the total cost increased by 6.3 per cent, in S_3 season by 12.7 per cent and in S_4 season by 14.3 per cent respectively over the S_1 season. This increase in total cost was mainly due to the escalation of labour charges and fertilizer prices. In all the seasons the factors contributed to the escalation of total cost were observed as labour followed by manures and fertilizers.

In S_2 season the share of labour component was 69.27 per cent, of which 53.8 per cent was contributed by human labour alone. The share of labour was found to be maximum S_3 and S_4 seasons which accounted to 70.39 and 70.82 per cent respectively with human labour as the major contributor.

The expenditure on chemical fertilizers was 9.62 per cent of the total cost in S_2 season. This was due to an exorbitant rise in the prize of fertilizers. There after the prize of fertilizers was reduced in the subsequent seasons, resulting in a reduction on the share of chemical fertilizers to total cost, which were 8.54 and 7.46 per cent respectively in S_3 and S_4 seasons.

The share of organic manure to total cost remained almost stable in all the seasons.

The returns from grains was Rs. 12888.75 in S_1 season, which reduced by 11 per cent in S_2 season and increased by 11.56 per cent in S_3 season and again reduced by 8 per cent in S_4 season when compared to S_1 season. The returns from straw was Rs. 3141.33 in S_1 season and was found to be increasing in subsequent seasons.

A comparison of the gross returns in different seasons showed that it reduced by 4 per cent in S_2 season and thereafter showed an increase over S_1 season.

The net return registered a decline in S_2 and S_4 seasons. The decline to the extent of 70 per cent in S_2 and 73 per cent in S_4 seasons. In S_1 and S_3 season the net return was comparatively high.

The Benefit-cost ratio was found to be 1.17 in S_1. This ratio was less in S_2 and S_4 seasons ie. 1.05 and 1.03 respectively. S_1 and S_3 seasons referred to first crop season during which majority of the farmers used high

yielding varieties and hence got better output. In S_2 and S_4 season which referred to second crop season, farmers used local varieties and hence less gross return, net profits and loss BC ratio.

4.3. Impact of increase in fertilizer prices and wage rate in rice production

4.3.1. Variation in the price of Nitrogenous fertilizer and its level of use

The farmers in the study area used mainly urea for nitrogen. Hence the price of urea was taken for discussion purpose.

The price variation of nitrogen and quantity of nitrogen used in different strata during different season is presented in table 4.3.1.

During 1992 first crop season, the price of urea was maximum of Rs. 3137 per tonne In August 1992 the price was reduced by the Government of India by about 10 per cent.

The study has revealed that though the price was reduced by about 10 per cent, this did not bring any increase

Table 4.3.1. Change in the price of nitrogen and level of use

Sl. No.	Item	Level of use/price per unit (Rs) S_1	S_2	S_3	S_4
1.	Price of N (Rs/t)	3137 (100)	2830 (90.21)	2830 (90.21)	2830 (90.21)
2.	Use of N (Kg/ha)				
	i. Stratum I	70.73 (100)	63.56 (89.86)	63.08 (89.18)	63.08 (89.18)
	ii. Stratum II	68.67 (100)	59.10 (86.06)	58.63 (85.38)	58.63 (85.38)
	iii. Stratum III	55.90 (100)	53.20 (95.17)	52.72 (94.31)	52.83 (94.51)
	iv. Overall average	67.74 (100)	60.28 (88.99)	60.10 (88.72)	60.10 (88.72)

Figures in parenthesis denote index numbers

Note : The price of nitrogen given referred to the price of urea.

The use of N is given in terms of the actual nutrient nitrogen

in its use. From the second crop season it was noticed that the level of nitrogen use was reduced by 11 per cent. This was reflected in the different strata also. In the stratum level 11 per cent reduction in use was noticed in stratum I, 15 per cent in stratum II and 5 per cent in stratum III.

It was also observed that the level of use of nitrogen decreased with the increase in the size of holdings. This may be due to the more intensive approach of the farmers in smaller stratum. There was an overall 11 per cent reduction in the level of use of N in the area during the period. This may be due to the fact that there was a considerable increase in the price of P and K fertilizers which tempted the farmers to use less quantity of nitrogen.

Mahatvaraj, 1993 and Marwaha and Gaur, 1993 also observed that due to the sudden increase in the price of fertilizers other than nitrogen, their was a reduction in the use of nitrogen.

4.3.2 Changes in the price of phosphatic fertilizer and its level of use

The table 4.3.2 depicted the change in the price of phosphatic fertilizer and quantity of it used in different strata during different seasons.

Table 4.3.2. Change in the price of phosphate and its level of use

Sl. No.	Item	Level of use/price per unit (Rs) S_1	S_2	S_3	S_4
1.	Price of P (Rs/t)	3465 (100)	6990 (201.73)	6458 (186.38)	5740 (165.66)
2.	Use of P (Kg/ha)				
i.	Stratum I	31.03 (100)	27.54 (88.75)	26.75 (86.21)	26.75 (86.21)
ii.	Stratum II	32.18 (100)	27.84 (86.51)	27.82 (86.45)	27.82 (86.45)
iii.	Stratum III	26.12 (100)	24.69 (94.37)	24.29 (92.99)	24.29 (92.99)
iv.	Overall average	30.73 (100)	27.23 (88.61)	26.76 (87.08)	26.76 (87.08)

Figures in parenthesis denoted index numbers

Note : The price of phosphate given referred to the price of factamphos. The level of use is given in terms of the actual nutrient phosphorus

Farmers in the study area used mainly phosphorous in the form of Factamphos Hence the price of factamphos was taken for discussion purpose.

The price of phosphorus was minimum of Rs. 3465/. tonne, up to August 1992. In August 1992 the Govt. of India as a policy measure enhanced the price of phosphatic fertilizers by 101.7 per cent and the price rose to Rs. 6990 per tonne. This disturbed the agricultural economy to a great extent. Hence inorder to protect the interest of the farmers, Government of Kerala in the state level permitted a small amount of subsidy in 1993. Government of India announced a subsidy of Rs. 1000 on potassic and phosphatic fertilizers in July 1993. Even after permitting a second subsidy, the prevailing price of `P' was Rs. 5740 per tonne which was 66 per cent more than the price at the base level of 1992 first crop season. This price escalation considerably affected its use by the farmers. In the aggregate level during S_2 season, Phosphorous use was reduced by 11.39 per cent, and in S_3 and S_4 season by 12.92 per cent. This decling trend in its application was noticed in stratum level also. The analysis showed that the reduction in the use of `P' was about 12-14 ,per cent in stratum I and II and 6-7 per cent in stratum III in different seasons.

This finding was in line with the observation of Marwaha and Gaur, 1993 and Rebello *et al.*, 1976.

4.3.3 Changes in the price of potash and its level of use

The variations in the price of potash and its level of use in different strata during different seasons are furnished in table 4.3.3.

The price of potash during 1992 first crop season was Rs. 1740 per tonne. In 1992 August along with the price of phosphorous, the price of potash also was increased by the Government of India to Rs. 4973 per tonne. Again as in the case of phosphatic fertilizers a small amount of subsidy to potassic fertilizers was permitted during first crop season of 1993 by Government of Kerala and subsequently Government of India permitted Rs. 1000 per tonne. As a result the price was reduced to Rs. 3908 per tonne. Even after permitting subsidy, the price prevailed was at a higher rate which was 124.6 per cent more than that at the base level. This affected the consumption of `K' fertilizer in different seasons. The consumption of fertilizers reduced by 13 per cent in S_2 season and 13.6 per cent each in S_3 and S_4

Table 4.3.3. Change in the price of potash and its level of use

Sl. No.	Item	Level of use/price per unit (Rs) S_1	S_2	S_3	S_4
1.	Price of K (Rs/t)	1740 (100)	4973 (285.80)	4952 (284.60)	3908 (224.60)
2.	Use of K (Kg/ha)				
i.	Stratum I	35.26 (100)	30.60 (86.78)	30.02 (85.14)	30.02 (85.14)
ii.	Stratum II	27.88 (100)	23.14 (83.97)	23.63 (84.76)	23.63 (84.76)
iii.	Stratum III	27.77 (100)	26.61 (95.82)	25.56 (92.04)	25.56 (92.04)
iv.	Overall average	31.24 (100)	27.16 (86.94)	26.98 (86.40)	26.99 (86.40)

Figures in parenthesis denoted index numbers

Note : The price of potash given referred to the price of muriate of potash. The level of use is given in terms of the actual nutrient potash.

seasons. In the stratum level also the same trend was noticed. The reduction in the use of potash was about 13 to 16 per cent in strata I and II and 4 to 8 per cent in stratum III.

Similar observations was reported by Rebello *et al.*, 1976 and Singh *et al.*, 1976.

4.3.4. Extent of variation in wage rate and level of use of men labour

Table 4.3.4 depicted the variation in wage rate and the level of use of men labourers.

A steady of increase in wage rate was observed in different seasons during the period under study. During S_1 season the wage rate for men labourer was Rs. 54.17 which showed an increase of Rs. 56.54 in S_2, Rs. 62.79 in S_3, and Rs. 64.04 in S_4 seasons. Thus an over all increase of 18.2 per cent was noticed in wage rate during the period of 2 years.

A slight variation in wage rate was noticed in different strata. This may be due to regional disparity

Table 4.3.4. Variation in the wage rate and level of man labour use

Sl. No.	Item	Level of use/price per unit (Rs) S_1	S_2	S_3	S_4
1.	Wage rate (Rs/day)				
i.	Stratum I	55 (100)	57.73 (104.96)	63.45 (115.36)	67.24 (122.25)
ii.	Stratum II	53.54 (100)	55.63 (103.90)	62.22 (116.21)	64.78 (120.99)
iii.	Stratum III	53.23 (100)	55.29 (103.87)	62.06 (116.59)	65.29 (122.66)
iv.	Overall average	54.17 (100)	56.54 (104.37)	62.79 (115.91)	64.04 (118.22)
2.	Level of use (days/ha)				
i.	Stratum I	111.21 (100)	109.18 (98.17)	107.00 (96.21)	104.02 (93.53)
ii.	Stratum II	96.97 (100)	94.36 (97.31)	97.50 (100.55)	94.49 (97.44)
iii.	Stratum III	99.51 (100)	99.57 (100.06)	99.84 (100.33)	98.12 (99.21)
iv.	Overall average	103.88 (100)	101.90 (98.90)	102.40 (98.57)	99.70 (95.98)

Figures in parenthesis denote index numbers

noticed in wage rate. Some times especially in smaller holdings farmers were forced to give higher wage rate for getting labourers in time. But the stratum level variation is not significant.

The wage rate given to the men labourer was found to be much higher than the minimum wages fixed by the Government. The minimum wages for agricultural labourers fixed by the Government of Kerala (with effect from 1-4-92) for various agricultural operations are as follows.

1. Men labourers for doing ordinary heavy labour like digging, preparing basins etc. (eight hours) Rs. 40 and paise 20 per day.
2. Female labourers doing light type of work (weeding etc.) for eight hours Rs. 30 per day.

The level of labour use also declined in different seasons. But the reduction in labour use in different seasons is not significant. It was about 6 per cent in stratum I, 3 per cent in stratum II and 1 per cent in stratum III. Overall reduction in labour use during the period was 4 per cent over the base period.

Jha and Kumar (1976), Rebello *et al.*, (176) and Bal *et al.*, (1983) also observed similar results.

4.3.5. Variation in wage rate and level of use of women labourers

The variation in wage rate and level of use of women labourers is presented in table 4.3.5.

The study has revealed that the women labourers were paid at a very low rate when compared to men labourers. A difference of Rs. 18 to Rs. 24 per day was observed in different seasons. As in the case of men labourers, a steady increase was noticed in the wage rate of women labourers also. The wage rate which was Rs. 35.88 in S_1 season increased to Rs. 36-30 in S_2 season, Rs. 39.0 in S_3 season and Rs. 40.82 in S_4 season. Thus an overall increase of 13.8 per cent in wage rate was found during the period of 2 years.

The change in wage rate was noticed in stratum level also. The wage rate was found to be maximum in stratum III. Since holding sizes are comparatively higher in this stratum more women labourers are required for certain

Table 4.3.5. Changes in wage rate and level of use of women labour

Sl. No.	Item	Level of use/price per unit (Rs) S_1	S_2	S_3	S_4
1.	Wage rate (Rs/day)				
i.	Stratum I	35.22 (100)	35.65 (101.22)	39.21 (111.33)	40.38 (114.65)
ii.	Stratum II	36.25 (100)	36.65 (101.10)	40.21 (111.09)	41.02 (113.16)
iii.	Stratum III	37.00 (100)	37.41 (101.17)	41.29 (111.59)	41.76 (112.86)
iv.	Overall average	35.88 (100)	36.30 (101.17)	39.90 (111.20)	40.82 (113.77)
2.	Level of use (days/ha)				
i.	Stratum I	75.49 (100)	75.31 (99.76)	72.68 (96.28)	72.68 (96.28)
ii.	Stratum II	69.11 (100)	69.32 (100.30)	68.51 (99.13)	68.50 (99.12)
iii.	Stratum III	66.70 (100)	67.15 (100.67)	67.03 (100.49)	66.70 (100)
iv.	Overall average	71.70 (100)	71.75 (100.07)	70.33 (98.09)	70.28 (98.02)

Figures in parenthesis denote index numbers

operations like weeding, harvesting etc. coupled with scarcity of women labourers might have prompted them to pay higher wage rates.

Considering the level of labour use much variation was not observed in different seasons. In stratum III, the maximum sized holdings no variation in labour use was found in different seasons. In other strata the variation was not significant. But an over all reduction of 2 per cent was seen in aggregate level on S_3 and S_4 seasons.

Similar observations were made by Jha and Kumar (1976), Rebello *et al.*, (1976) and Singh *et al.*, (1981).

4.3.6. Trends in prices of production inputs and output

In this section the changes in prices of all the inputs used for rice production and their level of use during different seasons are discussed. (vide Table 4.3.6 and 4.3.7)

During the period from S_1 to S_4 seasons the price of rice had increased from Rs. 374 to Rs. 428 per quintal or 14 per cent on the other hand the price of inputs increased

Table 4.3.6. Trends in prices of production inputs and output

Sl. No.	Input/output	Price/unit (Rs) S_1	S_2	S_3	S_4
1.	Seed (Rs/quintal)	600 (100)	600 (100)	700 (116.67)	700 (116.67)
2.	Farm yard manure (Rs/qtl)	329.60 (100)	332.80 (100.97)	373.60 (113.35)	377.20 (114.44)
3.	Fertilizers (Rs/qtl)				
	a. Nitrogen	313.70 (100)	283.00 (90.21)	283.00 (90.21)	283.00 (90.21)
	b. Phosphate	346.50 (100)	699.00 (201.73)	645.80 (186.38)	574.00 (165.66)
	c. Potash	174.00 (100)	497.30 (285.80)	495.20 (284.60)	390.80 (224.60)
4.	Labour (Rs/day)				
	a. Men	54.17 (100)	56.54 (104.37)	62.79 (115.91)	64.04 (118.22)
	b. Women	35.88 (100)	36.30 (101.17)	39.90 (111.20)	40.82 (113.77)
5.	Price/quintal of rice	374 (100)	377 (100.80)	422 (112.83)	428 (114.44)

Figures in parenthesis denote index numbers

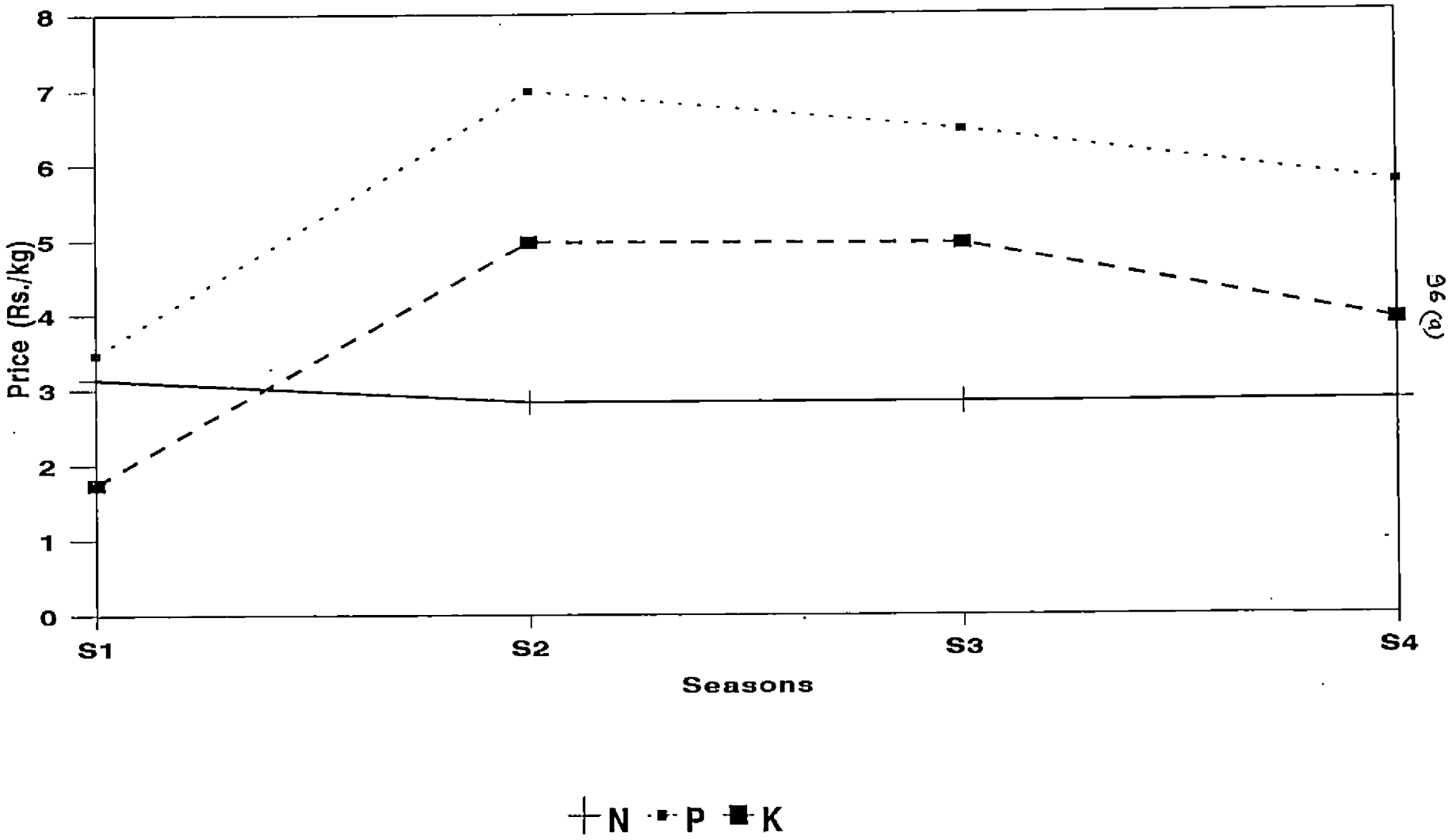


Fig. 4.3.1. Variation in the price of fertilizers

considerably. A graphical representation of the trends in the prices of fertilizers is given in Fig. 4.3.1. The maximum increase in the price of input was observed in the case of potash fertilizer which was 186, 185 and 124 per cent respectively during S_2 S_3 and S_4 season and S_1 season. This was followed by the price of phosphatic fertilizers which increased by 102, 86 and 66 per cent respectively in S_2, S_3 and S_4 seasons. The prices of farm yard manure showed an increase of 14 per cent, men labour 18 per cent and women labour 14 per cent over S_1 season. Thus a wide disparity in the prices of input and output could be seen during the two year period under study. The increase in price of the factors was relatively much higher than that of the out put. This was specially so in the case of potash and phosphatic fertilizers as well as wages.

An analysis of the level of use of input factors showed that there was a reduction in the use of chemical fertilizers in different seasons. The trends in the level of use of N, P and K are depicted in Fig. 4.3.2. This was around 14 per cent in the case of potash, 13 per cent in the case of phosphate and 11 per cent in the case of nitrogen.

With the increase in wage rate of men and women labourers, their level of use decreased to an extent of 4 per cent in the case of men labour and 2 per cent in the case of

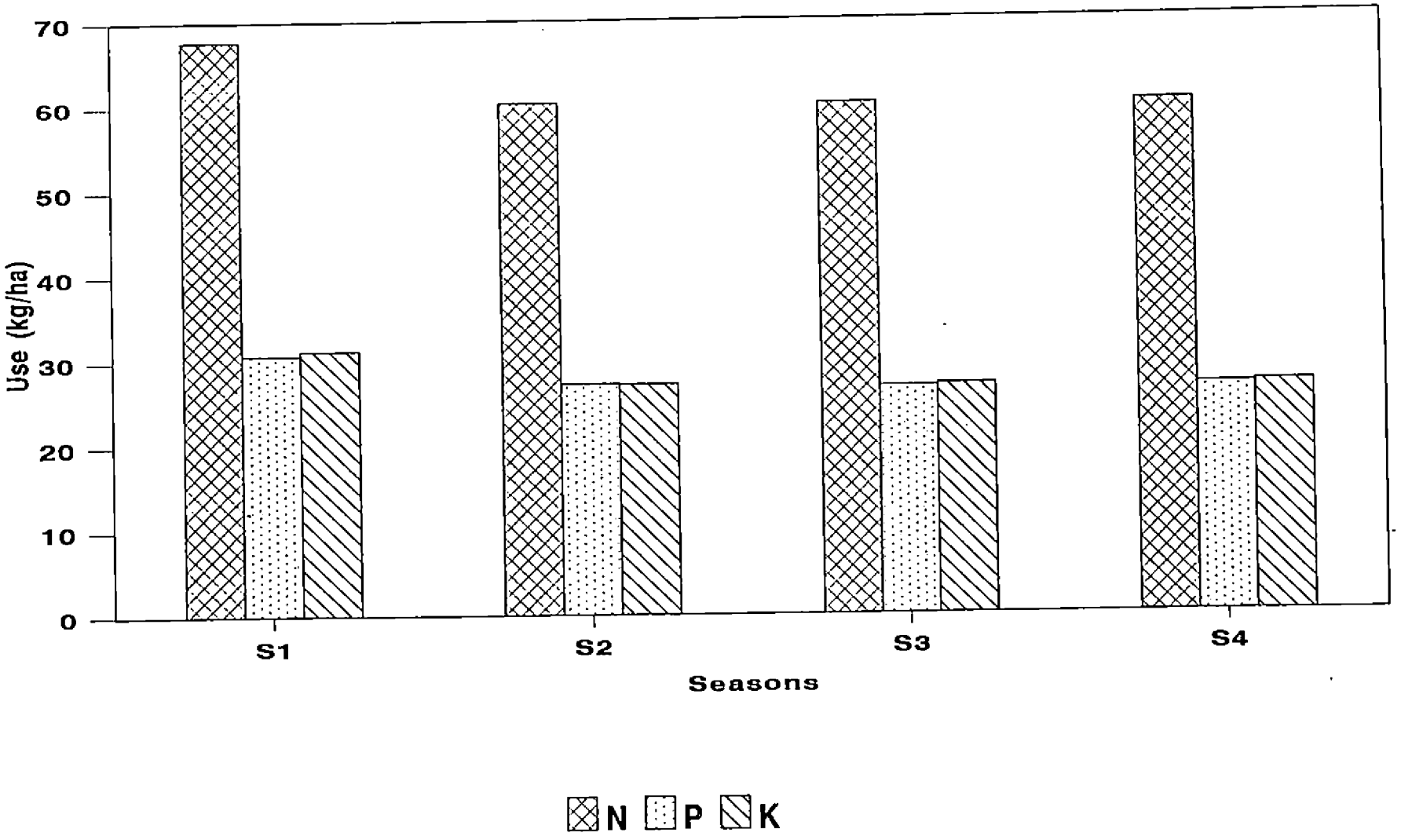


Fig. 4.3.2. The change in the level of use of fertilizers

Table 4.3.7. Average inputs of factors and production of rice

Sl. No.	Item	Quantity			
		S_1	S_2	S_3	S_4
1.	Seed (Kg)	78.68 (100)	78.70 (100.02)	76.86 (97.69)	77.13 (98.03)
2.	Farm yard manure (Kg)	5045 (100)	5132 (101.72)	5099.50 (101.08)	5051.25 (100.12)
3.	Fertilizers (Kg)				
	a. Nitrogen	67.74 (100)	60.28 (88.99)	60.10 (88.72)	60.10 (88.72)
	b. Phosphate	30.73 (100)	27.23 (86.94)	26.76 (86.40)	26.76 (86.40)
	c. Potash	31.24 (100)	27.16 (86.94)	26.99 (86.40)	26.99 (86.40)
4.	Labour (days)				
	i. Family labour	7.85 (100)	7.98 (101.66)	8.05 (102.55)	8.18 (104.20)
	ii. Hired labour				
	a. Men	103.88 (100)	101.90 (98.09)	102.40 (98.57)	99.70 (95.98)
	b. Women	71.70 (100)	71.75 (100.07)	70.33 (98.09)	70.28 (98.02)
5.	Production (Kg) Grain yield	3447 (100)	3056.75 (88.68)	3395.25 (98.50)	2733.50 (79.31)

Figures in parenthesis denote index numbers

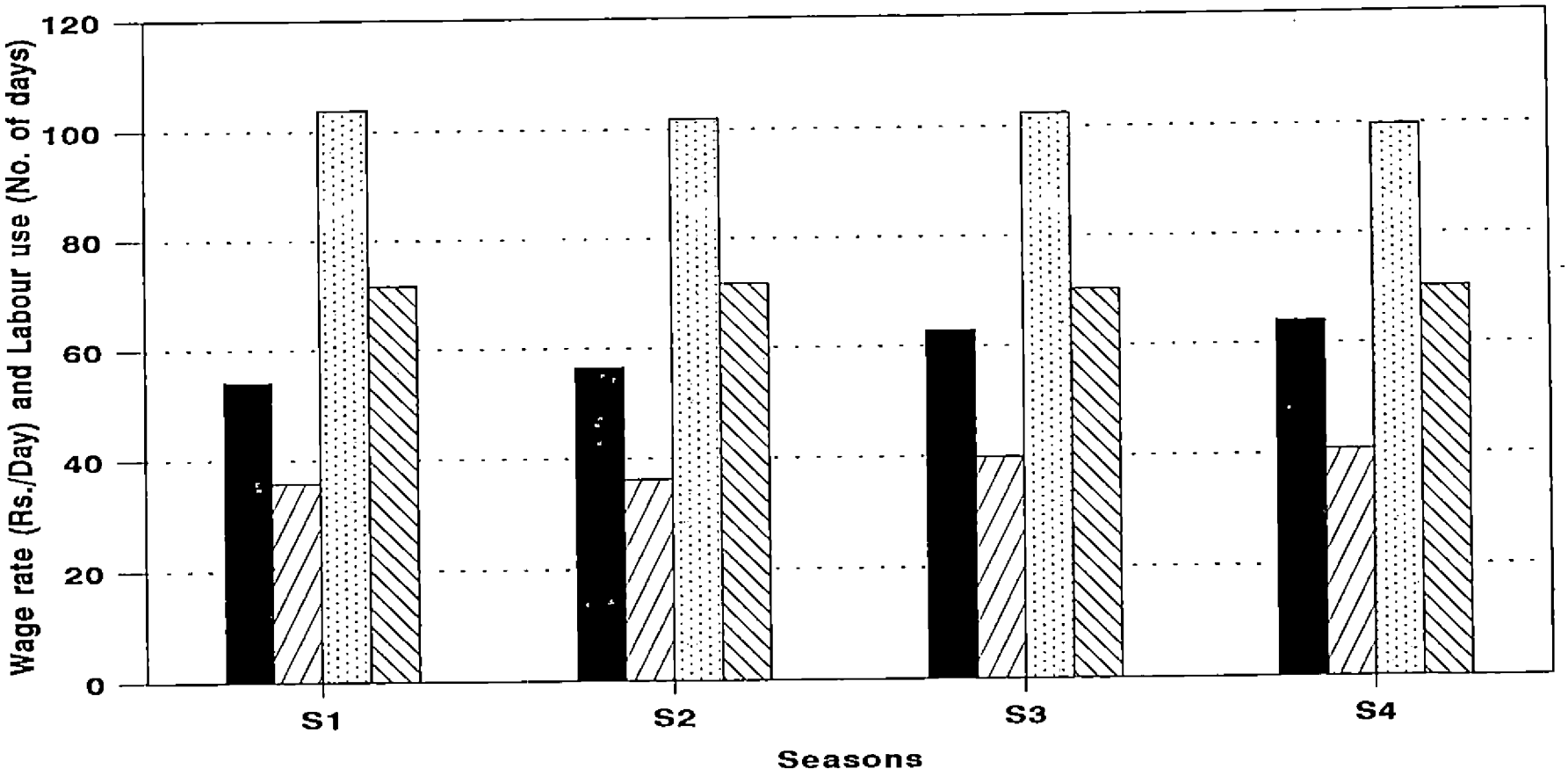


Fig. 4.3.3. Variation in the wage rate and labour use

women labourers in S_4 season over S_1 season. A bar diagram showing the variation in wage rate and labour use in aggregate level is presented in Fig. 4.3.3. It was evident from the table that with a reduction in the use of hired labour the contribution of family labour increased by about 4 per cent in S_4 season over S_1 season.

This analysis clearly indicated that the rice farmers were highly price conscious.

It was also noticed that corresponding to the reduction in the level of use of inputs, the grain output reduced to an extent of 20 per cent in S_4 season over S_1 season.

4.4. Resource use efficiency of the input factors

The resource use efficiency of different input factors used in the production process during different seasons was analysed by regression of analysis fitting a Cobb Douglas production function in the form given below.

$$Y = a\, x_1^{b_1}\, x_2^{b_2}\, x_3^{b_3}\, x_4^{b_4}\, x_5^{b_5}\, x_6^{b_6}\, x_7^{b_7}\, x_8^{b_8}$$

where, Y = average yield of rice in kg/ha

x_1 = Seed (Rs/ha)

x_2 = Plant protection (Rs/ha)

x_3 = Organic manure (Rs/ha)

x_4 = Nitrogen applied (Kg/ha)

x_5 = Phosphate applied (Kg/ha)

x_6 = Potash applied (Kg/ha)

x_7 = Men labour (Labour days)

x_8 = Women labour (Labour days)

The results of the functional analysis are presented in table 4.4.1

The study has not given significant result with the different variables used. Perhaps this may be due to the existance of multi collinearity among the different independent factors involved in the production process.

The study has revealed that 26 per cent of the total variation in production in S_1 season, 54 per cent in S_2 season, 38 per cent S_3 season and only 15 per cent in S_4 season were explained by the different input factors considered. In S_4 season R^2 value was not significant.

Table 4.4.1. Estimated Production Elasticities of the input factors

Sl. No.	Variable	S_1	S_2	S_3	S_4
1.	Intercept/constant	27.99	3.847	11.63	7.645
2.	Cost of seed (x_1)	-0.053	-0.053	-0.026	0.183
3.	Cost of plant protection (x_2)	-0.015	0.035	0.037	-0.115
4.	Cost of organic mannure (x_3)	0.188*	0.241*	0.230*	-0.039
5.	Nitrogen (x_4)	0.095	0.183*	0.127	0.144
6.	$P_2 O_5$(x5)	0.068	0.034	0.086	-0.130
7.	K_2o (x6)	-0.032	0.057	-0.023	0.165
8.	Men labour (x_7)	0.183*	0.258*	0.202*	0.253
9.	Female labour (x_8)	0.035	0.057	-0.013	0.375*
10.	Multipregression co-efficient (R^2)	0.262	0.544	0.382	0.154
11.	F value	4.52*	15.50*	7.64*	2.33
12.	Sample size	111	113	108	111
13.	Returns of scale	0.469	0.918	0.672	0.806

* Significant at 5% level of significance

In S_1 season, cost of organic manure and number of days of men labour employed were found to be significant at 5 per cent level of probability. Both of these variables had exhibited positive relationship with production. Among the manures and fertilizers, organic manure alone had shown significant effect. The regression coefficient of production elasticity of organic manure and men labour were 0.19 and 0.18 respectively. This indicated that one per cent increase in the expenditure of organic manure increased the production by 0.19 per cent. Similarly one per cent increase in men labour increased the production by 0.18 per cent.

In S_2 season cost of organic manure, quantity of nitrogen applied and number of days of men labour employed were found to be significant at 5 per cent level of probability. All these variables were found to be having more response in S_2 season. The regression coefficient of oragnic manure was 0.24, that of nitrogen was 0.18 and that of men labour was 0.26. This implied that a one per cent increase in the expenditure on organic manure increased production by 0.24 per cent. Similarly one per cent increase in nitrogen increased the production by 0.18 per cent. In the case of men labour increase in total production by 0.26

per cent was resulted due to its one per cent increase. All these variables had shown positive relationship with production.

In S_3 season also the results obtained were similar to S_1 season. Only cost of organic manure and men labour were found to be significant. Elasticity coefficient were at a higher rate when compared to S_1 season (0.23 and 0.202 respectively). This implied that a one per cent increase in expenditure of organic manure would increase the production by 0.23 per cent. Similarly that of men labour increased the production by 0.20 per cent.

In S_4 season no significant results were obtained for the different factors used except for the women labour. The regression coefficient of women labour was 0.375 in this seasons.

None of the other variables were found to be significant in any of the seasons.

The returns to scale was of the order of 0.47, 0.92, 0.67 and 0.81 respectively during S_1, S_2, S_3 and S_4 seasons.

The marginal productivities and marginal value productivities of the input factors which were found to be significant in functional analysis were presented in table 4.4.2.

Table 4.4.2. Marginal productivity and marginal value product of input factors

Sl. No.	Item	S_1		S_2		S_3		S_4	
		MPP	MVP	MPP	MVP	MPP	MVP	MPP	MVP
1.	Cost of org. manure	0.42	1.57	0.45	1.71	0.44	1.86	-0.06	-0.25
2.	Nitrogen	4.97	18.59	9.39	35.39	7.43	31.34	5.10	21.85
3.	Male labour	5.86	21.92	7.29	27.48	6.45	27.21	6.31	27.03
4.	Female labour	1.74	6.50	2.46	9.29	-0.67	-2.81	14.40	61.61

It was observed that the marginal productivity of organic manure was highest in S_2 season (0.45) followed with S_3 season (0.44) and S_1 season (0.42) respectively and it was negative and negligible in S_4 season. The marginal

productivity of nitrogen was maximum in S_2 season (9.39) followed with S_3 season (7.43), S_4 season (5.10) and S_1 season (4.97). Similarly the productivity of men labour was maximum in S_2 season (7.29) followed with S_3 season 6.45, S_4 season (6.31) and S_1 season (5.86). The marginal productivity of women labour was maximum in S_4 season (14.40) and in all other seasons it was negligible. It was generally observed that the marginal productivity of input factors was highest in S_2 season.

It was observed that the marginal value productivity of organic manure and nitrogen were well above their respective factor cost. Hence it can be inferred that these inputs were used efficiently by the farmers. But the marginal value product of men labour was below the wage rate showing the inefficient use of male labour employment.


SUMMARY

SUMMARY

Rice cultivation in Kerala is becoming less and less attractive as a result of the exorbitant increase in the cost of production, without commensurate increase in the product prices. During the past few years the wage rates of agricultural labourers have considerably increased. The prices of fertilizers were increased as a policy measure by the Government of India, with effect from August 1992. The impact of this price hike would generally lead to a negative trend in production potential.

The present study was undertaken to examine the changes in the pattern of intake of labour and use of fertilizers consequent on the increase in wage rate and fertilizer prices and their impact on the production and productivity of Rice in the state with reference to a particular district. The study was undertaken with following broad objectives.

1. To examine the changes in the pattern of labour uptake and use of fertilizers consequent on the increase in wage rate and price of fertilizers.

2. To study the impact of increase in price of fertilizers and wage rate in the production and productivity of Rice.

Besides these main objectives an attempt was also made to work out the economics of rice cultivation and to examine the resource use efficiency of the different input factors involved in the production process.

The study was conducted in Thiruvananthapuram district of Kerala state. From the district Nedumangad agricultural subdivision was purposely selected since having the maximum area under rice cultivation. From this subdivision four Krishi bhavans were selected at random. From each Krishi bhavan 30 rice cultivators were selected at random so as to make the total sample size of 120. The sample was post stratified based on the area under rice cultivation into 3 strata as shown below.

Stratum	I	area under rice	-	< 0.20 hectare
Stratum	II	area under rice	-	0.20- 0.4 hectare
Stratum	III	area under rice	-	>0.4 hectare

The studies conducted on similar lines were reviewed, based on which different variable were selected for the study. The variables selected for the study were.

1. Wages paid to the labourers during first and second crop seasons of 1992-93 and 1993-94.

2. Labour use for different agricultural operations during the above two years.

3. Quantity of fertilizers applied in different seasons.

4. Quantity of organic manure used in different seasons.

5. Production obtained in different crop seasons.

6. Price of input used and output obtained in different crop seasons (cost of cultivation).

The data were collected from rice growers using a well structured and pre-tested questionnaire.

The data so collected were analysed using appropriate statistical techniques ,Viz. index numbers, percentage analysis and regression analysis. The salient findings of the study are given below.

Salient findings

1. About 69 per cent of the total respondents had nuclear families with a family size of 4 numbers or even less than that. The average family size of the respondents was found to be 4.17.

2. Majority of the respondent farmers (61 per cent) fell in the age group of 45-60 years.

3. All the sample farmers were found to be literate and more than half of them were having SSLC standard.

4. Majority of the farmers were mere agriculturists.

5. Most of the households belonging to stratum I and II were having a size 0.4 to 1 hectare where as in stratum III, majority of holdings were of size 1 to 2 hectare.

6. Considering the annual income, most of the farmers fell in the income group of less than Rs. 50,000 per annum who were much above the poverty line and having a better standard of livings.

7. The total cost of cultivation increased from Rs. 13917.13 per hectare in 1992 first crop season to Rs. 15910.71 in 1993 second crop season. This increase of 12.53 per cent was consequent to the increase in cost of all the input factors involved in the production process.

8. The maximum share of total cost was contributed by labour component which was 72.5 per cent in S_1 season, 69.37 per cent in S_2, 70.32 per cent in S_3 and 70.82 per cent in S_4

season. Among this expenditure on human labour was the highest which was accounted to 56.19 per cent to the total cost in S_1 and it increased to 57.5 per cent in S_4 season.

9. The share of fertilizers to the total cost increased from 6.53 per cent in S_1 to 7.46 per cent in S_4 season and it was maximum during S_2 season (9.62 per cent).

10. The returns from grain was more in first crop season and less in second crop season. This was due to the fact that in first crop season farmers were mostly using high yielding varieties. The same trend was noticed in gross return also.

11. The price of nitrogen in terms of urea, reduced by 9.79 per cent in S_4 season. The level of use of nitrogen reduced by 11, 15 and 5 per cent respectively in stratum I, II and III. There was an overall 11 per cent reduction in the level of use of nitrogen.

12. The price of phosphate in terms of factamphos increased by 101.73 per cent in S_2 season, 86.38 per cent in S_3 season and 65.66 per cent in S_4 season over S_1 season. During this period a reduction in its use at the rate of

12-14 per cent in stratum I and II and 6-7 per cent in stratum III were noticed.

13. The price of potash showed an increase of 185.8 per cent in S_2 season, 184.60 per cent in S_3 season and 124.60 per cent in S_4 season over S_1 season. During this period there was a reduction of about 13-16 per cent in the use of potash in stratum I and II and 4-8 per cent in stratum III.

14. A steady increase in the wage rate of men labourers from Rs. 54.17 to 64.04 from S_1 to S_4 season was noticed. But a proportionate reduction in labour was not observed. The level of use of men labour reduced by 6 per cent in the case of stratum I, 3 per cent in stratum II and only by 1 per cent in stratum III. It was infered that the hike in wage rate did not influence much in the use of labour.

15. The wage rate of women labourers increased to the extent of 1, 11 and 14 per cent respectively during S_2, S_3 and S_4 seasons over S_1 season. No significant variation in labour use was observed in stratum level analysis.

16. Wage rate of both male and female labourers were much above the minimum wage rates fixed by the Government.

17. The price of output viz., rice increased by 14 per cent in S_4 season over S_1 season. The increase in the price of output was only nominal when compared to the price of input especially potash and phosphatic fertilizers during this period.

18. Corresponding to the reduction in the level of use of inputs, the grain output showed a decline to an extent of 20 per cent in S_4 season over S_1 season.

19. The production functions analysis revealed that only 26 per cent of total variation in production in S_1, 54 per cent in S_2, 38 per cent in S_3 and only 5 per cent in S_4 season were explained by the different independent variables considered.

20. The cost of organic manure and men labour had significant elasticity during S_1, S_2 and S_3 seasons. Nitrogen had substantial elasticity in S_2 season and women labour had substantial elasticity in S_4 season. Others did not appear important.

21. The marginal value product of organic manure and nitrogen were much above their factor cost, but the marginal value product of men labour was less than the wage rate prescribed.

Implication of the findings of the study

The results presented above illustrated very clearly that profits from cultivating rice have been declining under pressure of rising input prices. It can be inferred that the rise in the prices of production inputs adversely affected the level of its utilization on the one hand and the level of farm productively on the other. This exorbitant rise in the prices of farm inputs like fertilizers and labour restricted their use by the farmers and thereby reduced the level of productivity in recent years.

The use of modern inputs is essentially a business proposition and will be resorted to only if it is profitable to the farmers. The mere need for higher agricultural production in the country has hardly any relevance to the farmers in talking a decision on the use of non - conventional inputs. The future scope of increasing agricultural production in India lies only in increasing agricultural productivity per unit with the use of modern inputs. Thus the prevailing adverse terms of trade in the use of purchased inputs have to be made favorable for the adoption of improved technology for rapid agricultural development with stability.

The present structure of input - output prices pose a threat to the viability of new cereal production

technology. The faster increase in the price of inputs compared to that of output price will make agriculture uneconomical posing a serious policy dilemma for agricultural development. It requires a set of policies designed to enchance resource efficiency in the agricultural sector in the long run. Till then substantial subsidies for using modern inputs and /or higher output prices seem to be the only alternative.

The area under rice has been declining year after year. Food grain deficit has been chronic in the state with internal production at about one third of the total requirement. The Government of Kerala, in the Agricultural Development Policy had certain programs to arrest the declining trend in area under rice cultivation such as group farming, procurement of paddy at the time of harvest etc. In addition to theis Government should take steps to reduce the cost of production to the minimum extent possible. To reduce the cost on human labour, mechanisation should be allowed wherever possible and the practice of chemical weeding should also be encouraged. The subsidy portion now given to the cultivators for fertilizers may be enhanced so as to enable them to purchase sufficient quantity of fertilizers at reasonable price. The production and application of organic manure and bio fertilizers have to be emphasised. The cost structure should be well studied before

fixing support prices, cost of production studies should be conducted by the university or the Department of Agriculture itself. The State Agricultural Prices Board recently established as a part of the current agricultural policy of the state may take necessary steps for fixing support price of the respective commodities.

Suggestions for future research

This study was limited to only one district with a restricted sample size and therefore generalization of results for the whole state was not possible. So the present investigation could be elaborated along the following limes of research work in future.

1. Similar studies are to be conducted in other districts also to cover the whole state and to facilitate geneearalisation.

2. It was found that the cost of production is increasing at an alarming rate. Hence inorder to protect the interest of the cultivators, suitable policy measures should be evolved. The cost of production study should be taken up more scientifically either at the department level or university level in every year in fixing of support prices of different varieties of rice by the Government.

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* Originals not seen

APPENDICES

Appendix I. Area, Production and Productivity of Rice in Kerala

Year	Area (lakh hectare)	Production (lakh MT)	Productivity (kg/ha)
1975-76	8.76	13.29	1519
1976-77	8.55	12.55	1468
1977-78	8.40	12.92	1538
1978-79	7.99	12.73	1594
1979-80	7.93	13.00	1638
1980-81	8.01	12.72	1587
1981-82	8.06	13.39	1661
1982-83	7.78	13.06	1679
1983-84	7.40	12.08	1631
1985-86	7.30	12.56	1720
1986-87	6.64	11.34	1709
1987-88	6.04	11.32	1709
1988-89	5.77	10.12	1753
1989-90	5.83	11.41	1956
1990-91	5.59	10.86	1942
1991-92	5.41	10.60	1959
1992-93	5.38	10.85	2018
1993-94	5.30	10.72	2022

Source: Directorate of Economics & Statistics

Appendix - II

Impact of Increase in Wage rate and Cost of Fertilizers in Rice Production in Thiruvananthapuram District

QUESTIONNAIRE

1. Name of the farmers :

2. Adresss :

3. Location
   a) Village :
   b) Ditrrict :
   c) Panchayat/Krishibhavan :
   d) Sub division :

4. Age :

5. Religion : Caste :

6. Family Details

Sl. No.	Name	Age	Sex	Relation ship with head of the family	Educational status	Occupation		Monthly Income (Rs.)		Annual Income (Rs.)
						Main	Sub	Main	Sub	

7. Size of holding (in cents)

Details	Wetland	Gardenland
Area owned by the famer		
Area leased in		
Area leased out		
Area irrigated		
Area un irrigated		
Area irrigable		
Value of land (Price/Cost) (Price/Cent)		
Land Revenue		
Net area sown		
Area sown more than once		
Gross cropped area		
Uncultivable area, if any		
Fallow land		
Land used for other purposes such as Building		

8. Crops and Cropping Pattern

Year	Sl. No.	Type of land	Season	Name & variety of the crop	Area (cents) Rainfed irrigated	Total
1991-92	1.	Wet land	Virippu Mundakan Punja			
	2.	Garden land				
1992-93	1.	Wet land	Virippu Mundakan Punja			
	2.	Garden land				
1993-94	1.	Wet land	Virippu Mundakan Punja			
	2.	Garden land				

9. Reasons for change in cropping pattern, if any

a) Reduction in area under rice, if any

1. High cost of cultivation Yes/No
2. Non availability of labourers in time Yes/No
3. Increase in wage rate for different operations Yes/No
4. Poor yield of the crop Yes/No
5. Increase in the cost of fertilizers Yes/No
6. Non-remuneration price for the product Yes/No
7. Lack of marketing facilities of the product Yes/No
8. Non availability of credit in time Yes/No

b) Any other reasons as spelt out by the farmer

1. Whether there is any change is the method of planting Yes/No

Transplanting to direct sowing or vice versa if yes, why

a. High labour cost
b. Non availability of labourers
c. Any other reasons

Economics – Cultivation of Rice

Area under rice Season Variety used Year

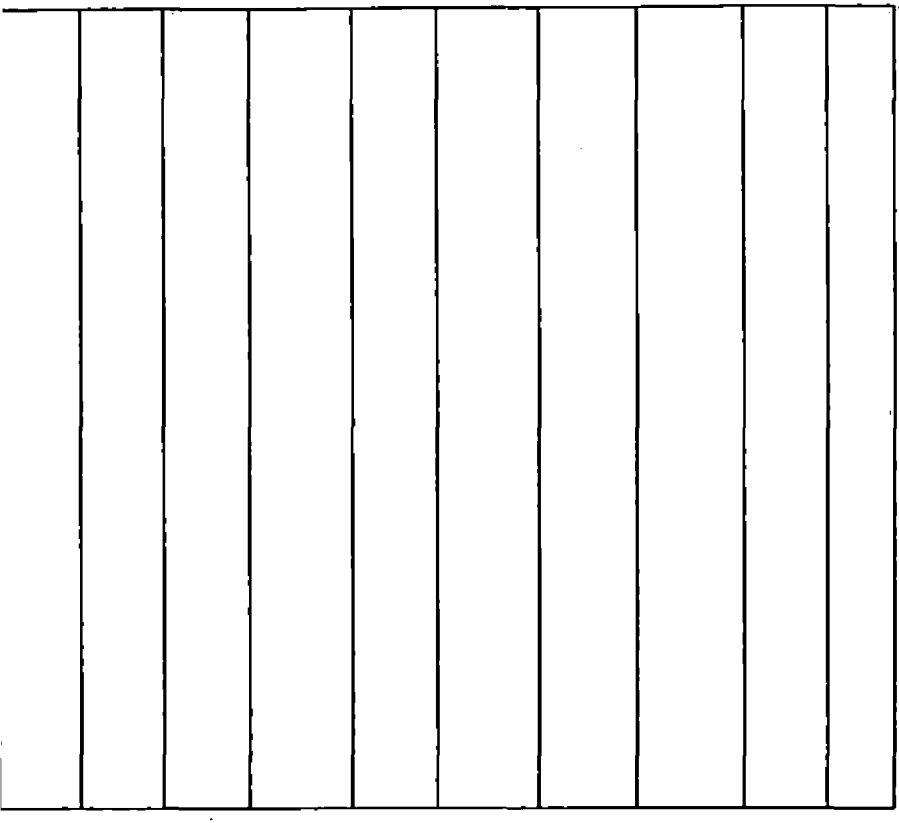
Operation	Qua-ntity	Rate/ (Rs.)	Cost of inputs (Rs.)	Mechanical Labour			Animal Labour			Human Labour				Rate (Rs.)		Total cost (Rs.)	Total cost (Rs.)
				Trader / tiller			No. of	Rate/ (Rs.)	Total cost	Family		Hired					
				Hour	Rate/ (Rs.)	Total (Rs.)				Male	Female	Male	Female	Male	Female		
Preperation of Nursery Area																	
1. Ploughing - 1 Ploughing - 2 Ploughing - 3																	
2. Taking/plastering bunds																	
3. Digging corners																	
4. Puddling and levelling																	
5. Reparation of seedbed																	
Seeds & Saving																	
6. Cost of seed																	
7. Seed treatment																	
8. Sowing																	
Manures & Manuring																	
9. Basal application of organic manure																	
Cowdung/Compost Green leaf																	
fish meal, bionmeal wood ash																	

Application of fertilizers 1. 2. 3. 4. 5. 1. Irrigation & drainage 2. Weeding if necessary 13. Plant protection 1. 2. 3. 14. Upwding seedlings and transporting **Manifield** Preparatory **Cultivations** 1. Ploughing - 1 Ploughing - 2 Ploughing - 3 2. Plastering bunds and taking corners 3. Pudding and levelling **Manures and Manuring** 4. Basal application of organic manure 1. 2. 3. 4. 5. Liming 6. Basal appl of fertilizers 1. 2. 3. 4. 5. 6. 7. Mg SO_4																		

7. Distribution of seedlings and planting							
Intercultural opens							
8. Thinning/gaptilling							
9. Weeding I Weeding II							
10. *Appln of weedings*							
11. Irrigation and drainage							
12. Plant Predection 1. 2. 3. 4. 5. 6. 7.							
14. Harvesting							
15. Transporting and threshing							
16 Winnowing, clearing drying packing *in* sacks							
Total Cost							

Returns

Particulars	Qty	Price/unit	Total Value
Grain yield			
Straw yield			
Total			



Profit / Loss

B.C. ratio

2. Type of seed used HYV/LV

If HYV, Why ?	If LV, Why ?
a. High grain yield	a. High cost of cultivation for HYV
b. Lodging absent for HYV	b. Love straw yield for HYV
c. Any other reasons	c. Poor palatibility of grains for HYV
	d. HYV show more response to fertilizers
	e. HYV more susceptible to pests & diserve
	f. Other reasons

3. Whether there is any change in the cultivation practices followed Yes/No
If yes mention those practices

   a. Reduction in no. of ploughing

   b. Reduction in no. of weeding

4. Whether there is reduction in quantity of fertilizer used Yes/No

   If yes, Why ?

   a. High cost of fertilizers

   b. Not much response of quantity of fertilizer used on yield

   c. Any other reasons

5. Whether there is any increase in quantity of organic manure used Yes/No
If yes, Why ?

   a. Substituting for chemical fertilizers

   b. Cheap and readily available

   c. Result in lesser cost of cultivation

   d. Any other reason

6. Whether there is any change in the type of fertilizers used Yes/No

7. Whether a member of group farming samitis Yes/No
If yes, Why ?

   a. Cost of cultivation is reduced

   b. Group management result in more profitability

   c. Any other reason

8. Which type of fertilizers are used.

	91-92	92-93	93-94
N			
P			
K			

9. Whether any improved cultivation practices are followed to reduce labour use.
Yes/No
If yes, specify
   a. Application of weedicides
   b. More family labour used
   c. Mechanisation
   d. Keeping the land follow
   e. Water management
   f. Any other reasons

10. Whether plant protection measures are adopted.
If no, Why ?
   a. High cost of chemicals
   b. Non availability of sprayers
   c. Non availability of skilled labours
   d. Any other reaon

11. Whether there is any reduction in the no. of laboureres used for different agricultural operations Yes/No
If yes, specify
   a. Ploughing
   b. Land preparation
   c. Irrigation
   d. Application of fertilizers
   e. Plant protection
   f. Weeding
   g. Transplanting
   h. Harvesting

12. Whether use any mechanical labour Yes/No
If yes specify in which operation
   a. Ploughing
   b. Saving
   c. Harvesting

13. Whether rice is cultivated in all seasons Yes/No
If no, why
   a. Inadequate irrigation
   b. Non availability of labourers
   c. Any other reasons

IMPACT OF INCREASE IN WAGE RATE AND COST OF FERTILIZERS IN RICE PRODUCTION IN THIRUVANANTHAPURAM DISTRICT

By

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ABSTRACT OF THE THESIS
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ABSTRACT

The study "Impact of increase in wage rate and cost of fertilizers in Rice production in Thiruvananthapuram district" was carried out with the following objectives.

1. To examine the changes in the pattern of labour intake and fertilizer use consequent on the increase in wage rate and price of fertilizers.
2. To study the impact of increase in price of fertilizers and wage rate in the production and productivity of Rice.

An attempt was also made to work out the economics of Rice cultivation and to examine the resource are efficiency of different input factors involved in the production process.

The study was conducted at Nedumangad Agricultural sub division using a sample of 120 farmers selected by multi stage stratified random sampling technique.

The variables selected for the study included wages paid to the labourers during first and second crop season of 1992-93 and 1993-94., labour use for different agricultural operations, quantity of fertilizers and organic manner used, production obtained in different crop seasons, and pricer of input and output obtained in different crop seasons.

The data were collected from Rice growers using a well structured and pretested questionnaire.

The data so collected were analysed using appropriate statistical techniques, viz., index numbers, percentage analysis and regression analysis. Some of the important findings of this study were.

1. Majority of the respondent farmers fell in the age group of 45-60 years, had nuclear families, educated up to high schools and were mere agriculturists.

2. The total cost of cultivation increased by 12.53 per cent in S_4 season over S_1 season due to the increase in cost of all the input factors involved in the production process.

3. The maximum share of total cost was contributed by labour component which was 72.5 per cent in S_1 season, 69.32 per cent in S_2, 70.32 per cent in S_3 and 70.82 per cent in S_4 season. Among this the expenditure on human labour was the highest which was 56.19 per cent to total cost in S_1 and it increased to 57.45 per cent in S_4 season.

4. The share of fertilizers to the total cost increased from 6.53 per cent in S_1 to 7.46 per cent in S_4 season and it was maximum during S_2 season (9.62 per cent).

5. The returns from grain was more in first crop season and less in second crop season because the farmers mostly used high yielding variety during first crop season.

6. The price of nitrogen in terms of urea reduced by 9.79 per cent in S_4 season. But its level of use reduced by 11, 15 and 5 per cent respectively in stratum I II and III.

7. Since S_1 season, the price of phosphate increased by 101.73 per cent in S_2 season, 86.38 in S_3 season and 65.66 per cent in S_3 season. During this period a reduction in its use at the rate of 12-14 per cent in

stratum I and II and 6-7 per cent in stratum III was noticed.

8. The price of potash showed an increase of 185.8 per cent in S_2 season, 184.60 per cent in S_3 season and 124.60 per cent in S_4 season over S_1 season. During this period its use was reduced by 13-16 per cent in stratum I and II and 4-8 per cent in stratum III.

9. A study increase in the wage rate of men and women labourers was observed during this period. But a proportional reduction in the level of labour use was not noticed. The wage rate of both male and female labourers were above the minimum wage rate fixed by the Government.

10. The price of output increased by 14 per cent in S_4 season over S_1 season. The increase in the price of output was only nominal when compared to the price of inputs.

11. The production function analysis revealed that the cost of organic manures and men labour had significant elasticity during S_1 , S_2 and S_3 season. Nitrogen had significant elasticity in S_2 season and women labour in S_4 season. Other factors did not appear significant.

12. The marginal value product of organic manure and nitrogen were much above their respective factor cost. But the marginal value product of men labour was less than the wage rate prescribed.

The results obtained from the study was similar to those obtained in earlier studies with regard to most of the variables. The results clearly indicated that the profits from cultivating rice had been declining under pressure of rising input prices. The exorbitant rise in the prices of farm inputs like fertilizers and labour restricted their use by the farmers and there by reduced the level of productivity in recent years. By proper policy measures of the Government and its implementation the rice cultivation can be made a profitable preposition.