

AGRICULTURAL OUTPUT COST-PRICING
ANALYSIS

Issues in the context of Economic
Liberalisation in India.

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Agricultural Output Cost-Pricing Analysis : Issues in the
Context of Economic Liberalisation in India:

The Study

The study deals with agricultural output, cost-price relationship across space over time with respect to principal cereal and other cash crops grown in India with a view to examine the extent to which the Indian agriculture has become cost effective in the aftermath of technological change so as to become competitive not only in domestic market but also internationally. In the process the study also assesses the extent to which the technological change has had wider spread across the regions and crops.

Objectives of the Study



- (1) to examine the trend in unit costs relative to yield,
- (2) to examine changes in component elements of costs,
- (3) to examine the factors responsible for changes in cost, e.g., prices of the factor input and level of input use,
- (4) to examine behaviour of prices relative to cost with a view to ascertain the cost effectiveness of Indian agriculture in the aftermath of technological change with respect to major field crops across space overtime.

Main Findings of the Study

- (1) Cost increases per hectare of cultivation has outstripped the corresponding increases in yield of all the principal cereal and other cash crops in respective regions between seventies and eighties leading to large increases in per unit cost.
- (2) Cost increases have been mainly brought about by increases in cost on account of human and animal labour as components of operational cost and rental value of own land, as component of fixed cost.
- (3) Share of cost on fertilizer is seen to have been in the range of 10 to 15 per cent of the total cost and 20 to 25 per cent of the operational cost in respect of crops having experienced technological change and the cost on account of seed is seen to have constituted one-third of the operational cost in respect of groundnut only.
- (4) Increase in each component of the crops overtime is seen to be due mainly to increase in the prices of the factor input rather than increase in the levels of factor inputs, except fertilizer^{and} manure, the use of which in per hectare terms is seen to have

increased between seventies and eighties, specially in respect of the states and crops having experienced technological change.

- (5) Analyses of the cost of production at constant prices bring out that in the case of crops which have had the benefits of technological change, the costs at constant prices are seen to have been declining or only marginally increasing owing to large yield increases.
- (6) Taking States into consideration across the crops (though not strictly comparable), Punjab, Haryana, Gujarat, Karnataka, Andhra Pradesh and Tamil Nadu (to some extent) are seen to have benefited from technological change in eighties.
- (7) Nevertheless, high cost at current prices leading to high procurement/support and open market prices appears to have led Indian agriculture to high cost syndrome thereby reducing the cost-effectiveness of agricultural production.
- (8) The price-cost ratios with respect to each of the procurement/support, farm-harvest and wholesale prices are not seen to have been favourable and improving in general, despite technological change.

Policy Implications

To stamp out the disadvantages arising out of cost effectiveness of Indian agriculture future efforts must be redoubled to boost productivity of crops. There is, therefore, an urgent need for developing state-of-the-art production technology to have advantage of the opportunities opened up for the agricultural producers, both in domestic market and in international market, by the new economic policies initiated in 1991.

Agricultural Output Cost-Pricing Analysis : Issues in the Context of Economic Liberalisation in India

Introduction

The new economic policy set in motion since mid-1991 has progressively started posing new challenges to as well as creating new opportunities for the Indian economy. Direct and indirect impact of these policy changes are bound to affect the agricultural sector of the Indian economy. It is argued that impact of overall liberalisation of the economy would be higher investment and growth in agriculture induced by favourable terms of trade. In all these arguments, dominant role of market forces, both domestic and international, is visualised to be of crucial importance. In keeping with these policy changes, therefore, Indian agriculture not only has to become cost effective but also competitive internationally as well as in domestic market. In this changing scenario and under changing circumstances it would of major interest to examine and analyse the extent to which the technological change introduced in Indian agriculture in seventies has had wider spread as also the cost effectiveness of such technological changes. The present study is an attempt in that direction. The study envisages to examine the nature of and extent of changes in production, input use patterns, factor input proportions, cost structure and value of output brought about by the interaction of price factor

and technological change in agriculture during the last two decades.

Objectives of the Study

The main objectives of the study are to examine (i) the trend in unit costs relative to yields, (ii) the changes in component elements of cost and (iii) behaviour of prices relative to cost with a view to ascertain the cost effectiveness of Indian agriculture in the aftermath of technological change with respect to major field crops across space and overtime. Further, the analysis is also attempted to bring out the extent to which the rising cost can be said to be an account of increase in the relative prices of the important factor-inputs or on account of increase in the levels of physical input use. Finally, the objective of the study is also to examine the implications of emerging cost-price relationships on the on-going process of economic liberalisation in India, with special reference to trade liberalisation in agriculture.

Methodology of the Study and Data Used

The study is based on cost, yield and input use data collected through sample surveys in connection with Comprehensive Scheme for the Study of Cost of Cultivation of Principal Crops in India by the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India and on data relating to farm output prices published in

various reports of the Commission on Agricultural Costs and Prices, Government of India, and in the reports on Farm Harvest Prices and wholesale prices, published by the Ministry of Agriculture, Government of India. The price covered under study is early seventies to late eighties in respect of representative regions of the country growing principal food-grains, oilseeds and cash crops. Normally one would attempt a time series and/or a cross-section analysis of the data over years and from different regions in order to study changes in cost, productivity and prices over time and across the regions. However, since the data on various items of cost, outputs, inputs and prices, cropwise and regionwise, are not available continuously and uniformly for all the years covered under the study we have resorted to tabular presentation of the results of our analysis in terms of percentage change in different variables from one sub-period to the other in different States considered for the study.

The crops considered under the study are (i) paddy in the States of Andhra Pradesh, Assam, Bihar, Haryana, Karnataka, Madhya Pradesh, Punjab, Tamil Nadu, Uttar Pradesh and West-Bengal, (ii) wheat in the States of Haryana, Madhya Pradesh, Punjab, Rajasthan and Uttar Pradesh, (iii) gram in the States of Haryana, Madhya Pradesh, Rajasthan and Uttar Pradesh, (iv) cotton in the States of Gujarat, Karnataka, Maharashtra and Punjab, (v) sugarcane in the States of Andhra Pradesh,

Karnataka, Maharashtra and Uttar Pradesh, (vi) groundnut in the States of Gujarat, Karnataka, and Tamil Nadu and (vii) rapeseed-mustard in the States of Assam, Haryana and Rajasthan. States covered under each crop account for bulk of the area and/or output of the respective crops in India. In most cases each sub-period's cost, price and output related data are presented based on triennium averages, but, due to unavailability of data on continuous basis some averages are based on two years' data and a few on one year data.

Main Findings of the Study

Analyses of cost and pricing of agricultural output of principal cereals and other crops grown in different regions lead to the following findings which have implications for future strategies and policies for agricultural development.

- 1) In the case of two most important cereals, paddy and wheat, cost increases between seventies and eighties have far outweighed the corresponding yield increases in all the States, including the ones which are known to have experienced technological change. This has led to a situation of high and increasing cost of production of paddy and wheat in India.
- 2) Cost increases have come mostly from increases in the cost on human and animal labour as a part of operational (variable) cost and from increases in the rental value of own land as part of the fixed

cost. Fertilizer input has accounted for only 15 percent of the total cost in the States known to have experienced technological change.

- 3) Cost of production of paddy and wheat at constant prices reveals either a marginally decreasing or a very marginally increasing cost over the sub-periods brought about by large yield increases in the States known to have experienced technological change in the cultivation of these two crops depicting positive outcome of technological change, viz., Punjab, Haryana, Karnataka, Andhra Pradesh, Tamil Nadu for Paddy and Punjab, Haryana and Uttar Pradesh for wheat.
- 4) Cost increases have been brought about largely by increases in the prices of the input rather than increases in physical unit of input per hectare and/or per unit of output.
- 5) Cost increases have been sought to be matched by increase in support/procurement prices leading to increase in open market prices. Yet, the price cost ratios have shown deteriorating economic situation over the decade even in States having experienced technological change, though wheat growers are seen to have fared comparatively better than the paddy growers. In terms of variable cost, the price-cost ratios are seen to be more favourable and encouraging.

- 6) Cost increases in the case of gram, an important pulse crop grown in India, have been mainly due to a declining and/or stagnant yield between late seventies and mid-late eighties.
- 7) No State seems to have made any technological breakthrough in gram cultivation as revealed by rising cost of production even at constant price.
- 8) Human and animal labour cost and cost on accounts of rental value of own land account for the bulk of the cost increases.
- 9) Cost increases have been sought to be neutralised by hefty increases in support/procurement price which has led to increase in farm-gate and open market price. Even though the ratio of procurement/support price to cost is not seen to be favourable, an improvement in the farm harvest and wholesale prices to cost ratios are noticed and these are also seen to be turning favourable over the sub-periods. Procurement price is seen to have been in-operative. All the three sets of prices are seen to be much more favourable when examined against only the variable cost.
- 10) In the case of cotton, an important cost crop grown in India, Punjab is the only state which has shown only marginal increase in cost of production owing

to relatively larger increase in yield brought about by improved technology.

- 11) In terms of constant prices therefore Punjab shows declining cost of production while States of Karnataka and Gujarat show marginal increase in cost depicting favourable impact of technological change of some degree. Increasing cost at constant price in Maharashtra, owing to declining yield of cotton indicates that technological change has had no impact on cotton cultivation in Maharashtra till mid-late eighties.
- 12) Cost increases have been largely on account of human and animal labour on the one hand and rental value of own land on the other. Cost on fertilizer has accounted for 10 to 15 per cent of the total cost in various States.
- 13) Though procurement/support price has remained inoperative (except in Maharashtra), increase in the same has led to substantial increase in farm harvest and open market price. This has led to a situation of high cost-high price syndrome. However, over the sub-periods the ratio of each of the three sets of prices to cost is seen to be deteriorating except in Punjab and the ratios of farm harvest price and

procurement price to cost are seen to be less than unity. With respect to variable cost, the ratio is seen to be positive though deteriorating.

- 14) In the case of sugarcane cost increases between seventies and eighties have considerably outstripped the yield increases, specially in Maharashtra, known for cultivation of sugarcane, owing to yield level having reached a plateau in mid-late seventies.
- 15) Cost increases have been brought about largely by increases in cost on human labour, animal labour, fertilizer-manure and irrigation on the one hand and rental value of own hand on the other.
- 16) Costs at constant price show an increasing trend in Maharashtra owing to stagnant yield level, and a decreasing cost in Andhra Pradesh and Karnataka. Uttar Pradesh, another important state for the cultivation of sugarcane is seen to have been operating at a low level of technology leading to increasing cost at constant price due to low and stagnant yield till mid-late seventies.
- 17) Cost increases have been sought to be more than countered by hefty increases in farm gate prices paid by sugar factories, specially in Maharashtra. This led to a situation of high cost led high price

syndrome in sugarcane cultivation, though procurement price has remained in-operative. The ratios of Prices to cost with respect to all the three sets of prices though favourable are seen to be declining in the case of Maharashtra. In the case of all the States prices paid by the sugar factories are seen to be favourable compared to the cost.

Procurement price is seen to have been inoperative.

- 18) As regards groundnut and rapeseed-mustard, two important oilseed crops grown in India, cost of production has risen considerably between seventies and eighties.
- 19) Cost increases have mostly come from increase in cost on human labour, animal labour, seed (in the case of groundnut only) on the one hand and rental value of own land on the other.
- 20) Cost analyses at constant price show technological break-through of some degree in the cultivation of groundnut in Gujarat and Karnataka as revealed by declining cost of production in mid-late eighties. In Tamil Nadu, on the other hand, yield level though high, appears to have reached a plateau, resulting into increased cost even at constant price in mid-late eighties.

- 21) The States of Haryana and Rajasthan show some degree of technological change in the cultivation of rapeseed-mustard as revealed by declining cost at constant price owing to large yield increases in mid-late eighties. There does not seem to be any breakthrough achieved in the production of rapeseed-mustard in Assam even by mid-late eighties, as revealed by increasing cost of production at constant price.
- 22) Procurement prices have mostly remained in-operative and cost increases have largely been sought to be met by very hefty increases in farm gate and open market prices leading to a scenario of high cost led high price syndrome in oilseed. However, the price-cost ratios with respect to all the three sets of price are seen to have declined over the sub-periods and are seen to have remained barely above unity in the case of groundnut. In the case of rapeseed mustard, except in the State of Assam, ratios are seen to have been not only above unity but also improving over the sub-periods.

Inferences and Policy Implications

It thus appears to be a high cost scenario in the cultivation/production of important cereals, pulses, oilseeds and other cash crops like cotton and sugarcane in India. This

high cost situation in the production of major agricultural crops in India may neither augur well for the domestic economy nor for international trade. Any price determined and supported on the basis cost of production of marginal producers (additional production at the margin) is bound to leave the efficient producers with large surplus income (profit) and deprive the domestic consumers of the benefits of lower cost of production brought about through improved technology. Further, the procurement/support price announced every year also takes into account the trends in the open market prices; a continual off the cuff increase in procurement/support prices fuel the increases in domestic open market prices.

Theoretical concept of technological change connotes outward shift in the production function, ceteris paribus, leading to reduced cost per unit of output produced. However, in a dynamic situation, where the full potentials of technological change is not realised, and more importantly, where relative prices of factor inputs also increases due to industrywise change, the downward shift in the cost functions brought about by outward shift in production function (via technological improvement) is met with an opposite upward shift in cost functions brought about by rising prices of factor inputs. If the opposite force of upward shift turns out to be stronger than the force of downward shift, the cost

per unit of output produced will turn out to be higher in the post technological period. This appears to have happened in the case of India in respect of the important cereals and cash crops considered in this study.

Unfortunately detailed estimates of cost of production of principal crops for the early nineties are not available for us to comment conclusively on the price-cost relationship in the current period, but, there is enough indirect evidence to suggest that stagnant and/or low productivity high cost led high domestic prices of principal agricultural commodities continue to dominate the scenario in the agricultural front in India.

A comparison of domestic prices with world prices of principal agricultural commodities, (though strictly not comparable), reveals that during large part of eighties except for rice and cotton no clear evidence of domestic price being lower than the world price is noticed. Implication of high cost led high domestic prices during mid-late eighties is reflected in India's inability to take advantage of world trade in important agricultural commodities.

It may be argued that any disproportionate increase in cost of producing agricultural commodities in future would add fuel to the already inflationary situation in the country. This would firstly affect the domestic demand and price out of the bulk of the low income vulnerable section of the

population, specially from the foodgrains sector, thereby increasing the burden of subsidy on the Central Government on account of public distribution system. Secondly, this would also adversely affect any price advantage India might have enjoyed in the trade of agricultural commodities in the international market. To stamp out these disadvantages in future efforts must be redoubled to boost productivity of the crops so as to make agricultural production cost effective and also make it globally competitive. There is, therefore, an urgent need for developing state-of-the-art production technology to take advantage of the opportunities opened up for the agricultural producers, both in domestic market and in international market, by the new economic policies.

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I

INTRODUCTION

Although far-reaching policy changes have not been introduced directly as yet in the agricultural sector in the wake of economic reforms in India initiated in the beginning of nineties, there are indications and evidences of movement in that direction. The approach in this regard has admittedly been cautious and gradual because reforms in agricultural sector have far-reaching consequences and implications for agricultural growth, food security, employment generation and poverty alleviation. However, liberalization is expected to provide a powerful thrust to growth and modernization of agriculture in near future (Rao, 1994). Agricultural Policy Resolution formulated and being given final shape is a pointer in that direction. It proposes to give agriculture the status of industry thereby visualizing cultivators as entrepreneurs seeking to maximize profits subject to resource constraints. It is believed that such a change in status would bring about the best from the farming community in augmenting agricultural production in desired mix not only

for meeting the domestic needs, but also for generating export surplus in years to come. With the signing of the agreement on Dunkel Draft Report, giving rise to World Trade Organization from January 1995, it is believed that the opportunities for enhanced agricultural exports, not only traditional but also non-traditional, have opened up considerably which the country can ill-afford to ignore. In all these arguments, dominant role of market forces, both domestic and international, is visualized to be of crucial importance. This obviously means less of State intervention in the business of agricultural production and disposal. The new policy environment is designed to create a favourable climate for agricultural output to increase. Effective exchange rate adjustment and trade reforms are expected to improve the terms of trade of tradable agriculture, make it internationally competitive and enable it to record large increases in export output. Simultaneously, freeing agriculture from internal control in domestic trade is expected to have positive impact on agricultural growth through increased prices of agricultural output. However, the challenges being posed by such policy changes in agricultural sector are bringing about improvement in quality and making agricultural production cost effective, so that the products become competitive internationally and economically viable in the domestic market.

Importance and Objectives of the Study

In this changing scenario and under the changing circumstances, it would be of some interest and importance to examine and analyse the nature and extent of changes in production, input use patterns, factor proportions, costs, cost structure and profitability brought about by the interaction of price factor and technological change in agriculture during the last two decades. These have long term implications for the goals of growth, efficiency, equity and sustainability in Indian agriculture. Analysis of such a nature would help throw light on the nature of cost-price relationships that have prevailed in respect of important foodgrains and other crops grown in different regions in India. To be more specific, analysis will help ascertain if the yield levels of some important crops have reached their plateau with the existing technology and if the Indian agriculture is found to be in the high cost syndrome. Further, the analysis will bring out the extent to which the rising cost can be said to be on account of increase in the relative prices of the important inputs and/or on account of increase in the levels of physical input use. Analysis of the gross value of the output and the agricultural prices, farm harvest, procurement-support and wholesale will, on the other hand, throw light on whether these price levels have been keeping pace with rising cost, if any. In this context it would be interesting to examine the status that the domestic

farm prices, arising out of domestic demand and supply situations and supported by state agencies, would acquire in relation to the international prices and the implications of such relationships on the on-going process of economic liberalization in India. Pricing policy of agricultural products has been a major instrument for achieving certain objectives, such as creating a positive price climate for agricultural growth, ensuring reasonable prices for consumers and producers, influencing farm income, regulating exports and/or imports and providing revenue to the Government. At the micro-level, the prices that farmers receive for their products and the cost of the inputs that they pay influence the farm household economy. The mechanism under which these prices and costs are to be determined in the changing circumstances are to be appreciated clearly by Government policymakers and administrators in order that these policies could be formulated realistically. A great deal of literature is already available on the agricultural price policy, farm price determination, input subsidies and related aspects based on the discussions, debates that have taken place on these issues from time to time. It is, however, time that in view of the proposed changing status of agriculture, a fresh look into these issues was given with a view to understand their relevance and implications in the long term perspective of agricultural development.

It is with these objectives in view that we have carried out the present study. The study is divided into five sections, Section II presents the methodology of the study and the data used for analysis. Section III presents a detailed analysis of the farm cost data in respect of the principal crops. Analysis of the cost-price relationships is dealt with in Section IV with a view to examine the trends and correlation in different prices during the period chosen for the study as also to examine the trends in various cost-price ratios. The final section discusses the issues emerging from the findings of the paper in the context of economic liberalization in India.

II

METHODOLOGY AND SOURCES OF DATA

The study is based on cost, yield and input use data collected through sample surveys in connection with Comprehensive Scheme for the Study of Cost of Cultivation of Principal Crops in India by the Directorate of Economics and Statistics, Ministry of Agriculture, Government of India and on data relating to farm output prices published in the reports of the Commissions on Agricultural Costs and Prices, Government of India, and in the reports on Farm Harvest Prices and wholesale prices, published by the Ministry of Agriculture, Government of India. The period covered under the study is early seventies to late eighties in respect of representative regions of

the country growing principal foodgrains, oilseeds and cash crops.

Methods of Analysis

Normally one would attempt a time series and/or a cross-section analysis of the data over years and from different regions in order to study changes in cost, productivity and prices over time and across the regions. The time series analysis could be attempted through the following exponential functional form for the estimation of growth rate in (i) production, (ii) yield, (iii) input use, (iv) cost, (v) gross value of output, and (vi) prices as the case may be.

$$Y = ab^t$$

Or $\ln Y = \ln a + t \ln x b$

i.e. $\ln Y = A + Bt$

where Y is the dependent variable, as the case may be, regressed upon time, the independent variable (Mitra, 1993). However, since the data on various items of cost, outputs, inputs and prices, cropwise and regionwise are not available continuously and uniformly for all the years covered under the study we resorted to tabular presentation of the results of our analysis in terms of percentage changes in different variables from one sub-period to the other in different regions considered for the study in this paper.

Periods, Crops and States Covered

The crops considered under the study are (i) paddy in the States of Andhra Pradesh, Assam, Bihar, Haryana, Karnataka, Madhya Pradesh, Punjab, Tamil Nadu, Uttar Pradesh and West Bengal, (ii) wheat in the States in Haryana, Madhya Pradesh, Punjab, Rajasthan and Uttar Pradesh, (iii) gram in the States of Haryana, Madhya Pradesh, Rajasthan and Uttar Pradesh, (iv) cotton in the States of Gujarat, Karnataka, Maharashtra and Punjab, (v) sugarcane in the States of Andhra Pradesh, Karnataka, Maharashtra and Uttar Pradesh, (vi) groundnut in the States of Gujarat, Karnataka and Tamil Nadu and (vii) rapeseed-mustard in the States of Assam, Haryana and Rajasthan. States covered under each crop account for bulk of the area and/or output of the respective crops in India.

So far paddy is concerned, cost related data are available for the periods (i) early seventies, (ii) mid-late seventies and (iii) mid-late eighties for all the States mentioned above except for Haryana, Karnataka, Punjab and Uttar Pradesh where the same are available only for (i) mid-late seventies and (ii) mid-late eighties. In the case of wheat cost related data are available for the periods (i) early seventies, (ii) mid-late seventies, and (iii) mid-late eighties for all the States mentioned earlier except Rajasthan, where the same are available for (i) mid-late seventies and (ii) mid-late eighties. For gram the cost related data are available for

the periods (i) late seventies-early eighties and (ii) mid-late eighties for the States of Haryana, Rajasthan and Uttar Pradesh, and for the State of Madhya Pradesh the same are available for (i) mid-seventies, (ii) early eighties and (iii) late eighties. For cotton the cost related data are available for the periods (i) mid-seventies and (ii) mid-eighties for all the States mentioned earlier except Punjab where the same are available for (i) early seventies, (ii) late seventies, and (iii) mid-eighties. Sugarcane crop shows the availability of cost related data for all the four States mentioned earlier for the periods (i) mid-late seventies, and (ii) mid-late eighties. In the case of groundnut cost related data are available for (i) mid-late seventies and (ii) mid-eighties for all the States mentioned in the study. Rapeseed-mustard crop shows the availability of cost related data for (i) early eighties and (ii) mid-late eighties. In most cases each sub-period's cost and output related data are presented based on triennium averages, but, due to unavailability of data on continuous basis some averages are based on two years' data and a few on one year data.

Cost Concepts

The cost concepts adopted in Ministry's data on cost and used in this study are as follows:

Cost A2 includes (i) value of hired human labour, (ii) value of owned and hired bullock labour, (iii) value of owned machinery used, (iv) hired machinery charges, (v) value of home

produced and purchased seeds, (vi) value of pesticides and insecticides, (vii) value of purchased and farm produced manures, (viii) value of fertilizers, (ix) depreciation of implements and farm buildings, (x) irrigation charges, (xi) land revenue, cess and other taxes, (xii) interest on working capital, (xiii) rent paid on leased in land, and (xiv) miscellaneous expenses.

Cost B2 includes (i) Cost A2, (ii) interest on owned fixed capital assets (excluding land), and (iii) rental value of owned land (net of land revenue).

Cost C2 includes (i) Cost B2 and (ii) imputed value of family labour.

III

ANALYSIS OF COST ESTIMATES

As mentioned earlier, in this section we deal with the cost analysis. The first part of this section deals with cost of production of various crops in selected states and changes in the same over sub-periods. The second part of the section attempts a detailed cost analysis. The third part deals with analysis of the components of operational and fixed costs comprising total cost. The fourth part deals with the relationship of cost with the value of output and finally, the fifth part deals with cost analysis at constant price.

Table 1 : Cost of Production (Rs/ql) & Yield (ql/Ha) & Value of Output (Rs/Ha) of PADDY Statewise in Different Sub-Periods

	Triennium Averages \$			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
ANDHRA PRADESH						
Cost A2	29.41	53.89	76.69	83.22	42.31	160.73
Cost B2	53.23	85.39	119.50	60.41	39.96	124.50
Cost C2	56.63	89.59	125.09	58.21	39.62	120.89
Yield	23.41	29.17	32.60	24.59	11.75	39.22
Value	1884.67	2926.00	4856.00	55.25	65.96	157.66
ASSAM						
Cost A2	17.15	37.02	59.97	115.82	62.00	249.63
Cost B2	44.89	63.62	94.02	41.72	47.80	109.45
Cost C2	46.53	83.19	107.03	78.81	28.66	130.05
Yield	15.80	18.44	18.25	16.75	-1.07	15.51
Value	1038.67	1979.33	2749.00	90.56	38.89	164.67
BIHAR						
Cost A2	33.02	46.64**	53.95	41.23	15.67	63.37
Cost B2	68.13	83.80**	111.46	23.00	33.01	63.60
Cost C2	75.70	92.17**	127.15	21.75	37.96	67.97
Yield	16.41	18.83**	18.01	14.74	-4.31	9.79
Value	1928.33	2218.00**	3161.67	15.02	42.55	63.96
MADHYA PRADESH						
Cost A2	N.A.	58.64**	84.50	-	44.09	-
Cost B2	N.A.	82.57**	124.93	-	51.32	-
Cost C2	N.A.	89.56**	139.13	-	55.35	-
Yield	N.A.	34.57**	37.56	-	8.67	-
Value	N.A.	4825.50**	7427.50**	-	53.92	-
KARNATAKA						
Cost A2	N.A.	35.31	57.05	-	61.56	-
Cost B2	N.A.	62.90	99.32	-	57.92	-
Cost C2	N.A.	66.64	111.54	-	67.37	-
Yield	N.A.	34.39	36.69	-	6.69	-
Value	N.A.	4574.67	7421.00	-	62.22	-

* : Average based on one year data

** : Average based on two year data

Contd...

Table 1 : Cost of Production (Rs/ql) & Yield (ql/Ha) & Value of Output (Rs/Ha) of PADDY Statewise in Different Sub-Periods

	Triennium Averages \$			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
ANDHRA PRADESH						
Cost A2	29.41	53.89	76.69	83.22	42.31	160.73
Cost B2	53.23	85.39	119.50	60.41	39.96	124.50
Cost C2	56.63	89.59	125.09	58.21	39.62	120.89
Yield	23.41	29.17	32.60	24.59	11.75	39.22
Value	1884.67	2926.00	4856.00	55.25	65.96	157.66
ASSAM						
Cost A2	17.15	37.02	59.97	115.82	62.00	249.63
Cost B2	44.89	63.62	94.02	41.72	47.80	109.45
Cost C2	46.53	83.19	107.03	78.81	28.66	130.05
Yield	15.80	18.44	18.25	16.75	-1.07	15.51
Value	1038.67	1979.33	2749.00	90.56	38.89	164.67
BIHAR						
Cost A2	33.02	46.64**	53.95	41.23	15.67	63.37
Cost B2	68.13	83.80**	111.46	23.00	33.01	63.60
Cost C2	75.70	92.17**	127.15	21.75	37.96	67.97
Yield	16.41	18.83**	18.01	14.74	-4.31	9.79
Value	1928.33	2218.00**	3161.67	15.02	42.55	63.96
CHHATTISGARH						
Cost A2	N.A.	58.64**	84.50	-	44.09	-
Cost B2	N.A.	82.57**	124.93	-	51.32	-
Cost C2	N.A.	89.56**	139.13	-	55.35	-
Yield	N.A.	34.57**	37.56	-	8.67	-
Value	N.A.	4825.50**	7427.50**	-	53.92	-
KARNATAKA						
Cost A2	N.A.	35.31	57.05	-	61.56	-
Cost B2	N.A.	62.90	99.32	-	57.92	-
Cost C2	N.A.	66.64	111.54	-	67.37	-
Yield	N.A.	34.39	36.69	-	6.69	-
Value	N.A.	4574.67	7421.00	-	62.22	-

* : Average based on one year data

** : Average based on two year data

Contd...

Table 1 : Cost of Production (Rs/ql) & Yield (ql/Ha) & Value of Output (Rs/Ha) of PADDY Statewise in Different Sub-Periods

	Triennium Averages \$			%Increase/Decrease			
	Sub-periods			2 Over	3 Over	3 Over	
	1	2	3	1	2	1	
MADHYA PRADESH							
Cost A2	28.42	54.88	74.10	93.08	35.03	160.71	
Cost B2	54.35	95.25	122.73	75.26	28.84	125.81	
Cost C2	67.22	106.95	144.94	59.10	35.52	115.63	
Yield	12.90	13.71	13.93	6.30	1.56	7.96	
Value	1304.67	2189.33	2906.00	67.81	32.73	122.74	
PUNJAB							
Cost A2	N.A.	69.63	80.52	-	15.63	-	
Cost B2	N.A.	102.61	117.08	-	14.10	-	
Cost C2	N.A.	109.50	134.72	-	23.03	-	
Yield	N.A.	53.93	53.71	-	-0.40	-	
Value	N.A.	7084.00	8759.33	-	23.65	-	
TAMIL NADU							
Cost A2	36.98	51.75	74.54**	39.94	44.05	101.59	
Cost B2	56.67	81.89	109.94**	44.50	34.26	94.00	
Cost C2	59.27	85.18	113.71**	43.71	33.49	91.84	
Yield	24.93	32.90	37.88**	31.96	15.15	51.95	
Value	1870.33	3849.67	5609.50**	105.83	45.71	199.92	
UTTAR PRADESH							
Cost A2	N.A.	39.20	63.92	-	63.06	-	
Cost B2	N.A.	67.00	102.77	-	53.40	-	
Cost C2	N.A.	81.69	120.36	-	47.34	-	
Yield	N.A.	20.68	20.91	-	1.13	-	
Value	N.A.	1679.00	3079.67	-	83.42	-	
WEST BENGAL							
Cost A2	24.60	58.89	75.82	139.39	28.75	208.21	
Cost B2	43.83	89.68	120.98	104.61	34.90	176.02	
Cost C2	55.91	110.28	140.42	97.26	27.32	151.16	
Yield	17.79	20.64	23.35	16.02	13.16	31.30	
Value	1832.33	2760.00	4671.00	50.63	69.24	154.92	
* : Average based on one year data							
** : Average based on two year data							
	I	II	III		I	II	III
1. Andhra Pradesh	1971-72 to 1973-74	1977-78 to 1979-80	1981-82 to 1983-84	06. Madhya Pradesh	1972-73 to 1974-75	1981-82 to 1983-84	1984-85 to 1986-87
2. Assam	1971-72 to 1973-74	1979-80 to 1981-82	1984-85 to 1986-87	07. Punjab		1981-82 to 1983-84	1985-86 to 1987-88
3. Bihar	1972-73 to 1974-75	1976-77 to 1977-78	1981-82 to 1983-84	08. Tamil Nadu	1971-72 to 1973-74	1977-78 to 1979-80	1980-81 to 1981-82
4. Haryana		1977-78 to 1979-80	1985-86 to 1987-88	09. Uttar Pradesh		1975-76 to 1977-78	1981-82 to 1983-84
5. Karnatak		1973-74 to 1975-76	1984-85 to 1986-87	10. West Bengal	1971-72 to 1973-74	1978-79 to 1980-81	1982-83 to 1984-85

Changes in Cost of Production

Estimates of triennium averages of cost of production along with various components of cost and yield and value in respect of paddy during early seventies, mid-late seventies and mid-late eighties accompanied by estimated percentage change from one sub-period to the other are presented in Table 1. All the States for which data are available for three sub-periods show a much larger increase in cost per unit of output between early seventies and mid-late seventies compared to mid-late seventies and mid-late eighties (Table 1), even though the yield increases are seen to be relatively larger between the first two sub-periods. This shows that cost increases have considerably outstripped the output increases during the sub-period when yield increases have been significant, specially in Tamil Nadu, Andhra Pradesh in South known for having experienced technological change in seventies. Similarly, between mid-late seventies and mid-late eighties the States of Haryana, Karnataka, Punjab and Uttar Pradesh also known for having experienced technological change, along with other two Southern States which experienced technological change and the remaining States of Assam, Bihar, Madhya Pradesh and West Bengal which did not experience technological change show some rise in cost per unit of output with almost stagnant level of yield, though yield levels in Punjab are reported to be much higher than any other States followed by Haryana, Tamil Nadu, Karnataka

and Andhra Pradesh. Hence, during second sub-period also cost increases have outstripped the production increases, albeit by a relatively small margin. In absolute terms, however, the cost of production is either lower or of the same order in States having experienced technological change compared to the States not having experience the same.

As regards different cost components, it is noted that by and large Cost A2, comprising out of pocket expenses, show a relatively higher percentage increase than the other two components, Cost B2 and Cost C2, in the case of all the States which did not experience technological change specially between early seventies and mid-late seventies. The Southern States and Haryana, Punjab and Uttar Pradesh to some extent, on the other hand, show by and large percentage increases of similar order in Cost A2, Cost B2 and Cost C2. This indicates that in the case of States which are known to have experienced technological change relative increase in cost due to cash expenses (may be on account of fertilizer, etc., seed, irrigation charges and labour) and due to interest on owned capital and rental value of owned land and due to imputed value of family labour is more or less of the same order. On the other hand, the States not having experienced technological change show relatively higher order of increase in cash expenses mainly because the absolute levels of cost on account of cash expenses are seen to be much lower in these States to begin with.

Table 1 also shows that increases in the value of the crop is much higher than yield increases, specially in the case of States which have shown marginal increases in yield, like Assam, Bihar, Madhya Pradesh and Uttar Pradesh. This shows that increases in cost of production over the years have led to increases in the unit value of the crop (average price for different varieties realised), specially in the regions not having experienced technological change. We can infer from the above analysis that the benefits of new technology lie in the lower and/or the same level of cost per unit of output in the States having experienced technological change as compared to other States, brought about mainly by yield increases.

The cost related and yield and value estimates for wheat, the other major cereal grown in India, are presented in Table 2. All the States show a larger increase in cost per unit of output produced between early seventies and mid-late seventies than between mid-late seventies and mid-late eighties mainly because the yield increases between the first and the second sub-periods have been smaller than those between the second and third sub-periods except in Madhya Pradesh not known for having experienced technological change. This is particularly so in the States of Haryana and Punjab known for having experienced technological change. Thus, even though cost increases are seen to have outstripped the increases in yield in both the sub-periods, the same is of much smaller order between mid-late seventies

and mid-late eighties. In absolute terms the cost per unit of output varies within a narrow range during all the sub-periods in all the five States, but, the yield levels in Punjab and Haryana, specially known for having experienced technological change, are observed to be much higher compared to those of other States, indicating the gains from technological change in production of wheat.

So far as various cost components are concerned, it is seen that percentage increase in Cost B2 and Cost C2 have been more or less of the same order in all the States between sub-periods 1 and 2 and 2 and 3 with Cost A2 showing marginally higher relative increases on account of cash expenses.

Table 2 also shows that the increases in the value per hectare of wheat between the sub-periods in all the States are of much higher order than the corresponding yield increases, indicating that increases in cost of production have led to increases in the unit value of the crop (average price for different varieties realised) over the sub-periods. This shows that even with increasing cost of production the economic position of wheat growers may not have deteriorated over the sub-periods.

Table 3 presents the estimates of cost related and yield and value estimates in respect of gram, the only pulse included in our study because of the data constraints in respect of other pulses. The State of Rajasthan shows a very considerable

Table 2 : Cost of Production (Rs/ql) & Yield (ql/Ha) & Value of Output (Rs, of WHEAT Statewise in Different Sub-Periods

	Triennium Averages \$			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
HARYANA						
Cost A2	29.28	60.65	79.18	107.13	30.57	170.43
Cost B2	48.61	93.36	121.75	92.05	30.41	150.44
Cost C2	57.49	110.69	134.50	92.55	21.51	133.97
Yield	20.24	23.79	29.48	17.50	23.95	45.64
Value	2046.00	2827.67	5909.67	38.20	108.99	188.84
MADHYA PRADESH						
Cost A2	25.85	51.24**	79.06	98.20	54.30	205.83
Cost B2	46.63	88.44**	137.83	89.66	55.84	195.58
Cost C2	54.62	100.89**	154.40	84.72	53.04	182.70
Yield	9.16	12.03**	12.19	31.38	1.30	33.09
Value	881.33	1713.00**	2883.00	94.36	68.30	227.12
PUNJAB						
Cost A2	32.15	66.89	84.59	108.02	26.47	163.08
Cost B2	56.27	104.11	131.44	85.04	26.25	133.61
Cost C2	62.62	109.68	140.24	75.16	27.87	123.97
Yield	24.48	26.87	33.35	9.76	24.14	36.27
Value	2015.33	3506.00	6609.00	73.97	88.51	227.94
RAJASTHAN						
Cost A2	N.A.	47.55**	67.31	-	41.55	-
Cost B2	N.A.	80.30**	107.47	-	33.84	-
Cost C2	N.A.	92.85**	127.53	-	37.35	-
Yield	N.A.	19.99**	23.32	-	16.69	-
Value	N.A.	2872.00**	5893.00	-	105.19	-
UTTAR PRADESH						
Cost A2	32.34	53.48	80.13**	65.37	49.84	147.79
Cost B2	55.33	88.56	117.20**	60.06	32.34	111.83
Cost C2	64.82	101.56	131.12**	56.69	29.10	102.29
Yield	19.34	21.07	25.41**	8.94	20.56	31.34
Value	2130.33	2734.67	5219.50**	28.37	90.86	145.01

* : Average based on one year data

** : Average based on two year data

	I	II	III
01. Haryana	1970-71 to 1972-73	1976-77 to 1978-79	1985-86 to 1987-88
02. Madhya Pradesh	1970-71 to 1972-73	1974-75 to 1975-76	1984-85 to 1986-87
03. Punjab	1970-71 to 1972-73	1978-79 to 1980-81	1985-86 to 1987-88
04. Rajasthan		1974-75 to 1975-76	1984-85 to 1986-87
05. Uttar Pradesh	1971-72 to 1973-74	1977-78 to 1979-80	1985-86 to 1986-87

percentage increase in cost of production between late seventies-early eighties and mid-late eighties mainly because of decline in yield per hectare during the corresponding sub-periods. Yield levels had been stagnant between late seventies-early eighties and mid-late eighties in all the States reported whereas cost increases during the respective corresponding periods in different States have been substantial which resulted into increased cost of production between sub-periods.

Percentage increases in cost in respect of all the components of cost are seen to be by and large of similar order indicating comparable percentage increases in cost on account of cash expenses and on account of imputed interest, rental value of land and on account of imputed wages for family labour. In absolute term the cost per unit of output is much higher in Haryana compared to Madhya Pradesh and Rajasthan even though the yield levels are comparable. In Uttar Pradesh, on the other hand, even though the cost per unit is high the yield level is also higher than the other three States.

Even though the yield levels remained stagnant or even declined between different sub-periods in all the States, the percentage increase in value of output are seen to be of substantial order, specially in Haryana, Madhya Pradesh and Rajasthan. This obviously means an increase in the unit value of the crop (average price) in order to take care of the increased cost of production in the face of yield level remaining stagnant or even declining. Value per hectare in the case

Table 3 : Cost of Production(Rs/ql) & Yield(ql/Ha) & Value of Output(Rs of GRAM Statewise in Different Sub-Periods

	Triennium Averages \$			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
HARYANA						
Cost A2	N.A.	81.71**	128.24	-	56.95	-
Cost B2	N.A.	164.42**	270.88	-	64.75	-
Cost C2	N.A.	192.06**	322.38	-	67.86	-
Yield	N.A.	6.49**	6.52	-	0.54	-
Value	N.A.	1376.50**	2867.67	-	108.33	-
MADHYA PRADESH						
Cost A2	58.00**	91.80	147.98	58.30	61.19	155.15
Cost B2	102.61**	173.98	258.47	69.56	48.56	151.90
Cost C2	116.58**	223.14	298.86	91.41	33.93	156.35
Yield	7.12**	8.95	7.04	25.79	-21.30	-1.01
Value	953.00**	2421.67	2886.00	154.11	19.17	202.83
RAJASTHAN						
Cost A2	N.A.	40.23	117.16	-	191.23	-
Cost B2	N.A.	73.45	197.77	-	169.27	-
Cost C2	N.A.	94.59	233.60	-	146.97	-
Yield	N.A.	6.81	6.14	-	-9.79	-
Value	N.A.	902.67	2823.33	-	212.78	-
UTTAR PRADESH						
Cost A2	N.A.	102.71	121.27	-	18.07	-
Cost B2	N.A.	182.01	214.28	-	17.73	-
Cost C2	N.A.	213.00	255.13	-	19.78	-
Yield	N.A.	10.07	10.19	-	1.19	-
Value	N.A.	2929.67	3732.33	-	27.40	-

* : Average based on one year data

** : Average based on two year data

	I	II	III
\$ 01. Harayana		1978-79 to 1985-86 to 1979-80 1987-88	
02. Madhya Pradesh	1975-76 to 1976-77	1981-82 to 1985-86 to 1983-84 1987-88	
03. Rajasthan		1975-76 to 1984-85 to 1977-78 1986-87	
04. Uttar Pradesh		1981-82 to 1984-85 to 1983-84 1986-87	

of all the four States is seen to have increased more than proportionately to the yield, specially in Haryana, Madhya Pradesh and Rajasthan where yield levels remained stagnant. Thus, the economic position of gram growers may not have deteriorated owing to increasing cost of production. Yield increasing technological change does not seem to have occurred in the case of gram.

Cost related estimates and estimates of yield and value for the cash crop cotton are presented in Table 4. Punjab is seen to be the only State where yield levels have not only been high compared to other States, but, have also increased substantially in absolute term in mid-late eighties over mid-late seventies and this is reflected in a very marginal increase in cost of production between the corresponding sub-periods. In Maharashtra, on the other hand, yield levels are seen to be stagnant whereas the cost increased two-fold between mid-late seventies and mid-late eighties resulting into doubling of cost per unit of output. In Gujarat and Karnataka even though yield level doubled, cost increases outstripped the increase in yield and hence cost of production increased substantially between mid-late seventies and mid-late eighties. In absolute term the cost of production in Punjab is seen to be much lower than those in Gujarat, Karnataka and Maharashtra. Increases in cost in respect of Cost A2, Cost B2 and Cost C2 are seen to be by and large of the similar order in respect of each of the States. Thus, Punjab is the only State which shows some evidence of benefit brought

Table 4 : Cost of Production(Rs/ql) & Yield(ql/Ha) & Value of Output(Rs/t) of COTTON Statewise in Different Sub-Periods

	Triennium Averages \$			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
GUJARAT						
Cost A2	N.A.	213.13	305.41	-	43.30	-
Cost B2	N.A.	284.80	416.44	-	46.22	-
Cost C2	N.A.	323.68	473.72	-	46.35	-
Yield	N.A.	4.17	10.08	-	141.61	-
Value	N.A.	1644.67	5531.67	-	236.34	-
KARNATAKA						
Cost A2	N.A.	130.61**	286.42**	-	119.30	-
Cost B2	N.A.	246.94**	433.19**	-	75.42	-
Cost C2	N.A.	270.14**	474.44**	-	75.63	-
Yield	N.A.	3.32**	6.31**	-	90.50	-
Value	N.A.	1419.50**	3791.50**	-	167.10	-
MAHARASHTRA						
Cost A2	N.A.	146.49	331.25	-	126.12	-
Cost B2	N.A.	233.19	449.77	-	92.88	-
Cost C2	N.A.	259.47	503.51	-	94.05	-
Yield	N.A.	3.83	4.07	-	6.09	-
Value	N.A.	1650.67	2211.33	-	33.97	-
PUNJAB						
Cost A2	87.73	163.33**	176.45	86.17	8.04	101.13
Cost B2	160.10	277.16**	291.74	73.12	5.26	82.23
Cost C2	191.18	322.38**	353.11	68.63	9.53	84.70
Yield	9.50	8.35**	13.00	-12.16	55.78	36.84
Value	2434.67	3668.00	6752.00	50.66	84.08	177.33

* : Average based on one year data

** : Average based on two year data

	I	II	III
\$ 01. Gujarat		1974-75 to 1976-77	1981-82 to 1983-84
02. Karnataka		1976-77 to 1977-78	1985-86 to 1986-87
03. Maharashtra		1975-76 to 1977-78	1981-82 to 1983-84
04. Punjab	1972-73 to 1974-75	1979-80 to 1980-81	1984-85 to 1986-87

about by new technology in cotton production.

As regards value of the crop, increase in it seems to be considerably higher than the corresponding yield increase in all the four States, though the State of Maharashtra shows a comparatively smaller increase in value of the crop per hectare between mid-late seventies and mid-late eighties. This shows that cost increases over the periods have led to increase in the unit value (average price), specially in the case of Punjab. This indicates that even with increasing cost of production, the economic conditions of cotton growers in these States may not have deteriorated on account of increasing cost.

The cost related and yield and value estimates in the case of the other important cash crop, sugarcane, are presented in Table 5. Yield levels are comparable in Andhra Pradesh, Karnataka and Maharashtra except during mid-late seventies in Andhra Pradesh when it was comparatively lower and during mid-late eighties in Karnataka, where it was relatively higher. In comparison the yield levels in Uttar Pradesh having largest area under sugarcane in India are noted to be way below the other States reported. The yield increases (except in Maharashtra, where it remained stagnant) are seen to be of much smaller order than increases in cost leading to large increases in cost of production between mid-late seventies and mid-late eighties. The increase in cost of production has been highest in Maharashtra, known for growing sugarcane under assured irrigation, high fertilizer use and use of better varieties of seeds.

Table 5 : Cost of Production (Rs/qtt) & Yield (qtt/Ha) & Value of Output (Rs/Ha) of SUGARCANE Statewise in Different Sub-Periods

	Triennium Averages \$			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
ANDHRA PRADESH						
Cost A2	N.A.	6.11	10.03	-	64.21	-
Cost B2	N.A.	10.37	17.68	-	70.40	-
Cost C2	N.A.	10.75	17.95	-	67.06	-
Yield	N.A.	681.23	767.25	-	12.63	-
Value	N.A.	9412.67	19017.33	-	102.04	-
KARNATAKA						
Cost A2	N.A.	5.05	5.69	-	12.53	-
Cost B2	N.A.	9.52	11.14	-	16.94	-
Cost C2	N.A.	10.30	11.54	-	12.03	-
Yield	N.A.	776.20	856.07	-	10.29	-
Value	N.A.	16034.00	23062.00	-	43.83	-
MAHARASHTRA						
Cost A2	N.A.	4.87	11.41**	-	134.29	-
Cost B2	N.A.	7.36	15.84**	-	115.15	-
Cost C2	N.A.	7.89	16.80**	-	112.95	-
Yield	N.A.	770.04	780.20**	-	1.32	-
Value	N.A.	11553.33	20270.50**	-	75.45	-
UTTAR PRADESH						
Cost A2	N.A.	3.24	5.66	-	74.97	-
Cost B2	N.A.	6.47	10.56	-	63.08	-
Cost C2	N.A.	7.55	12.78	-	69.35	-
Yield	N.A.	357.35	395.20	-	10.59	-
Value	N.A.	4695.00	9767.67	-	108.04	-

* : Average based on one year data

** : Average based on two year data

	Period I/	Period II/
01. Andhra Pradesh	1977-78 to 1979-80	1985-86 to 1987-88
02. Karnataka	1981-82 to 1983-84	1984-85 to 1986-87
03. Maharashtra	1973-74 to 1975-76	1986-87 to 1987-88
04. Uttar Pradesh	1973-74 to 1975-76	1984-85 to 1986-87

Only in Karnataka cost increases are seen to be commensurate with yield increases leading to a marginal rise in cost per unit of output. In absolute term the cost per unit of output is seen to be lowest in Karnataka showing highest yield per hectare and very near so in Uttar Pradesh, but showing lowest yield per hectare. Yield levels, brought about through new technology, seem to have reached its plateau, specially in the case of Maharashtra.

Increase in cost in respect of different cost components is seen to be more or less of the same order in respective States. This shows that cost increases on account of cash expenses (out of pocket expenses) are of the same order as the cost increases on account of interest on owned capital used, rental value of owned land used and on account of imputed value of family labour used.

In the case of all the States increases in value of the crop per hectare between mid-late seventies and mid-late eighties far outweigh the increases in yield per hectare. This shows that the farm gate prices or the prices paid by the sugar factories to the cane growers increased considerably, specially in Maharashtra where the yield level remained stagnant between mid-late seventies and mid-late eighties, as noted earlier, and, in Andhra Pradesh and Uttar Pradesh. Thus, even though the cost increases between mid-late seventies and mid-late eighties are seen to be of considerable order, specially in Maharashtra, followed by Uttar Pradesh and Andhra Pradesh, the economic positions of the

cane growers in this State may not have been adversely affected by such increases because of hefty increases in price paid to the growers leading to more than proportionate increase in value per hectare to yield per hectare.

Table 6 presents cost related and yield and value estimates in respect of groundnut, an important oilseed crop grown in India. Cost increases between mid-late seventies and mid-late eighties are seen to be considerably high in all the three States specially in Tamil Nadu which incidentally recorded the highest yield per hectare. Yield of groundnut in Gujarat and Karnataka even though increased between mid-late seventies and mid-late eighties is still very low. On the other hand, in Tamil Nadu, even though the yield is seen to be relatively higher, a marginal decrease is seen in the same between mid-late seventies and mid-late eighties. In absolute term cost per unit of output is seen to be lowest in the case of Tamil Nadu, showing highest yield per hectare, which may be due to adoption of improved technology in production. Increases in cost in respect of all the components of cost are seen to be more or less of similar order in respective States showing equi-proportionate increase in cost due to cash expenses and due to imputed value of interest on owned capital, of rental value of owned land and of family labour.

Increases in the value of production per hectare are seen to be much larger than the increases in yield per hectare

in the case of all the States. Thus, more than proportionate increase in value of production to yield per hectare between the two sub-periods may have neutralized any adverse impact of increases in cost of production on the economic conditions of groundnut producers.

Rapeseed mustered is the other oilseed crop for which cost related and yield and value estimates are presented in Table 7. The State of Assam shows a very large increase in cost of production between late seventies and mid-late eighties mainly because of decrease in yield during the corresponding sub-period. Haryana and specially Rajasthan show a very moderate increase in cost mainly because of yield increases between the two sub-periods. In absolute term the cost of production (Cost C2) is comparable in Haryana and Rajasthan in both the sub-periods whereas in Assam the same is much higher than those in Haryana and Rajasthan in the sub-period mid-late eighties. All the cost components show increases of more or less the same order between the sub-periods in respective States.

The value per hectare is seen to have increased more than the yield per hectare in respect of all the States indicating a compensating effect of increase in unit value of crop (average price) on the cost increases incurred by the growers.

We have noted in the analysis presented above that in general, for all the States and for all the respective crops considered in this study cost increases outstripped the

Table 6 : Cost of Production (Rs/ql) & Yield (ql/Ha) & Value of Output (Rs/Ha) of GROUNDNUT Statewise in Different Sub-Periods

	Triennium Averages \$			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
GUJARAT						
Cost A2	N.A.	140.57	267.24	-	90.11	-
Cost B2	N.A.	210.34	355.39	-	68.96	-
Cost C2	N.A.	253.10	395.79	-	56.38	-
Yield	N.A.	4.24	7.30	-	72.23	-
Value	N.A.	1575.00	3646.00	-	131.49	-
KARNATAKA						
Cost A2	N.A.	125.80	218.32**	-	73.55	-
Cost B2	N.A.	187.18	334.03**	-	78.45	-
Cost C2	N.A.	209.77	359.99**	-	71.61	-
Yield	N.A.	5.17	7.19**	-	39.17	-
Value	N.A.	1212.67	3824.50**	-	215.38	-
TAMIL NADU						
Cost A2	N.A.	69.35	172.61	-	148.90	-
Cost B2	N.A.	108.05	275.04	-	154.55	-
Cost C2	N.A.	120.72	288.83	-	139.26	-
Yield	N.A.	11.84	11.38	-	-3.94	-
Value	N.A.	1720.67	3885.00	-	125.78	-

* : Average based on one year data

** : Average based on two year data

	Period I:	Period II:
01. Gujarat	1972-73 to 1974-75	1981-82 to 1983-84
02. Karnataka	1976-77 to 1978-79	1985-86 to 1986-87
03. Tamil Nadu	1972-73 to 1974-75	1981-82 to 1983-84

increases in yield per hectare between sub-periods 1 and 2 and 2 and 3 as the case may be and this led to increase in cost of production of crops between different sub-periods. It is, however, also noted that in the States where new technology have had its impact, the cost of production for such crops in those States turned out to be either lower or of the same order as compared to those in the States not having had the impact of new technology. Further, it is also noted that in respect of all crops, in all the States value of crops per hectare increased more than proportionately to yield increases over the respective sub-periods. This indicates that cost increases observed in different sub-periods may have been neutralized either wholly or partly by increased prices of the output realized, thereby stemming the possible deterioration in the economic conditions of producers due to cost increases.

There could be several reasons for costs to have increased. It may increase because of increase in physical quantities of inputs applied in production; alternatively, it may also increase because of increases in the unit value (prices) of the inputs applied in production or also because of increases in both unit values and quantities of inputs applied in production. In order to ascertain what really might have led to increases in cost in what follows we attempt an in-depth analysis of the cost estimates and their components.

Table 7 : Cost of Production (Rs/ql) & Yield (ql/Ha) & Value of Output (Rs/t) of RAPESEED MUSTARD Statewise in Different Sub-Periods

	Triennium Averages \$			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
ASSAM						
Cost A2	N.A.	68.17	176.28	-	158.58	-
Cost B2	N.A.	147.95	297.38	-	101.00	-
Cost C2	N.A.	192.10	422.50	-	119.94	-
Yield	N.A.	5.65	4.75	-	-16.04	-
Value	N.A.	1771.00	2135.00	-	20.55	-
HARYANA						
Cost A2	N.A.	116.75 *	134.12	-	14.88	-
Cost B2	N.A.	235.86 *	277.68	-	17.73	-
Cost C2	N.A.	274.53 *	317.70	-	15.73	-
Yield	N.A.	7.19 *	9.05	-	25.92	-
Value	N.A.	2770.00 *	5199.33	-	87.70	-
RAJASTHAN						
Cost A2	N.A.	103.70	108.09	-	4.23	-
Cost B2	N.A.	200.96	215.74	-	7.35	-
Cost C2	N.A.	254.46	272.42	-	7.06	-
Yield	N.A.	6.25	8.99	-	43.92	-
Value	N.A.	2413.00	4491.00	-	86.12	-

* : Average based on one year data

** : Average based on two year data

	Period I	Period II
01. Assam	1978-79 to 1980-81	1984-85 to 1986-87
02. Harayana	1980-81	1985-86 to 1987-88
03. Rajasthan	1979-80 to 1981-82	1984-85 to 1986-87

A Detailed Cost Analysis

In economic analysis we are normally concerned with two types of cost, viz., (i) operational cost, and (ii) fixed cost. We shall presently see what are the correspondence between operational cost and fixed cost on the one hand and Cost A2, Cost B2 and Cost C2 as adopted in the cost of cultivation studies of the Ministry of Agriculture, on the other. The operational cost in this analysis comprises (i) all the labour costs (human and animal), both actual and imputed, (ii) machine labour cost, both owned and hired, (iii) seed cost, both actual and imputed, (iv) manure cost, both actual and imputed, (v) fertilizer, insecticide, pesticide cost, (vi) cost on irrigation, and (vii) interest on working capital. The fixed cost comprises (i) rental value of owned land, (ii) rent paid for leased in land, (iii) land revenue, cess and taxes, (iv) depreciation on implements and farm buildings, and (v) interest on fixed capital. From the above account it is clear that Cost A2 excludes one item of operational cost, i.e., imputed cost of family labour, but includes three items of fixed cost, i.e. (i) rent paid for leased-in land, (ii) land revenue, cess and taxes, and (iii) depreciation on implements and farm buildings. Further, Cost B2 includes all the items of operational cost except imputed cost on family labour and all the five items of the fixed cost and that Cost C2 is the total cost comprising operational and fixed costs. Cost C2, as mentioned earlier, is thus the most

comprehensive cost concept which includes all the imputed as well as actual costs on account of both variable factors as well as fixed factors. Cost A2, on the other hand, indicates out of pocket expenses by the farmers based on the market price of actual purchase/hire and on imputed prices of farm family supplied inputs except family labour. Cost B2 is the total cost incurred by the farmers except cost on imputed value of family labour. We begin our cost analysis by examining the break-up of total cost (Cost C2) in respect of each crop into Cost A2 and Cost B2.

Share of different cost components in total cost based on triennium averages in respect of paddy is presented in Table 8. Cost A2 is found to account for 60 per cent or thereabouts of the total cost (Cost C2) in early seventies, mid-late seventies and mid-late eighties in the States of Andhra Pradesh, Haryana, Punjab and Tamil Nadu, which are known for having experienced impact of technological change of various degree in paddy production. States of Karnataka, Uttar Pradesh and West Bengal where technological change in paddy production has had marginal impact and is observed to be confined to some pockets in these States show around 55 per cent of total cost as due to Cost A2. The remaining States of Assam, Bihar and Madhya Pradesh show share of Cost A2 as between 45 and 50 per cent of total cost in different sub-periods. Thus, it is reasonable to conclude that higher the impact of new technology in production higher is

Table B : Share of Different Cost Items in respect of PADDY Statewise
in Different Sub-Periods

	Triennium Averages (Percent of Total Cost)		
	Sub-periods		
	1	2	3
ANDHRA PRADESH			
Operational Cost	56.26	63.82	65.47
Fixed Cost	43.74	36.18	34.53
Cost A2	58.04	64.91	62.51
Cost B2	94.79	95.74	95.47
ASSAM			
Operational Cost	57.94	64.71	66.08
Fixed Cost	42.06	35.29	33.92
Cost A2	39.97	46.14	45.29
Cost B2	76.31	77.40	72.46
BIHAR			
Operational Cost	54.79	58.82	51.77
Fixed Cost	45.21	41.18	48.23
Cost A2	47.16	51.50	41.95
Cost B2	90.69	90.39	87.61
HARYANA			
Operational Cost	-	71.27	69.56
Fixed Cost	-	28.73	30.44
Cost A2	-	66.16	60.83
Cost B2	-	92.29	89.74
KARNATAKA			
Operational Cost	-	56.77	60.49
Fixed Cost	-	43.23	39.51
Cost A2	-	54.60	50.90
Cost B2	-	92.22	88.86
MADHYA PRADESH			
Operational Cost	55.66	57.39	59.47
Fixed Cost	43.37	42.61	40.53
Cost A2	44.34	50.45	51.35
Cost B2	84.53	88.62	88.91
PUNJAB			
Operational Cost	-	63.87	60.65
Fixed Cost	-	36.13	39.35
Cost A2	-	63.63	59.55
Cost B2	-	93.75	93.31
TAMIL NADU			
Operational Cost	62.36	64.34	64.27
Fixed Cost	37.64	35.66	35.73
Cost A2	67.43	66.47	67.34
Cost B2	96.19	96.65	96.82
UTTAR PRADESH			
Operational Cost	-	65.70	63.32
Fixed Cost	-	34.30	36.68
Cost A2	-	53.51	52.53
Cost B2	-	83.95	85.33
WEST BENGAL			
Operational Cost	59.60	69.70	64.31
Fixed Cost	40.91	30.30	35.69
Cost A2	46.04	56.26	53.40
Cost B2	83.25	84.68	86.28

the share of out of pocket expenses in total cost.

Cost B2 is seen to account for 90 to 95 per cent of the total cost in different sub-periods in technologically advanced States of Andhra Pradesh, Haryana, Punjab and Tamil Nadu. As mentioned earlier, since Cost B2 is the sum of Cost A2 and rental value of owned land and interest on owned capital, it is borne out that the last two items account for around 30 to 35 per cent of total cost in those States during different sub-periods. Again, as mentioned earlier, since total cost (Cost C2) is the sum of Cost B2 and imputed value of family labour, by implication it follows that share of family labour cost in total cost varies between 5 and 10 per cent in the technologically advanced States in the production of paddy.

As against this the States having experienced less or least impact of technological change show a relatively larger share of family labour cost (around 15 per cent) to total cost in different sub-periods. In fact in the case of Assam, the share of family labour cost is seen to be around 25 per cent. However, the share of value of own land and interest on own capital to total cost does not show much difference between the States in different sub-periods.

Triennium average estimates of different cost components in respect of wheat for different regions for different sub-periods are presented in Table 9.

Share of Cost A2 is seen to be around 60 per cent or

**Table 9 : Share of Different Cost Items in respect of WHEAT Statewise
in Different Sub-Periods**

Triennium Averages (Percent of Total Cost)			

Sub-periods			

	1	2	3

HARYANA			
Operational Cost	63.70	69.17	66.28
Fixed Cost	36.30	30.83	33.58
Cost A2	55.01	59.05	58.81
Cost B2	87.17	85.83	90.41
MADHYA PRADESH			
Operational Cost	62.00	60.81	58.00
Fixed Cost	38.00	39.20	42.00
Cost A2	55.80	52.87	51.19
Cost B2	88.26	89.20	89.75
PUNJAB			
Operational Cost	58.88	61.46	58.05
Fixed Cost	41.12	38.54	41.95
Cost A2	55.96	64.35	60.28
Cost B2	90.78	95.35	93.80
RAJASTHAN			
Operational Cost	-	68.85	61.49
Fixed Cost	-	31.15	38.51
Cost A2	-	59.10	53.23
Cost B2	-	88.68	84.71
UTTAR PRADESH			
Operational Cost	63.12	67.57	69.60
Fixed Cost	37.07	32.43	30.40
Cost A2	54.12	59.42	61.07
Cost B2	88.54	89.09	89.31

thereabouts in Haryana, Punjab and Uttar Pradesh in different sub-periods. The same is seen to be around 55 per cent in the States of Madhya Pradesh and Rajasthan in different sub-periods. This indicates a higher out of pocket expenses for wheat growers in the States known to have experienced technological change; may be on account of seed, fertilizer and irrigation charges. Further, Cost B2 is seen to account for around 90 per cent of the total cost indicating a 30 per cent share of rental value of owned land and interest on owned capital in the total cost; in fact for Punjab, the same is seen to work out to 35 per cent or thereabouts of total cost in mid-late seventies and mid-late eighties. By implication, in the State of Punjab, known for technological break-through in wheat production, the share of family labour cost in mid-late seventies and mid-late eighties is estimated to be 5 per cent or thereabouts. The same is seen to work out at around 10 to 15 per cent in the case of other States.

Estimates of cost in respect of different cost components in different periods for gram are presented in Table 10. Cost A2 is seen to account for around 50 per cent of the total cost in all the States reported in seventies and eighties except in Haryana in mid-late eighties, when it was around 40 per cent. There does not seem to be any clear-cut relationship between yield realized and Cost A2, though Uttar Pradesh showing relatively higher yield shows larger proportion of Cost A2

Table 10 : Share of Different Cost Items in respect of GRAM Statewise
in Different Sub-Periods

Triennium Averages (Percent of Total Cost)			

Sub-periods			

	1	2	3

HARYANA			
Operational Cost	-	60.56	51.48
Fixed Cost	-	39.44	48.52
Cost A2	-	47.20	39.64
Cost B2	-	86.70	84.37
MADHYA PRADESH			
Operational Cost	55.88	52.18	55.34
Fixed Cost	44.12	47.82	44.66
Cost A2	49.81	48.64	49.50
Cost B2	88.42	91.56	90.97
RAJASTHAN			
Operational Cost	-	66.03	53.08
Fixed Cost	-	33.97	46.92
Cost A2	-	49.34	47.72
Cost B2	-	80.72	84.75
UTTAR PRADESH			
Operational Cost	-	58.16	59.24
Fixed Cost	-	41.84	40.76
Cost A2	-	47.96	47.19
Cost B2	-	85.53	83.82

compared to Haryana showing lowest yield. Cost B2, on the other hand, is seen to account for around 85 per cent of total cost in different sub-periods in Haryana, Rajasthan and Uttar Pradesh and around 90 per cent in Madhya Pradesh indicating the share of rental value of owned land and interest on owned capital to be around 35 to 40 per cent respectively of the total cost. Thus, the share of cost on account of family labour is estimated to be around 15 per cent and 10 per cent in different sub-periods in Haryana, Rajasthan, Uttar Pradesh and Madhya Pradesh respectively.

As regards cotton, the estimates of various cost components for which are presented in Table 11, Cost A2 in Gujarat, showing relatively high yield in mid-late eighties, is seen to account for almost 70 per cent of the total cost in mid-late seventies and mid-late eighties. In Punjab, the other State, showing relatively high yield, share of cost A2 is seen to be only around 50 per cent of total cost in mid-late seventies and mid-late eighties. In two other States, Karnataka and Maharashtra, showing relatively low yield, share of Cost A2 is seen to vary between 50 and 65 per cent in different periods. Cost B2 is seen to account for around 90 per cent of the total cost in Gujarat, Karnataka and Maharashtra in different sub-periods, implying a share of about 30 per cent of rental value of owned land and interest on own capital in total cost in those States. In Punjab Cost B2 is seen to account for around 85 per cent

Table 11 : Share of Different Cost Items in respect of COTTON Statewise
in Different Sub-Periods

Triennium Averages (Percent of Total Cost)			
	Sub-periods		
	1	2	3
GUJARAT			
Operational Cost	-	74.28	75.83
Fixed Cost	-	25.72	24.17
Cost A2	-	67.24	69.12
Cost B2	-	90.40	92.17
KARNATAKA			
Operational Cost	-	55.83	63.92
Fixed Cost	-	44.17	36.08
Cost A2	-	49.28	56.64
Cost B2	-	91.46	90.47
MAHARASHTRA			
Operational Cost	-	63.59	71.43
Fixed Cost	-	36.41	28.57
Cost A2	-	57.44	65.03
Cost B2	-	90.16	89.59
PUNJAB			
Operational Cost	57.97	61.44	60.65
Fixed Cost	42.03	38.56	39.35
Cost A2	48.25	52.89	50.02
Cost B2	84.47	86.58	82.62

Table 12 : Share of Different Cost Items in respect of SUGARCANE Statewise
in Different Sub-Periods

Triennium Averages (Percent of Total Cost)			
	Sub-periods		
	1	2	3
ANDHRA PRADESH			
Operational Cost	-	58.46	56.15
Fixed Cost	-	41.54	43.85
Cost A2	-	57.93	54.68
Cost B2	-	96.70	98.07
KARNATAKA			
Operational Cost	-	55.44	50.64
Fixed Cost	-	44.56	49.36
Cost A2	-	49.17	47.79
Cost B2	-	93.16	96.10
MAHARASHTRA			
Operational Cost	-	68.99	71.00
Fixed Cost	-	33.23	29.00
Cost A2	-	64.59	66.97
Cost B2	-	93.87	94.16
UTTAR PRADESH			
Operational Cost	-	55.03	60.23
Fixed Cost	-	44.97	39.77

of total cost in different periods, implying a 25 per cent share of rental value of owned land and interest on owned capital. It is borne out by the above analysis that Punjab, showing highest yield of cotton per hectare, the family labour cost accounts for 15 per cent of the total cost in early seventies, mid-late seventies and mid-late eighties. The same in the case of Gujarat, Karnataka and Maharashtra turns out to be around 10 per cent in mid-late seventies and mid-late eighties.

In the case of sugarcane, Cost A2 is seen to account for 65 per cent or thereabouts of the total cost in Maharashtra as compared to around 55 per cent and 50 per cent in Andhra Pradesh and Karnataka respectively in mid-late seventies and mid-late eighties (Table 12). This shows that Maharashtra cane growers' expenditure in cash and kind on current inputs like seed, fertilizer, hired labour, irrigation charges, etc., are relatively higher than those of Andhra Pradesh and Karnataka even though the yield levels are comparable to those of Andhra Pradesh and lower than those of Karnataka, specially in mid-late eighties. Uttar Pradesh, on the other hand, showing relatively low yield of sugarcane also shows relatively smaller share of Cost A2 (45 per cent) in both the sub-periods.

Share of Cost B2 is seen to be around 95 per cent of the total cost in Andhra, Karnataka and Maharashtra and around 85 per cent in Uttar Pradesh in the two sub-periods indicating that rental value of owned land and interest on owned capital account

for around 30, 40, 45 and 50 per cent of total cost in Maharashtra, Andhra Pradesh, Karnataka and Uttar Pradesh respectively. From these estimates, it is implied that the share of family labour cost is negligible at 5 per cent in Andhra Pradesh, Karnataka and Maharashtra, as compared to 15 per cent in Uttar Pradesh in mid-late seventies and mid-late eighties.

In the case of groundnut, the estimates for which are presented in Table 13, the share of Cost A2 is seen to be varying between around 60 and 65 per cent in mid-late seventies and mid-late eighties in the State of Tamil Nadu reporting relatively higher yield as well as in Gujarat and Karnataka reporting comparatively lower yield. Cost B2 is seen to account for around 90 per cent of the total cost in different sub-periods in all the three States except in Tamil Nadu where the same accounts for 95 per cent of the total cost in mid-late eighties. This implies that the share of rental value of owned land and interest on fixed capital account for 25 to 30 per cent of the total cost in different sub-periods with the exception of Tamil Nadu in mid-late eighties. It follows from the above account that family labour cost accounts for around 10 per cent of total cost in Gujarat, Karnataka in mid-late seventies and mid-late eighties and in Tamil Nadu in mid-late seventies and for around 5 per cent in Tamil Nadu in mid-late eighties.

Table 13 : Share of Different Cost Items in respect of GROUNDNUT Statewise in Different Sub-Periods

Triennium Averages (Percent of Total Cost)			
	Sub-periods		
	1	2	3
GUJARAT			
Operational Cost	-	75.10	74.74
Fixed Cost	-	24.90	25.26
Cost A2	-	65.00	66.84
Cost B2	-	87.27	89.89
KARNATAKA			
Operational Cost	-	72.22	64.54
Fixed Cost	-	27.67	35.46
Cost A2	-	65.35	59.46
Cost B2	-	90.75	92.87
TAMIL NADU			
Operational Cost	-	66.98	62.57
Fixed Cost	-	33.02	37.43
Cost A2	-	61.68	60.14
Cost B2	-	90.41	95.40

Table-14 : Share of Different Cost Items in respect of RAPESEED MUSTARD Statewise in Different Sub-Periods

Triennium Averages (Percent of Total Cost)			
	Sub-periods		
	1	2	3
ASSAM			
Operational Cost	-	55.08	64.91
Fixed Cost	-	44.90	35.09
Cost A2	-	34.85	41.30
Cost B2	-	76.87	70.17
HARYANA			
Operational Cost	-	53.99	52.69
Fixed Cost	-	46.01	47.31
Cost A2	-	42.61	45.69
Cost B2	-	85.93	86.84
RAJASTHAN			
Operational Cost	-	55.88	50.82
Fixed Cost	-	44.12	49.18
Cost A2	-	39.07	40.02
Cost B2	-	78.57	81.99

In the case of rapeseed mustard, the share of Cost A2 is seen to be around 40 to 45 per cent of the total cost in Assam, Haryana and Rajasthan in early eighties and mid-late eighties (Table 14). Cost P2, on the other hand, is seen to have decreased from 77 to 70 per cent in Assam in mid-late eighties over late seventies, remained at around 85 per cent in Haryana and increased from 79 per cent to 82 per cent in Rajasthan over the two sub-periods. So, the share of cost on account of rental value of owned land and interest on own capital should be varying in different sub-periods in these States between 30 per cent and 40 per cent. In the same way, the share of family labour cost implicitly be varying from 15 per cent in Haryana to 20 per cent in Rajasthan to around 25 to 30 per cent in Assam. Thus, share of cost on account of family labour appears to be on the higher side in the case of rapeseed mustard crop.

Taking all the crops into consideration one may conclude that for cereals, viz., paddy and wheat the Cost A2 (may be called operational cost) varies from 45 per cent in the States not having experienced technological change to 55 per cent in the States having experienced technological change in small measures and to 60 per cent in the States having experienced technological change in good measure. Similarly, family labour cost accounts for around 5 per cent of the total cost for these two cereals in States known for having experienced technological change in good measure compared to around 10 to 15 per cent in

the case of other States. Rental value of own land and interest on fixed capital are seen to account for around one-third of the total cost in the case of almost all the states in all the periods. Gram and rapeseed mustard show comparatively a smaller share of Cost A2 in all the States and a relatively higher share of family labour cost than in the case of other crops. It may be noted that these two crops have not had the benefit of new technology. In the case of groundnut, the share of Cost A2 is on the higher side around 65 to 70 per cent in the States showing high as well as low yield may be due to cost on account of seeds. However, the share of family labour cost to total cost is relatively low (less than 10 per cent) in both the sub-periods. Cotton and sugarcane are two cash crops which defy any particular trend of yield being related to share of Cost A2 in total cost in different sub-periods in different States. However, in the case of sugarcane the share of family labour cost is less than 5 per cent of total cost in both the sub-periods in all the States except Uttar Pradesh where the same is more than 15 per cent and which shows lower yield of cane. From the above account it is borne out that operational cost including imputed value of family labour, by and large, accounts for around two-thirds of the total cost and that the remaining one-third of the total cost is on account of rental value of own land and interest on own fixed capital.

Changes in Operational & Fixed Costs

It is not enough for our purpose to ascertain that the operational cost accounts for, on an average, about two-thirds of the total cost and that the share of the same has varied between 60 and 70 percent in different sub-periods for crops and regions having experienced technological change and for cash crops in most regions between 50 and 60 percent for crops and regions not having experienced technological change. These do not tell us how in absolute term the operational and fixed cost components may have been increasing in different sub-periods. We now, therefore, examine the changes that have occurred in operational and fixed costs in absolute term in different sub-periods and regions for each of the crops considered in our study. This will help us in setting up the first step towards analysing the factors responsible for such changes in operational and fixed costs.

Two cereal crops, paddy and wheat, show considerable increase in operational and fixed costs between sub-periods 1 and 2 and sub-periods 2 and 3 and therefore in an overall increase between sub-periods 1 and 3 (Tables 15 and 16). However, the rate of increase (as depicted by percentage change) in operational cost is seen to have declined between mid-late seventies and mid-late eighties as compared to the sub-periods between early seventies and mid-late seventies, especially in respect of the regions having experienced

Table 15 : Cost of Production(Rs./Qntl) and Value of Output(Av.Price Rs./Qnt)
PADDY Statewise in Different Sub-Periods

State/Item	Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
ANDHRA PRADESH						
Operational Cost	36.42	65.18	90.76	78.97	39.25	149.21
Fixed Costs	28.31	36.95	47.88	30.52	29.56	69.10
Total Cost(13+31)	64.73	102.13	138.64	57.78	35.74	114.17
Av.Value or Price	80.50	100.31	148.97	24.61	48.51	85.07
ASSAM						
Operational Cost	28.33	55.33	89.69	95.27	62.11	216.55
Fixed Costs	20.57	30.17	46.04	46.72	52.57	123.84
Total Cost(13+31)	48.90	85.50	135.72	74.85	58.74	177.56
Av.Value or Price	65.75	107.32	150.66	63.22	40.38	129.13
BIHAR						
Operational Cost	44.02	58.87**	73.48	33.75	24.82	66.94
Fixed Costs	36.33	41.21**	68.47	13.45	66.15	88.49
Total Cost(13+31)	80.34	100.08**	141.95	24.57	41.84	76.68
Av.Value or Price	117.53	117.82**	175.52	0.25	48.97	49.33
HARYANA						
Operational Cost	N.A.	64.61**	97.39	-	50.74	-
Fixed Costs	N.A.	26.05**	42.61	-	63.58	-
Total Cost(13+31)	N.A.	90.66**	140.00	-	54.43	-
Av.Value or Price	N.A.	139.61**	197.73**	-	41.64	-
KARNATAKA						
Operational Cost	N.A.	41.26	75.15	-	82.16	-
Fixed Costs	N.A.	31.41	49.09	-	56.29	-
Total Cost(13+31)	N.A.	72.67	124.24	-	70.98	-
Av.Value or Price	N.A.	133.02	202.26	-	52.05	-

* : Average based on one year data

** : Average based on two year data

Contd...

Table 15 : Cost of Production(Rs./Qntl) and Value of Output(Av.Price Rs./Qnt)
PADDY Statewise in Different Sub-Periods

State/Item	Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
MADHYA PRADESH						
Operational Cost	40.21	70.98	101.33	76.54	42.76	152.03
Fixed Costs	31.33	52.69	69.05	68.18	31.04	120.38
Total Cost(13+31)	72.23	123.67	170.38	71.21	37.77	135.87
Av.Value or Price	101.14	159.65	208.66	57.86	30.70	106.32
PUNJAB						
Operational Cost	N.A.	70.12	82.35	-	17.43	-
Fixed Costs	N.A.	39.67	53.42	-	34.67	-
Total Cost(13+31)	N.A.	109.79	135.77	-	23.66	-
Av.Value or Price	N.A.	131.36	163.08	-	24.14	-
TAMIL NADU						
Operational Cost	42.47	64.25	81.59**	51.28	26.99	92.11
Fixed Costs	25.63	35.61	45.37**	38.93	27.41	77.00
Total Cost(13+31)	68.10	99.86	126.95**	46.63	27.14	86.42
Av.Value or Price	75.02	117.02	148.09**	55.98	26.54	97.39
UTTAR PRADESH						
Operational Cost	N.A.	60.02	80.20	-	43.62	-
Fixed Costs	N.A.	31.34	49.93	-	59.33	-
Total Cost(13+31)	N.A.	91.35	136.13	-	49.01	-
Av.Value or Price	N.A.	81.20	147.28	-	81.38	-
WEST BENGAL						
Operational Cost	43.01	91.61	107.13	113.01	16.94	149.10
Fixed Costs	29.52	39.82	59.44	34.88	49.29	101.35
Total Cost(13+31)	72.15	131.42	166.57	82.15	26.74	130.80
Av.Value or Price	103.02	133.74	200.01	29.83	49.55	94.16

* : Average based on one year data

** : Average based on two year data

Table 16 : Cost of Production (Rs./Qnt1) and Value of Output (Av. Price Rs./Qnt)
WHEAT Statewise in Different Sub-Periods

State/Item	Triennium Averages			% Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
HARYANA						
Operational Cost	43.04	84.44	105.12	96.19	24.49	144.24
Fixed Costs	24.53	37.63	53.27	53.39	41.55	117.13
Total Cost (13+31)	67.57	122.07	158.61	80.65	29.94	134.73
Av. Value or Price	101.07	118.88	200.44	17.62	68.61	98.32
MADHYA PRADESH						
Operational Cost	41.69	70.27**	112.80	68.54	60.52	170.55
Fixed Costs	25.55	45.30**	81.67	77.26	80.30	219.60
Total Cost (13+31)	67.25	115.56**	194.47	71.85	68.28	189.19
Av. Value or Price	96.25	142.39**	236.57	47.94	66.14	145.79
PUNJAB						
Operational Cost	40.69	73.53	96.53	80.70	31.27	137.21
Fixed Costs	28.41	46.10	69.76	62.25	51.31	145.50
Total Cost (13+31)	69.10	119.63	166.28	73.11	39.00	140.62
Av. Value or Price	82.34	130.50	198.15	58.49	51.84	140.66
RAJASTHAN						
Operational Cost	N.A.	76.19**	102.84	-	34.98	-
Fixed Costs	N.A.	34.46**	64.40	-	86.85	-
Total Cost (13+31)	N.A.	110.66**	167.24	-	51.13	-
Av. Value or Price	N.A.	143.71**	252.70	-	75.84	-
UTTAR PRADESH						
Operational Cost	51.40	80.27	112.24**	56.19	39.82	118.39
Fixed Costs	30.19	38.52	49.01**	27.61	27.24	62.37
Total Cost (13+31)	81.43	118.79	161.25**	45.89	35.74	98.04
Av. Value or Price	110.13	129.77	205.45**	17.83	58.32	86.55

* : Average based on one year data

** : Average based on two year data

reasonable measure of technological change. On the other hand, the rate of increase in fixed cost in respect of the same is seen to have increased between mid-late seventies and mid-late eighties as compared to the sub-periods between early seventies and mid-late seventies. Such difference in relative increase in operational cost may have been brought about by spurt in the use of current inputs in the second phase of green-revolution, i.e. the period between early seventies and mid-late seventies.

In the case of gram, which has not had the benefit of technological change, the rate of increase in fixed cost is seen to ^{be} higher than that in operational cost in different regions in different sub-periods (Table 17). As seen earlier, the State of Uttar Pradesh which has realised comparatively higher yield, is seen to have experienced marginal increases both in operational cost and fixed cost.

Cotton which has experienced technological change of various measures in different regions show higher rate of increase in operational cost as compared to fixed cost in all the regions (Table 18). In the case of Punjab, the rate of increase in operational cost is seen to be higher in the sub-period between early seventies and mid-late seventies, presumably due to spurt in the use of current inputs in the wake of availability of high yielding varieties.

In the case of sugarcane the State of Karnataka is seen to be showing only a marginal increase in operational and fixed

Table 17 : Cost of Production(Rs./Qntl) and Value of Output(Av.Price Rs./Q
GRAM Statewise in Different Sub-Periods

State/Item.	Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
HARYANA						
Operational Cost	N.A.	113.34**	175.53	-	54.86	-
Fixed Costs	N.A.	73.82**	145.41	-	124.06	-
Total Cost(13+31)	N.A.	187.16**	340.93	-	82.16	-
Av.Value or Price	N.A.	212.26**	439.83	-	107.21	-
MADHYA PRADESH						
Operational Cost	63.60**	91.16	165.86	43.33	81.95	160.79
Fixed Costs	50.22**	83.54	133.83	66.34	60.21	166.49
Total Cost(13+31)	113.82**	174.69	299.70	53.48	71.56	163.31
Av.Value or Price	133.94**	270.58	409.75	102.01	51.44	205.91
RAJASTHAN						
Operational Cost	N.A.	69.75	141.19	-	102.43	-
Fixed Costs	N.A.	35.89	124.81	-	247.78	-
Total Cost(13+31)	N.A.	105.63	265.99	-	151.81	-
Av.Value or Price	N.A.	132.62	459.83	-	246.74	-
UTTAR PRADESH						
Operational Cost	N.A.	134.68	163.69	-	21.54	-
Fixed Costs	N.A.	96.88	112.63	-	16.26	-
Total Cost(13+31)	N.A.	231.56	276.32	-	19.33	-
Av.Value or Price	N.A.	290.93	366.27	-	25.90	-

* : Average based on one year data

** : Average based on two year data

Table 18 : Cost of Production (Rs./Qnt!) and Value of Output (Av. Price Rs./Qnt)
COTTON Statewise in Different Sub-Periods

State, Item	Triennium Averages			% Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
GUJARAT						
Operational Cost	N.A.	244.45	364.16	-	48.97	-
Fixed Costs	N.A.	84.64	116.09	-	37.16	-
Total Cost (13+31)	N.A.	329.09	480.26	-	45.93	-
Av. Value or Price	N.A.	394.09	548.60	-	39.21	-
KARNATAKA						
Operational Cost	N.A.	154.19**	309.71**	-	100.87	-
Fixed Costs	N.A.	121.98**	174.79**	-	43.29	-
Total Cost (13+31)	N.A.	276.17**	484.50**	-	75.43	-
Av. Value or Price	N.A.	428.21**	600.40**	-	40.21	-
MAHARASHTRA						
Operational Cost	N.A.	167.29	362.41	-	116.63	-
Fixed Costs	N.A.	95.79	144.95	-	51.32	-
Total Cost (13+31)	N.A.	263.08	507.35	-	92.85	-
Av. Value or Price	N.A.	430.61	543.77	-	26.28	-
PUNJAB						
Operational Cost	115.49	207.90**	226.13	80.01	9.77	95.80
Fixed Costs	83.74	130.48**	146.69	55.82	12.42	75.17
Total Cost (13+31)	199.23	338.38**	372.82	69.84	10.18	87.13
Av. Value or Price	256.28	439.54	519.38	71.51	18.16	102.66

* : Average based on one year data

** : Average based on two year data

cost mainly because of considerable increase in yield too. In the case of Maharashtra and Uttar Pradesh, two important sugarcane growing states, the rate of increase in operational cost is seen to slightly higher than that in fixed cost, presumably because of increased use of current inputs (Table 19).

As regards two oil seed crops, groundnut and rapeseed-mustard, in all the three regions fixed cost is seen to have increased at a relatively faster rate in the case of groundnut, specially in Karnataka (Table 20), while in the case of rapeseed mustard only in the State of Assam the total cost is seen to have increased considerably, mainly on account of higher rate of increase in operational cost (Table 21). These two crops, specially rapeseed-mustard, are not seen to have had the benefits of experiencing technological change.

Having discussed the break-up of the total cost (Cost C2) into components of operational cost and fixed cost we now move to analysing various items under each cost component with a view to identify the factors contributing to cost increases over different sub-periods. In this analysis we have taken into consideration only those items of cost which account for bulk of the (i) operational cost which is Cost A2 + imputed value of family labour - (rent paid on leased-in land + depreciation on implements and buildings) and (ii) the fixed cost which includes rental value of own land, rent paid on leased-in land, depreciation on implements and interest on own capital and also the ones which influence the crop output considerably.

Table 19 : Cost of Production (Rs./Qntl) and Value of Output (Av. Price Rs./Qntl) SUGARCANE Statewise in Different Sub-Periods

State/Item	Triennium Averages			% Increase Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
ANDHRA PRADESH						
Operational Cost	N.A.	6.56	10.15	-	54.67	-
Fixed Costs	N.A.	4.66	7.93	-	69.96	-
Total Cost (13+31)	N.A.	11.23	18.08	-	61.02	-
Av. Value or Price	N.A.	13.82	24.79	-	79.39	-
KARNATAKA						
Operational Cost	N.A.	5.78	6.17	-	6.78	-
Fixed Costs	N.A.	4.65	6.02	-	29.51	-
Total Cost (13+31)	N.A.	10.42	12.19	-	16.91	-
Av. Value or Price	N.A.	20.66	26.94	-	30.41	-
MAHARASHTRA						
Operational Cost	N.A.	5.88	12.92**	-	119.60	-
Fixed Costs	N.A.	2.83	5.28**	-	86.26	-
Total Cost (13+31)	N.A.	8.53	18.19**	-	113.39	-
Av. Value or Price	N.A.	15.00	25.98**	-	73.17	-
UTTAR PRADESH						
Operational Cost	N.A.	4.75	8.37	-	76.07	-
Fixed Costs	N.A.	3.88	5.53	-	42.30	-
Total Cost (13+31)	N.A.	8.64	13.89	-	60.88	-
Av. Value or Price	N.A.	13.14	24.72	-	88.12	-

* : Average based on one year data

** : Average based on two year data

Table 20 : Cost of Production(Rs./Qntl) and Value of Output (Av. Price Rs./Qntl) Groundnut Statewise in Different Sub-Periods

State/Item	Triennial Averages			% Increase Decrease		
	Subperiods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
GUJARAT						
Operational Cost	N.A.	218.64	339.08	-	55.09	-
Fixed Costs	N.A.	72.51	114.61	-	58.06	-
Total Cost(13+31)	N.A.	291.15	453.69	-	55.83	-
Av. Value or Price	N.A.	371.75	499.68	-	34.41	-
KARNATAKA						
Operational Cost*	N.A.	171.55	255.73**	-	49.07	-
Fixed Costs	N.A.	65.73	140.53**	-	111.79	-
Total Cost(13+31)	N.A.	237.54	396.26**	-	66.81	-
Av. Value or Price	N.A.	234.56	531.55**	-	126.62	-
TAMIL NADU						
Operational Cost	N.A.	89.93	194.23	-	115.98	-
Fixed Costs	N.A.	44.33	116.20	-	162.10	-
Total Cost(13+31)	N.A.	134.27	310.43	-	131.21	-
Av. Value or Price	N.A.	145.29	341.49	-	135.05	-

* : Average based on one year data

** : Average based on two year data

Table 21 : Cost of Production (Rs./Qntl) and Value of Output (Av. Price Rs.)
 RAPESEED MUSTARD Statewise in Different Sub-Periods

State/Item	Triennium Averages			% Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
ASSAM						
Operational Cost	N.A.	105.74	274.42	-	159.54	-
Fixed Costs	N.A.	86.18	148.35	-	72.13	-
Total Cost (13+31)	N.A.	191.96	422.77	-	120.25	-
Av. Value or Price	N.A.	313.27	449.79	-	43.58	-
HARYANA						
Operational Cost	N.A.	148.42 *	167.94	-	13.15	-
Fixed Costs	N.A.	126.50 *	150.81	-	19.22	-
Total Cost (13+31)	N.A.	274.92 *	318.75	-	15.94	-
Av. Value or Price	N.A.	385.26 *	574.30	-	49.07	-
RAJASTHAN						
Operational Cost	N.A.	139.05	138.32	-	-0.53	-
Fixed Costs	N.A.	109.78	133.83	-	24.90	-
Total Cost (13+31)	N.A.	248.83	272.14	-	9.37	-
Av. Value or Price	N.A.	386.29	499.56	-	29.32	-

* : Average based on one year data

** : Average based on two year data

On this basis we have considered for further analysis (i) human labour cost, (ii) animal labour cost, (iii) machine hour cost, (iv) seed cost, (v) fertilizer and manure cost, (vi) insecticide cost, and (vii) irrigation charges as important components of operational cost for different crops as the case may be and all the components of fixed cost mentioned earlier.

Components of Operational Cost

Estimates of cost components of the operational cost for paddy are presented in Table 22. To begin with it is noticed that the components of cost taken together account for anywhere between 85 and 95 per cent of the operational cost in 10 States in all the three sub-periods. The average would be around 90 per cent of the operational cost.

Out of the 10 States, Andhra Pradesh, Bihar, Haryana, Karnataka, Madhya Pradesh, Tamil Nadu and Uttar Pradesh show human labour cost at around 45 per cent of the total operational cost which is more or less the case in all the sub-periods. In the States of Assam and West Bengal human labour cost is seen to account for more than 50 per cent of the operational cost and, finally, Punjab is the only State where the human labour cost is seen to account for between 30 per cent and 35 per cent of operational cost in almost all the sub-periods. Again, we also note that except in Assam and West Bengal, where human labour cost constitutes between 30 and 35 per cent of the total cost, in all the other 7 States, other than Punjab, the same is

Table 22 : Share of Main Cost Items in Operational Cost in respect of PADD Statewise in Different Sub-Periods

	Triennium Averages					
	Sub-periods					
	% Of Operational Cost			% Of Total Cost		
	1	2	3	1	2	3
ANDHRA PRADESH						
Human Labour Cost	39.79	37.66	39.00	22.39	24.03	25.53
Animal Labour Cost	12.67	11.18	10.94	7.13	7.13	7.16
Seed	8.83	5.76	5.18	4.97	3.67	3.39
Ferti & Manure Cost	29.32	29.41	29.58	16.50	18.77	19.36
Irrigation Charges	4.14	8.52	5.60	2.33	5.44	3.67
ASSAM						
Human Labour Cost	53.94	54.98	61.39	31.25	35.57	40.57
Animal Labour Cost	27.73	31.78	26.03	16.07	20.56	17.20
Seed	16.02	10.07	9.64	9.28	6.52	6.37
Ferti & Manure Cost	0.86	1.20	0.96	0.50	0.78	0.63
Irrigation Charges	-	0.00	0.03	-	0.00	0.02
BIHAR						
Human Labour Cost	42.84	43.35	48.25	23.47	25.50	24.98
Animal Labour Cost	35.03	32.22	25.94	19.19	18.95	13.43
Seed	7.75	8.25	8.12	4.25	4.85	4.20
Ferti & Manure Cost	11.30	11.88	11.67	6.19	6.99	6.04
Irrigation Charges	0.41	1.00	3.36	0.22	0.59	1.74
HARYANA						
Human Labour Cost	-	37.06	37.68	-	26.41	26.21
Animal Labour Cost	-	8.75	5.76	-	6.23	4.00
Seed	-	1.84	2.86	-	1.31	1.99
Ferti & Manure Cost	-	20.77	17.83	-	14.80	12.40
Irrigation Charges	-	21.34	19.08	-	15.21	13.27
KARNATAKA						
Human Labour Cost	-	38.60	43.56	-	21.91	26.35
Animal Labour Cost	-	18.72	15.09	-	10.63	9.13
Seed	-	7.90	6.59	-	4.49	3.99
Ferti & Manure Cost	-	30.66	25.89	-	17.41	15.66
Irrigation Charges	-	0.43	2.23	-	0.25	1.35

Contd.

Table 22 : Share of Main Cost Items in Operational Cost in respect of PADD Statewise in Different Sub-Periods

	Triennium Averages					
	Sub-periods					
	% Of Operational Cost			% Of Total Cost		
	1	2	3	1	2	3
MADHYA PRADESH						
Human Labour Cost	44.16	39.95	42.63	24.58	22.93	25.35
Animal Labour Cost	24.87	27.73	24.21	13.84	15.91	14.40
Seed	15.99	14.89	11.50	8.90	8.55	6.84
Ferti & Manure Cost	13.75	14.20	16.64	7.65	8.15	9.89
Irrigation Charges	0.94	0.28	1.40	0.53	0.16	0.83
PUNJAB						
Human Labour Cost	-	31.46	34.76	-	20.09	21.08
Animal Labour Cost	-	3.53	3.52	-	2.26	2.13
Seed	-	3.43	3.08	-	2.19	1.87
Ferti & Manure Cost	-	26.43	22.61	-	16.88	13.72
Irrigation Charges	-	18.70	17.67	-	11.95	10.72
TAMIL NADU						
Human Labour Cost	44.47	39.88	41.13	27.73	25.66	26.43
Animal Labour Cost	15.13	17.03	13.18	9.43	10.96	8.47
Seed	6.81	7.08	6.50	4.25	4.55	4.18
Ferti & Manure Cost	22.72	23.66	24.12	14.17	15.22	15.50
Irrigation Charges	7.16	5.17	7.50	4.47	3.32	4.82
UTTAR PRADESH						
Human Labour Cost	-	48.96	41.77	-	32.16	26.45
Animal Labour Cost	-	22.99	21.70	-	15.10	13.74
Seed	-	7.51	8.89	-	4.93	5.63
Ferti & Manure Cost	-	12.55	16.58	-	8.25	10.50
Irrigation Charges	-	4.88	5.89	-	3.21	3.73
WEST BENGAL						
Human Labour Cost	52.20	51.55	50.26	31.11	35.93	32.32
Animal Labour Cost	26.40	27.67	23.31	15.74	19.28	14.99
Seed	8.38	5.50	6.47	5.00	3.83	4.16
Ferti & Manure Cost	9.70	10.91	14.40	5.78	7.60	9.26
Irrigation Charges	0.44	1.62	2.31	0.26	1.13	1.48

around 25 per cent of the total cost. In Punjab the human labour cost is seen to account for only 20 per cent of the total cost. We may, therefore, conclude that bulk of the operational cost, with variation between the States, is accounted for by the cost on human labour.

Cost on manure and fertilizer is seen to account for between 20 and 28 per cent of the operational cost and between 12 and 18 per cent of the total cost of paddy in Andhra Pradesh, Haryana, Karnataka, Punjab and Tamil Nadu known for having experienced technological change. While Assam shows negligible cost on manure and fertilizer, the same in Bihar, Madhya Pradesh, Uttar Pradesh and West Bengal vary between 10 and 16 per cent of operational cost and 6 and 10 per cent of total cost. We also note that proportion of expenditure on manure and fertilizer do not vary in any significant way over the sub-periods in any of the States.

As regards animal labour cost, Andhra Pradesh, Karnataka and Tamil Nadu can be put in group of States where the animal labour cost is seen to account for between 11 and 18 per cent and between 7 and 11 per cent of operational cost and total cost respectively in different sub-periods. Assam, Bihar, Madhya Pradesh, Uttar Pradesh and West Bengal show the animal labour cost to be between 22 per cent and 30 per cent and between 14 and 20 per cent of operational and total cost respectively in different sub-periods. Only Punjab and Haryana

specially Punjab, show considerably smaller percentage of operational and total costs on the animal labour, being around 6 to 9 per cent and 4 to 6 per cent respectively in Haryana and around 4 per cent and 2 per cent respectively in Punjab in different sub-periods. This may be because of more use of machine hours in these two States.

Share of cost on seed varies between 6 and 9 per cent of the operational cost and around 4 to 5 per cent of the total cost in different sub-periods in the States of Andhra Pradesh, Bihar, Karnataka, Tamil Nadu, Uttar Pradesh and West Bengal. While in Haryana and Punjab the seed cost constitutes around 3 per cent of operational cost, in Assam and Madhya Pradesh it accounts for around 10 and 15 per cent.

Irrigation charges as per cent of operational/total cost are seen to be negligible in the States of Assam, Bihar, Karnataka, Madhya Pradesh and West Bengal. Obviously, in these States paddy cultivation is mostly rainfed. However, one can notice an indication of a very slow increase in raising paddy under irrigated conditions during eighties compared to seventies in these States except in Assam. The States of Andhra Pradesh, Tamil Nadu and Uttar Pradesh show between 5 and 9 per cent and between 3 and 5 per cent of operational and total costs respectively on irrigation in different sub-periods. Punjab and Haryana are the only two States where irrigation charges constitute around 18 to 20 per cent and 11 to 15 per cent of operational and total cost respectively showing relatively high incidence of irrigated

paddy cultivation in mid-late seventies and mid-late eighties.

If we relate the yield per hectare of paddy presented in Table 1 earlier with the components of operational and total cost we find that in Andhra Pradesh, Haryana, Karnataka, Punjab and Tamil Nadu where expenditures on manure and fertilizer as proportion of operational as well as total costs are relatively higher compared to the remaining five States, the yield per hectare of paddy is also higher. Further, Punjab shows much higher yield among these five States showing high yield mainly because sizable area under paddy is cultivated with assured water supply through irrigation. To a large extent this is true of Haryana also which is reflected, as mentioned earlier, in relatively much larger share of irrigation charges in operational/total cost in these two States. Further, the States showing higher yield due to impact of new technology also show smaller share of cost on human labour, animal labour and seed in operational cost and total cost as compared to the States showing lower yield. However, human labour, fertilizer, manure and irrigation charges, in that order, account for the bulk of operational cost of paddy in the States which have experienced technological change and in other States human labour and animal labour account for the bulk of the same in different sub-periods.

We now look at Table 23 giving estimates of main inputs used per hectare in physical quantities for different sub-periods

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Table 23 : Main Input Quantities used Per Hectare Of PADDY Statewise
in Different Sub-Periods

	Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
ANDHRA PRADESH						
Seeds (Kg.)	63.41	77.44	79.25	22.13	2.33	24.98
Fert. (Kg-Nutr/Ha)	53.23	112.59	126.84	111.54	12.66	138.31
Manure (Qntl/Ha)	58.13	48.03	67.46	-17.37	40.45	16.05
Labour (Man Hr/Ha)	875.25	1128.17	1214.86	28.90	7.68	38.80
Ani. Pair (Hr/Ha)	144.60	156.92	167.57	8.52	6.79	15.89
ASSAM						
Seeds (Kg.)	63.60	63.99	63.89	0.61	-0.15	0.46
Fert. (Kg-Nutr/Ha)	0.07 *	0.31	1.01	347.62	223.40	1347.62
Manure (Qntl/Ha)	1.23	1.46	1.50	18.70	2.74	21.95
Labour (Man Hr/Ha)	628.09	628.94	629.37	0.14	0.07	0.20
Ani. Pair (Hr/Ha)	262.50	249.11	261.08	-5.10	4.81	-0.54
BIHAR						
Seeds (Kg.)	45.11	44.05**	49.83	-2.34	13.11	10.46
Fert. (Kg-Nutr/Ha)	8.17	29.12**	24.89	256.43	-14.51	204.69
Manure (Qntl/Ha)	21.26	6.84**	6.17	-67.86	-9.68	-70.97
Labour (Man Hr/Ha)	794.79	850.57**	825.00	7.02	-3.01	3.80
Ani. Pair (Hr/Ha)	186.89	180.07**	257.73	-3.65	43.13	37.90
HARYANA						
Seeds (Kg.)	N.A.	25.20**	N.A.	-	-	-
Fert. (Kg-Nutr/Ha)	N.A.	137.01**	132.22	-	-3.50	-
Manure (Qntl/Ha)	N.A.	8.53**	4.87	-	-42.87	-
Labour (Man Hr/Ha)	N.A.	764.81**	726.30	-	-5.03	-
Ani. Pair (Hr/Ha)	N.A.	59.61**	38.23	-	-35.86	-
KARNATAKA						
Seeds (Kg.)	N.A.	78.38	81.80	-	4.37	-
Fert. (Kg-Nutr/Ha)	N.A.	74.60	79.12	-	6.06	-
Manure (Qntl/Ha)	N.A.	42.10	80.95	-	92.28	-
Labour (Man Hr/Ha)	N.A.	1073.14	923.43	-	-13.95	-
Ani. Pair (Hr/Ha)	N.A.	192.54	129.30	-	-32.85	-

* : Average based on one year data

** : Average based on two year data

Contd...

Table 23 : Main Input Quantities used Per Hectare Of PADDY Statewise
in Different Sub-Periods

	Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
MADHYA PRADESH						
Seeds (Kg.)	96.85	93.52	83.42	-3.44	-10.80	-13.87
Fert. (Kg-Nutr/Ha)	15.58	19.27	26.12	23.64	35.55	67.59
Manure (Qntl/Ha)	3.59	6.76	15.50	88.57	129.18	332.16
Labour (Man Hr/Ha)	644.63	572.34	583.05	-11.21	1.87	-9.55
Ani. Pair (Hr/Ha)	148.11	148.93	148.59	0.55	-0.23	0.32
PUNJAB						
Seeds (Kg.)	N.A.	N.A.	N.A.	-	-	-
Fert. (Kg-Nutr/Ha)	N.A.	180.81	173.89	-	-3.83	-
Manure (Qntl/Ha)	N.A.	56.93	66.88	-	17.48	-
Labour (Man Hr/Ha)	N.A.	834.76	818.81	-	-1.91	-
Ani. Pair (Hr/Ha)	N.A.	30.97	24.99	-	-19.31	-
TAMIL NADU						
Seeds (Kg.)	70.78	89.34	94.06**	26.23	5.28	32.90
Fert. (Kg-Nutr/Ha)	72.97	117.69	136.65**	61.28	16.11	87.26
Manure (Qntl/Ha)	49.77	34.27	36.12**	-31.13	5.39	-27.42
Labour (Man Hr/Ha)	1119.86	1147.95	1274.87**	2.51	11.06	13.84
Ani. Pair (Hr/Ha)	242.81	195.64	216.04**	-19.43	10.43	-11.03
UTTAR PRADESH						
Seeds (Kg.)	N.A.	53.95	N.A.	-	-	-
Fert. (Kg-Nutr/Ha)	N.A.	28.54	45.04	-	57.80	-
Manure (Qntl/Ha)	N.A.	19.85	26.43	-	33.13	-
Labour (Man Hr/Ha)	N.A.	976.74	881.79	-	-9.72	-
Ani. Pair (Hr/Ha)	N.A.	144.70	126.89	-	-12.31	-
WEST BENGAL						
Seeds (Kg.)	65.00	69.13	78.32	6.35	13.29	20.49
Fert. (Kg-Nutr/Ha)	10.74	27.62	35.31	157.25	27.83	228.84
Manure (Qntl/Ha)	27.33	21.07	29.85	-22.91	41.69	9.23
Labour (Man Hr/Ha)	895.37	1038.33	1135.35	15.97	9.34	26.80
Ani. Pair (Hr/Ha)	227.03	232.48	232.13	2.40	-0.15	2.24

* : Average based on one year data

** : Average based on two year data

for different States in respect of paddy. We find that except in the use of fertilizer and manure, that too, specially between early seventies and mid-late seventies, use per hectare of all other factor inputs per hectare do not show any significant change between sub-periods 1 and 2 and 2 and 3. In fact, between mid-late seventies and mid-late eighties use of human labour, fertilizer-manure, animal labour and seed is seen to have remained at the same level or decreased a little specially in the States having experienced technological change. These results corroborate and also explain the reasons for higher rate of increase in operational cost between early seventies and mid-late seventies, as observed in the earlier discussion.

One may deduce from the foregoing analysis that in the case of paddy the major components of operational cost, e.g. cost on human labour, animal labour, seed, fertilizer, manure and irrigation by and large increased in the same proportion as the total operational cost between early seventies and mid-late seventies and between mid-late seventies and mid-late eighties in all the States and that is the reason why the share of each item in the total operational cost remain more or less unchanged during different sub-periods. Further, since the use per hectare of human labour, animal labour and manure (triennium averages) is observed to remain more or less at the same level during different sub-periods (Table 23), specially between mid-late seventies and mid-late eighties, bulk of the increase in

expenditure on these items in mid-late seventies over early seventies and specially in mid-late eighties over mid-late seventies, as seen contributing to the increase in operational cost in the corresponding sub-periods, must have been brought about by price increases of these items rather than increased use of these inputs over the periods in different States growing paddy, specially between mid-late seventies and mid-late eighties.

We shall examine this aspect in more detail in order to examine to what extent is the increase in operational cost between sub-periods is attributable to increased use of various inputs. One of the ways this can be ascertained is by examining the changes in the use of those inputs per unit of output produced.

The results of this exercise for paddy is presented in Table 24. Use of all the inputs (in physical term) per unit of output (in physical term), viz., seed, human labour, animal labour, except for fertilizer and manure, is seen to have declined in all the regions between early seventies and mid-late seventies and between mid-late seventies and mid-late eighties. In the case of Haryana and Tamil Nadu even the fertilizer, manure use per unit of output is seen to have declined between the sub-periods. This shows that increase in output has been obtained by less than proportionate increase in inputs. This is what the cost reducing technology ought to result into. However, it is

Table 24 : Main Input Items Per Quintal Of Output Of PADDY Statewise
in Different Sub-Periods

Input Items	Ratio of Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
ANDHRA PRADESH						
Seeds (Kg.)	2.71	2.65	2.43	-1.98	-8.42	-10.23
Fert. (Kg-Nutr/Ha)	2.27	3.86	3.89	69.79	0.81	71.17
Manure (Qntl/Ha)	2.48	1.65	2.07	-33.68	25.69	-16.64
Fert+Manure (Qntl)	2.51	1.69	2.11	-32.74	25.12	-15.85
Labour (Man Hr/Ha)	37.38	39.68	37.27	3.46	-3.64	-0.30
Ani. Pair (Hr/Ha)	6.18	5.38	5.14	-12.89	4.44	-16.76
ASSAM						
Seeds (Kg.)	4.03	3.47	3.50	-13.83	0.93	-13.03
Fert. (Kg-Nutr/Ha)	0.00	0.02	0.06	283.38	226.89	1153.25
Manure (Qntl/Ha)	0.08	0.08	0.08	1.67	3.85	5.58
Fert+Manure (Qntl)	0.08	0.08	0.08	1.86	4.32	6.27
Labour (Man Hr/Ha)	39.76	34.10	34.49	-14.23	1.15	-13.25
Ani. Pair (Hr/Ha)	16.62	13.51	14.31	-18.72	5.94	-13.89
BIHAR						
Seeds (Kg.)	2.75	2.34**	2.77	-14.89	18.21	0.61
Fert. (Kg-Nutr/Ha)	0.50	1.55**	1.38	210.64	-10.66	177.52
Manure (Qntl/Ha)	1.30	0.36**	0.34	-71.98	-5.61	-73.56
Fert+Manure (Qntl)	1.30	0.38**	0.36	-70.90	-5.82	-72.60
Labour (Man Hr/Ha)	48.44	45.18**	45.80	-6.73	1.36	-5.46
Ani. Pair (Hr/Ha)	11.39	9.57**	14.31	-16.03	49.57	25.60
HARYANA						
Seeds (Kg.)	N.A.	0.73**	N.A.	-	-	-
Fert. (Kg-Nutr/Ha)	N.A.	3.96**	3.52	-	-11.20	-
Manure (Qntl/Ha)	N.A.	0.25**	0.13	-	-47.43	-
Fert+Manure (Qntl)	N.A.	0.29**	0.16	-	-42.41	-
Labour (Man Hr/Ha)	N.A.	22.13**	19.34	-	-12.61	-
Ani. Pair (Hr/Ha)	N.A.	1.72**	1.02	-	-40.98	-
KARNATAKA						
Seeds (Kg.)	N.A.	2.28	2.23	-	-2.17	-
Fert. (Kg-Nutr/Ha)	N.A.	2.17	2.16	-	-0.59	-
Manure (Qntl/Ha)	N.A.	1.22	2.21	-	80.23	-
Fert+Manure (Qntl)	N.A.	1.25	2.23	-	78.82	-
Labour (Man Hr/Ha)	N.A.	31.21	25.17	-	-19.34	-
Ani. Pair (Hr/Ha)	N.A.	5.60	3.52	-	-37.06	-

* : Average based on one year data

** : Average based on two year data

Table 24 : Main Input Items Per Quintal Of Output Of PADDY Statewise
in Different Sub-Periods

Input Items	Ratio of Triennium Averages			% Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
MADHYA PRADESH						
Seeds(Kg.)	7.51	6.82	5.99	-9.17	-12.17	-20.22
Fert.(Kg-Nutr)	1.21	1.40	1.88	16.30	33.48	55.24
Manure(Qntl)	0.28	0.49	1.11	77.38	125.67	300.30
Fert+Manure(Qntl)	0.29	0.51	1.13	74.84	123.11	290.09
Labour(Man Hr)	49.97	41.74	41.87	-16.48	0.31	-16.22
Ani. Pair(Hr)	11.48	10.86	10.67	-5.41	-1.76	-7.07
PUNJAB						
Seeds(Kg.)	N.A.	N.A.	N.A.	-	-	-
Fert.(Kg-Nutr)	N.A.	3.35	3.24	-	-3.44	-
Manure(Qntl)	N.A.	1.06	1.25	-	17.95	-
Fert+Manure(Qntl)	N.A.	1.09	1.28	-	17.29	-
Labour(Man Hr)	N.A.	15.48	15.24	-	-1.52	-
Ani. Pair(Hr)	N.A.	0.57	0.47	-	-18.99	-
TAMIL NADU						
Seeds(Kg.)	2.84	2.72	2.48**	-4.34	-8.57	-12.54
Fert.(Kg-Nutr)	2.93	3.58	3.61**	22.22	0.92	23.24
Manure(Qntl)	2.00	1.04	0.95**	-47.81	-8.48	-52.23
Fert+Manure(Qntl)	2.03	1.08	0.99**	-46.80	-8.17	-51.14
Labour(Man Hr)	44.92	34.90	33.66**	-22.32	-3.55	-25.08
Ani. Pair(Hr)	9.74	5.95	5.70**	-38.94	-4.10	-41.44
UTTAR PRADESH						
Seeds(Kg.)	N.A.	2.61	N.A.	-	-	-
Fert.(Kg-Nutr)	N.A.	1.38	2.15	-	56.03	-
Manure(Qntl)	N.A.	0.90	1.26	-	31.64	-
Fert+Manure(Qntl)	N.A.	0.97	1.29	-	31.99	-
Labour(Man Hr)	N.A.	47.24	42.17	-	-10.73	-
Ani. Pair(Hr)	N.A.	7.00	6.07	-	-13.29	-
WEST BENGAL						
Seeds(Kg.)	3.65	3.35	3.35	-8.33	0.11	-8.23
Fert.(Kg-Nutr)	0.60	1.34	1.51	121.72	12.96	150.46
Manure(Qntl)	1.54	1.02	1.28	-33.55	25.21	-16.80
Fert+Manure(Qntl)	1.54	1.03	1.29	-32.95	25.05	-16.15
Labour(Man Hr)	50.34	50.31	48.62	-0.05	-3.38	-3.42
Ani. Pair(Hr)	12.76	11.27	9.94	-11.74	-11.76	-22.13

* : Average based on one year data

** : Average based on two year data

possible that decrease in human labour and animal labour per unit of output as observed might have been more than made up by increased use of machine hours. In that case substitution of biological sources of energy (human and animal labour) by the mechanical source would have taken place. Fertilizer, manure use by and large, appeared to have increased more than proportionately to output, although it may be noted that its use might not have been anywhere the norms recommended by the Long Term Fertilizer Use study carried out for representative regions in India for different crops under different agro-climatic zones.

In the case of wheat, the six items of cost, e.g., cost on human labour, cost on animal labour, cost on machine hours, cost on seed, cost on manure and fertilizer and cost on account of irrigation, are seen to account for around 95 per cent of the operational cost in different sub-periods in the States of Haryana, Madhya Pradesh, Punjab, Rajasthan and Uttar Pradesh (Table 25).

In the early seventies human labour cost is seen to have accounted for around 30 per cent of the operational cost of wheat in all the States. In Haryana, however, the same is seen to have decreased to 25 per cent and thereabouts in mid-late eighties, but, in other three States the decline in the share of human labour cost is seen to be marginal. Again, it is noted from Table 17 that except in Haryana (in eighties), where the share of human labour cost declined to around 15 per cent from

Table 25 : Share of Main Cost Items in Operational Cost in respect of WHI
Statewise in Different Sub-Periods

	Triennium Averages					
	Sub-periods					
	% Of Operational Cost			% Of Total Cost		
	1	2	3	1	2	3
HARYANA						
Human Labour Cost	31.43	29.27	22.96	20.02	20.25	15.22
Animal Labour Cost	23.12	20.47	8.18	14.73	14.16	5.42
Machine Labour	7.04	10.21	19.42	4.48	7.06	12.87
Seed	12.39	7.47	11.47	7.89	5.17	7.60
Ferti & Manure Cost	12.14	17.91	22.59	7.73	12.39	14.97
Irrigation Charges	11.92	12.22	11.14	7.59	8.45	7.39
MADHYA PRADESH						
Human Labour Cost	33.72	32.43	28.14	20.91	19.72	16.32
Animal Labour Cost	29.94	19.71	21.22	18.56	11.98	12.31
Machine Labour	0.94	3.63	5.76	0.59	2.21	3.34
Seed	23.59	20.51	16.84	14.63	12.47	9.77
Ferti & Manure Cost	8.04	18.85	12.86	4.98	11.46	7.46
Irrigation Charges	1.36	2.36	12.68	0.84	1.44	7.36
PUNJAB						
Human Labour Cost	31.84	24.42	28.11	18.75	15.01	16.31
Animal Labour Cost	15.57	7.68	3.80	9.17	4.72	2.21
Machine Labour	9.68	19.62	21.64	5.70	12.06	12.56
Seed	6.99	7.46	7.29	4.12	4.59	4.23
Ferti & Manure Cost	23.71	32.19	27.82	13.96	19.78	16.15
Irrigation Charges	10.00	4.97	6.12	5.89	3.05	3.55
RAJASTHAN						
Human Labour Cost	-	28.29	30.30	-	19.48	18.63
Animal Labour Cost	-	16.73	16.84	-	11.52	10.36
Machine Labour	-	6.89	12.95	-	4.74	7.96
Seed	-	13.81	11.03	-	9.51	6.78
Ferti & Manure Cost	-	13.19	10.27	-	9.08	6.32
Irrigation Charges	-	18.47	16.31	-	12.71	10.03
UTTAR PRADESH						
Human Labour Cost	29.96	25.47	26.49	18.91	17.21	18.44
Animal Labour Cost	27.96	29.29	17.04	17.65	19.79	11.86
Machine Labour	3.89	7.06	14.32	2.45	4.77	9.96
Seed	11.65	9.74	9.44	7.35	6.58	6.57
Ferti & Manure Cost	11.94	16.90	20.45	7.54	11.42	14.24
Irrigation Charges	12.58	9.01	9.67	7.94	6.09	6.73

20 per cent of total cost, in the States of Madhya Pradesh, Punjab, Rajasthan and Uttar Pradesh the share of human labour cost in total cost is seen to have declined marginally from around 20 per cent over the sub-periods. Thus, the bulk of the operational cost is seen to be on account of human labour in each sub-period in all the States.

Share of animal labour cost is seen to be the other chunk of the operational cost, specially in early seventies. Rajasthan is the only State where share of animal labour cost to operational cost and to total cost is seen to remain at the same level (around 17 per cent and 11 per cent respectively) in mid-late seventies and mid-late eighties. All other States show decreases in the same specially in mid-late eighties and specially the States of Haryana and Punjab where the share came down to 8 per cent and 4 per cent respectively of operational cost. In these two States mechanization may be replacing the animal labour largely as can be seen from the share of machine hours which increased from around 7 to 9 per cent to around 20 per cent of operational cost from mid-late seventies to mid-late eighties.

As regards cost on fertilizer and manure Punjab is the only State where it is seen to account for around 30 per cent (progressively increased from 24 per cent in early seventies to around 30 per cent in mid-late seventies and maintained at the same level in mid-late eighties). In Haryana and Uttar

Pradesh the same is seen to have increased progressively from 12 per cent in early seventies to around 22 per cent in mid-late eighties. Madhya Pradesh and Rajasthan do not show any increasing trend in this direction; the cost on fertilizer in these two States account for between 10 and 13 per cent of operational cost in different periods.

Share of cost on seed to total operational cost is seen to be lowest in Punjab at around 7 per cent in all the sub-periods compared to 10 to 13 per cent in Uttar Pradesh, Rajasthan, Haryana and to around 20 per cent in Madhya Pradesh.

Haryana is the only State where irrigation charges as per cent of operational cost are seen to have remained at around 12 per cent in all the periods. Surprisingly, in Punjab the same is seen to have decreased from around 10 per cent in early seventies to around 6 per cent in mid-late eighties. In Madhya Pradesh share of cost on irrigation is seen to have increased sharply from around 2 per cent in seventies to around 13 per cent in mid-late eighties. Rajasthan shows between 16 and 18 per cent and Uttar Pradesh shows between 9 and 12 per cent of operational cost on irrigation during different sub-periods. It is difficult to comment on this item of operational cost for want of additional information on what constitutes the irrigation charges. It is understood that cost on machine hour (owned and hired), which is reported separately, may be including cost of operating machines for irrigation, if any. Besides, the share of irrigation from

private sources and public surface sources should also be known before any comments on share of expenditure on irrigation are made.

If we relate the yield per hectare of wheat presented in Table 2 earlier with the items of operational cost we find that the same is higher and progressively increasing in Haryana and Punjab, where the cost on fertilizer-manure as percentage of operational cost is also higher compared to other States. Further, higher yield is also associated with comparatively high and progressively increasing share of machine hour cost.

We now examine the estimates of main factor inputs used per hectare in different sub-periods in different States in respect of wheat presented in Table 26. It is observed that the use of seed per hectare remained more or less at the same level or showed marginal increase, in different sub-periods in respective States. Fertilizer-manure use is seen to have increased very substantially between early seventies and mid-late seventies compared to increases between mid-late seventies and mid-late eighties in all the States, specially in Haryana, Punjab and Uttar Pradesh. Human labour and animal labour use are seen to have either increased or remained at the same level in respective States between early seventies and mid-late seventies and then to have decreased between mid-late seventies and mid-late eighties. It may be inferred from these observations that increase in the operational cost of wheat between early seventies and mid-late

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Table 26 : Main Input Quantities used Per Hectare Of WHEAT Statewise
in Different Sub-Periods

	Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
HARYANA						
Seeds (Kg.)	101.83**	103.09	109.98	1.25	6.68	8.01
Fert. (Kg-Nutr/Ha)	43.73**	97.59	144.26	123.17	47.82	229.89
Manure (Qntl/Ha)	5.11**	10.59	0.91	107.24	-91.44	-82.26
Labour (Man Hr/Ha)	400.82**	560.64	374.84	39.87	-33.14	-6.48
Ani. Pair (Hr/Ha)	126.21**	123.99	48.88	-1.76	-60.58	-61.27
MADHYA PRADESH						
Seeds (Kg.)	104.67	105.02**	104.86	0.33	-0.14	0.18
Fert. (Kg-Nutr/Ha)	10.34	25.80**	33.39	149.47	29.44	222.92
Manure (Qntl/Ha)	3.18**	0.44**	1.41	-86.32	223.37	-55.77
Labour (Man Hr/Ha)	394.80	525.07**	368.88	33.00	-29.75	-6.57
Ani. Pair (Hr/Ha)	189.78	217.83**	142.82	14.78	-34.44	-24.75
PUNJAB						
Seeds (Kg.)	79.10**	93.68	108.61	18.42	15.94	37.30
Fert. (Kg-Nutr/Ha)	109.96**	165.71	177.81	50.70	7.30	61.70
Manure (Qntl/Ha)	15.97**	4.77	7.05	-70.10	47.70	-55.84
Labour (Man Hr/Ha)	399.83**	405.72	418.82	1.47	3.23	4.75
Ani. Pair (Hr/Ha)	103.50**	42.86	19.89	-58.59	-53.59	-80.78
RAJASTHAN						
Seeds (Kg.)	N.A.	122.46**	121.00	-	-1.19	-
Fert. (Kg-Nutr/Ha)	N.A.	37.98**	43.73	-	15.15	-
Manure (Qntl/Ha)	N.A.	5.94**	2.70	-	-54.55	-
Labour (Man Hr/Ha)	N.A.	728.14**	546.30	-	-24.97	-
Ani. Pair (Hr/Ha)	N.A.	179.39**	99.11	-	-44.75	-
UTTAR PRADESH						
Seeds (Kg.)	103.20	119.36	126.40**	15.66	5.89	22.48
Fert. (Kg-Nutr/Ha)	46.76	74.45	105.95**	59.22	42.31	126.58
Manure (Qntl/Ha)	21.22	11.08	8.45**	-47.77	-23.80	-60.20
Labour (Man Hr/Ha)	694.99	604.56	573.86**	-13.01	-5.08	-17.43
Ani. Pair (Hr/Ha)	238.53	192.23	115.08**	-19.41	-40.14	-51.76

* : Average based on one year data

** : Average based on two year data

seventies might have been brought about, among other things, by the increased use per hectare of all inputs in all the States, specially, fertilizer-manure input and to an extent human and animal labour inputs, but, the increase in operational cost between mid-late seventies and mid-late eighties seems to have been brought about, firstly, by increased use of fertilizer, albeit small increase, and increased use of machine hour and, secondly, by rising prices of other inputs, viz., human labour, animal labour and machine hour, specially in Punjab, Haryana and Uttar Pradesh which show comparatively high yield on account of the impact of technological change of varying degrees. Further that, even though fertilizer prices which presumably remained unchanged in eighties due to government subsidy programme, its consumption per hectare does not seem to have increased in the same vein.

In order to get better insight into the relationship between the output of wheat and main input items used, both in physical terms, we have examined the input used per unit of output in respect of each main input item in different sub-periods for each of the regions. The results are presented in Table 27. Results show an overall decline between early seventies and mid-late eighties in the ratio of input to output in respect of all the main input items except fertilizer. Considerable decline is observed in the case of animal labour, specially in the States of Punjab and Haryana. This is corroborated by the

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Table 27 : Main Input Items Per Quintal Of Output Of WHEAT Statewise in Different Sub-Periods

Input Items	Ratio of Triennium Averages			%Increase/Decrease		
	Sub-periods			Over	3 Over	3 Over
	1	2	3	1	2	1
HARYANA						
Seeds(Kg.)	5.03**	4.33	3.73	-13.84	-13.93	-25.84
Fert.(Kg-Nutr/Ha)	2.16**	4.10	4.89	89.93	19.26	126.50
Manure(Qntl/Ha)	0.25**	0.45	0.03	76.37	-93.09	-87.82
Fert+Manure(Qntl)	0.27**	0.49	0.08	77.44	83.61	-70.92
Labour(Man Hr/Ha)	19.80**	23.57	12.71	19.04	-46.06	-35.79
Ani. Pair(Hr/Ha)	6.23**	5.21	1.66	-16.39	-68.20	-73.41
MADHYA PRADESH						
Seeds(Kg.)	11.43	8.73**	8.60	-23.64	-1.43	-24.73
Fert.(Kg-Nutr/Ha)	1.13	2.14**	2.74	89.88	27.78	142.63
Manure(Qntl/Ha)	0.35**	0.04**	0.12	-89.59	219.21	-66.76
Fert+Manure(Qntl)	0.24	0.06**	0.14	-76.28	147.95	-41.18
Labour(Man Hr/Ha)	43.12	43.65**	30.27	1.23	-30.65	-29.80
Ani. Pair(Hr/Ha)	20.73	18.11**	11.72	-12.63	-35.28	-43.46
PUNJAB						
Seeds(Kg.)	3.23**	3.49	3.26	7.89	-6.61	0.76
Fert.(Kg-Nutr/Ha)	4.49**	6.17	5.33	37.29	13.57	18.67
Manure(Qntl/Ha)	0.65**	0.18	0.21	-72.76	18.97	-67.59
Fert+Manure(Qntl)	0.70**	0.24	0.26	-65.67	10.59	-62.04
Labour(Man Hr/Ha)	16.34**	15.10	12.56	-7.55	-16.85	-23.13
Ani. Pair(Hr/Ha)	4.23**	1.60	0.60	-62.28	-62.62	-85.90
RAJASTHAN						
Seeds(Kg.)	N.A.	6.13**	5.19	-	-15.32	-
Fert.(Kg-Nutr/Ha)	N.A.	1.90**	1.88	-	-1.32	-
Manure(Qntl/Ha)	N.A.	0.30**	0.12	-	-61.05	-
Fert+Manure(Qntl)	N.A.	0.32**	0.13	-	-57.46	-
Labour(Man Hr/Ha)	N.A.	36.43**	23.43	-	-35.70	-
Ani. Pair(Hr/Ha)	N.A.	8.98**	4.25	-	-52.65	-
UTTAR PRADESH						
Seeds(Kg.)	5.34	5.66	4.98**	6.16	-12.16	-6.75
Fert.(Kg-Nutr/Ha)	2.42	3.53	4.17**	46.15	18.05	72.52
Manure(Qntl/Ha)	1.10	0.53	0.33**	-52.06	-36.80	-69.70
Fert+Manure(Qntl)	1.12	0.56	0.37**	-49.94	-33.34	-66.63
Labour(Man Hr/Ha)	35.93	28.69	22.59**	-20.15	-21.26	-37.13
Ani. Pair(Hr/Ha)	12.33	9.12	4.53**	-26.03	-50.34	-63.27

* : Average based on one year data

** : Average based on two year data

earlier finding (Table 17) that the share of machine labour in the operational cost is seen to have increased over the periods indicating capital labour substitution. It can, therefore, be inferred that the input items, viz., seed, human labour, animal labour and in most cases manure increased less than proportionately to increase in output of wheat between the sub-periods in all the regions. In the case of fertilizer, however, increased use of it is not seen to be accompanied by either proportionate or more than proportionate increase in wheat output except between the sub-periods early seventies and mid-late seventies.

In the case of gram the five items of cost, i.e., human labour, animal labour, seed, fertilizer-manure and irrigation, are seen to account for between 80 and 95 per cent of the operational cost in different sub-periods in Haryana, Madhya Pradesh, Rajasthan and Uttar Pradesh for which detailed cost estimates are available. Share of each item in operational as well as total cost is presented in Table 28. It is seen that bulk of the cost is accounted for by human labour and animal labour, around one-third by human labour and between one-fourth and one-third by animal labour. Seed is seen to account for around one-fifth to one-fourth of operational cost in different states in each of the sub-periods. There does not seem to be any significant change in the share of human and animal labour cost between mid-late seventies and mid-late eighties in different States. Share of cost on account of seeds, however, show some increase between the two sub-periods in all

Table 28: Share of Main Cost Items in Operational Cost in respect of GRA Statewise in Different Sub-Periods

	Triennium Averages					
	Sub-periods					
	% Of Operational Cost			% Of Total Cost		
	1	2	3	1	2	3
HARYANA						
Human Labour Cost	-	31.19	35.26	-	18.89	18.15
Animal Labour Cost	-	27.79	28.68	-	16.83	14.77
Seed	-	14.44	20.42	-	8.75	10.51
Ferti & Manure Cost	-	0.28	0.49	-	0.17	0.25
Irrigation Charges	-	4.52	5.52	-	2.74	2.84
MADHYA PRADESH						
Human Labour Cost	31.75	32.76	29.78	17.74	17.09	16.48
Animal Labour Cost	34.11	27.16	22.51	19.06	14.17	12.46
Seed	25.88	30.54	30.00	14.46	15.94	16.60
Ferti & Manure Cost	4.06	2.20	5.79	2.27	1.15	3.20
Irrigation Charges	1.13	2.56	4.01	0.63	1.33	2.22
RAJASTHAN						
Human Labour Cost	-	40.11	34.62	-	26.48	18.38
Animal Labour Cost	-	23.04	22.12	-	15.21	11.74
Seed	-	22.46	28.26	-	14.83	15.00
Ferti & Manure Cost	-	1.34	1.79	-	0.88	0.95
Irrigation Charges	-	1.12	3.57	-	0.74	1.89
UTTAR PRADESH						
Human Labour Cost	-	34.01	36.82	-	19.78	21.81
Animal Labour Cost	-	34.03	31.66	-	19.79	18.75
Seed	-	19.22	23.42	-	11.18	13.87
Ferti & Manure Cost	-	2.37	1.19	-	1.38	0.71
Irrigation Charges	-	3.66	2.13	-	2.13	1.26

the States. However, human labour, animal labour and seed used per hectare are not seen to have changed in any significant way between ^{seventies and} eighties (Table 29). It may, therefore, be stated that the observed increases in the share of operational cost specially between mid-late seventies and mid-late eighties may have been on account of increased cost on human labour, animal labour and seed inputs brought about mainly by increases in the average value (price) of these factor inputs rather than by their increased use per hectare.

Estimates of main inputs used, presented in Table 20, show that the use of human labour, animal labour, seeds and fertilizer-manure in respective States either decreased or remained at the same level between different sub-periods. Higher yield level in Uttar Pradesh seems to be related to comparatively higher seed, human labour and animal labour used per hectare resulting into marginal increase in operational cost and Cost A2. In other three States operational cost increases between sub-periods, which appear to be substantial, may have been brought about largely by rising prices of the inputs of human labour, animal labour and seeds rather than increased per hectare use of these inputs.

A deeper probe into the matter through the analysis of input-output relationship in gram in physical term is carried out. The results are presented in Table 30. No substantive change in any input per unit of output of gram is noted between

Table 29 : Main Input Quantities used Per Hectare Of GRAM Statewise
in Different Sub-Periods

	Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
HARYANA						
Seeds (Kg.)	N.A.	47.39**	46.13	-	-2.68	-
Fert. (Kg-Nutr/Ha)	N.A.	0.59**	1.07	-	82.34	-
Manure (Qntl/Ha)	N.A.	N.A.	N.A.	-	-	-
Labour (Man Hr/Ha)	N.A.	213.24**	223.77	-	4.94	-
Ani. Pair (Hr/Ha)	N.A.	62.99**	66.78	-	6.02	-
MADHYA PRADESH						
Seeds (Kg.)	81.24**	85.20	78.64	4.87	-7.70	-3.20
Fert. (Kg-Nutr/Ha)	2.84**	2.93	11.63	3.17	297.04	309.62
Manure (Qntl/Ha)	1.15**	0.15	0.97	-86.67	530.43	-15.94
Labour (Man Hr/Ha)	373.00**	335.07	308.73	-10.17	-7.86	-17.23
Ani. Pair (Hr/Ha)	160.81**	150.36	116.53	-6.50	-22.50	-27.53
RAJASTHAN						
Seeds (Kg.)	N.A.	65.65	53.67	-	-18.25	-
Fert. (Kg-Nutr/Ha)	N.A.	1.54	2.82	-	83.33	-
Manure (Qntl/Ha)	N.A.	0.26 *	0.13 *	-	-50.00	-
Labour (Man Hr/Ha)	N.A.	279.81	222.02	-	-20.65	-
Ani. Pair (Hr/Ha)	N.A.	94.46	46.33	-	-50.95	-
UTTAR PRADESH						
Seeds (Kg.)	N.A.	88.10	93.66	-	6.31	-
Fert. (Kg-Nutr/Ha)	N.A.	3.10	2.32	-	-25.05	-
Manure (Qntl/Ha)	N.A.	4.09	2.69	-	-34.15	-
Labour (Man Hr/Ha)	N.A.	519.07	518.86	-	-0.04	-
Ani. Pair (Hr/Ha)	N.A.	161.27	175.91	-	9.08	-

* : Average based on one year data

** : Average based on two year data

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Table 30 : Main Input Items Per Quintal Of Output Of GRAM Statewise
in Different Sub-Periods

Input Items	Ratio of Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
HARYANA						
Seeds(Kg.)	N.A.	7.31**	7.07	-	-3.20	-
Fert.(Kg-Nutr/Ha)	N.A.	0.09**	0.16	-	81.36	-
Manure(Qntl/Ha)	N.A.	N.A.	N.A.	-	-	-
Fert+Manure(Qntl)	N.A.	0.00**	0.00	-	81.36	-
Labour(Man Hr/Ha)	N.A.	32.88**	34.32	-	4.38	-
Ani. Pair(Hr/Ha)	N.A.	9.71**	10.24	-	5.45	-
MADHYA PRADESH						
Seeds(Kg.)	11.42**	9.52	11.17	-16.63	17.29	-2.22
Fert.(Kg-Nutr/Ha)	0.40**	0.33	1.65	-17.98	404.52	313.79
Manure(Qntl/Ha)	0.16**	0.02	0.14	-89.40	701.10	-15.09
Fert+Manure(Qntl)	0.17**	0.02	0.15	-87.68	653.52	-7.16
Labour(Man Hr/Ha)	52.42**	37.44	43.83	-28.59	17.08	-16.39
Ani. Pair(Hr/Ha)	22.60**	16.80	16.55	-25.67	-1.52	-26.80
RAJASTHAN						
Seeds(Kg.)	N.A.	9.64	8.74	-	-9.37	-
Fert.(Kg-Nutr/Ha)	N.A.	0.23	0.46	-	103.24	-
Manure(Qntl/Ha)	N.A.	0.04 *	0.02 *	-	-44.57	-
Fert+Manure(Qntl)	N.A.	0.01	0.01	-	-22.27	-
Labour(Man Hr/Ha)	N.A.	41.11	36.16	-	-12.04	-
Ani. Pair(Hr/Ha)	N.A.	13.88	7.55	-	-45.63	-
UTTAR PRADESH						
Seeds(Kg.)	N.A.	8.75	9.19	-	5.06	-
Fert.(Kg-Nutr/Ha)	N.A.	0.31	0.23	-	-25.94	-
Manure(Qntl/Ha)	N.A.	0.41	0.26	-	-34.92	-
Fert+Manure(Qntl)	N.A.	0.41	0.27	-	-34.86	-
Labour(Man Hr/Ha)	N.A.	51.55	50.92	-	-1.22	-
Ani. Pair(Hr/Ha)	N.A.	16.01	17.26	-	7.79	-

* : Average based on one year data

** : Average based on two year data

sub-periods in any of the regions. As noted earlier (Tables 3 and 18) neither the yield nor the main input items are seen to have changed in any significant manner between the sub-periods in any region indicating a situation of stagnancy in the case of gram. Hence, any increase in operational cost between sub-periods might have been on account of increase in prices of the inputs.

Bulk of the operational cost (around 85 to 95 per cent) in the case of cotton in the four States of Gujarat, Karnataka, Maharashtra and Punjab is observed to comprise human labour cost, animal labour cost, seed, fertilizer-manure cost, insecticide cost and cost of irrigation (Table 31).

Human labour is seen to account for the largest chunk of operational cost in all States in all the sub-periods though the proportions in each State do not show any significant change in different sub-periods. Punjab shows highest proportion of human labour cost (around 50 per cent and 30 per cent of operational and total cost respectively). The same in Karnataka and Maharashtra are around 35 per cent and 22 per cent of operational and total cost respectively. Only in Gujarat the proportion is as low as 25 per cent and 18 per cent respectively.

The proportionate cost on animal labour to operational and total cost is seen to have decreased consistently in case of all the four States from mid-seventies to mid-eighties, from varying between 15 and 24 per cent to varying between 8 and 19 per cent of the operational cost.

Table 31: Share of Main Cost Items in Operational Cost in respect of COTI Statewise in Different Sub-Periods

	Triennium Averages					
	Sub-periods					
	% Of Operational Cost			% Of Total Cost		
	1	2	3	1	2	3
GUJARAT						
Human Labour Cost	-	22.74	27.23	-	16.89	20.65
Animal Labour Cost	-	21.37	11.73	-	15.87	8.90
Seed	-	6.59	5.17	-	4.90	3.92
Ferti & Manure Cost	-	12.81	19.49	-	9.51	14.78
Insecticides	-	15.31	18.98	-	11.37	14.39
Irrigation Charges	-	8.93	9.15	-	6.63	6.94
KARNATAKA						
Human Labour Cost	-	36.90	36.28	-	20.60	23.19
Animal Labour Cost	-	23.54	14.71	-	13.14	9.40
Seed	-	5.73	8.87	-	3.20	5.67
Ferti & Manure Cost	-	16.74	21.50	-	9.35	13.74
Insecticides	-	12.91	10.14	-	7.21	6.48
Irrigation Charges	-	1.15	2.93	-	0.64	1.87
MAHARASHTRA						
Human Labour Cost	-	39.95	34.66	-	25.40	24.76
Animal Labour Cost	-	19.59	18.95	-	12.46	13.54
Seed	-	7.06	7.44	-	4.49	5.32
Ferti & Manure Cost	-	25.54	26.83	-	16.24	19.16
Insecticides	-	5.15	6.39	-	3.28	4.57
Irrigation Charges	-	0.16	1.83	-	0.10	1.31
PUNJAB						
Human Labour Cost	51.31	51.41	53.41	29.75	31.59	32.40
Animal Labour Cost	14.95	11.45	8.45	8.67	7.03	5.12
Seed	2.33	2.29	3.27	1.35	1.41	1.99
Ferti & Manure Cost	14.30	10.67	9.86	8.29	6.56	5.98
Insecticides	3.43	5.41	11.18	1.99	3.33	6.78
Irrigation Charges	6.55	5.34	4.94	3.80	3.28	2.99

Share of cost on fertilizer-manure in operational cost is seen to be relatively higher in the case of Maharashtra and except in the case of Maharashtra the same is seen to have increased from mid-seventies to mid-eighties. However, in the case of Punjab share of fertilizer cost is seen to have declined considerably.

Insecticide component of operational cost appears to have been important only in the case of Gujarat and Karnataka where the cost on insecticide is seen to account for between 10 and 20 per cent of operational cost in different sub-periods.

Share of irrigation charges though small compared to the share of other inputs, is seen to be comparatively higher in the case of Gujarat and Punjab and is seen to be at the same level in both the sub-periods.

Share of cost of seeds is seen to vary between 6 and 8 per cent in Gujarat, Karnataka and Maharashtra in different sub-periods and the same is seen to be only around 2 per cent in Punjab.

On the whole we may surmise that human labour, animal labour and fertilizer-manure are the three main items of cost contributing mainly to the increase in operational cost. Though the share of human labour cost showed no considerable change over the periods in different States, the share of animal labour showed declining trend. Fertilizer-manure shares are seen to have increased except in Punjab.

Estimates of different inputs used in physical quantities per hectare depict that fertilizer-manure, human labour and animal labour use per hectare increased substantially in the States of Gujarat, Karnatka and Maharashtra between mid-seventies and mid-eighties and very marginally for fertilizer, human labour and seed in the State of Punjab (Table 32). Gujarat shows much higher labour use per hectare than other States and Maharashtra shows very high animal labour use per hectare than other States. Fertilizer-manure use per hectare is comparable in these States. From the above analysis we may infer that increased use of the factor inputs like human labour, animal labour and fertilizer-manure per hectare coupled with low yield might have accounted largely for increases in operational cost between mid-seventies and mid-eighties specially in Karnataka and Maharashtra. Gujarat shows a relatively smaller increase in operational cost because of substantial yield increase which accompanied physical factor input increase between mid-seventies and mid-eighties. In the case of Punjab increased human labour use per hectare in mid-late seventies over early seventies is seen to be accompanied by fall in yield which may have largely contributed to increase in operational cost in mid-late seventies. However, the period mid-late eighties shows a very marginal increase in operational cost over mid-late seventies in Punjab mainly on account of substantial yield increase even though accompanied by increases in fertilizer-manure and seed used per hectare.

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Table 32 : Main Input Quantities used Per Hectare Of COTTON Statewise
in Different Sub-Periods

	Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
GUJARAT						
Seeds (Kg.)	N.A.	9.84	9.99	-	1.56	-
Fert. (Kg-Nutr/Ha)	N.A.	22.99	80.07	-	248.35	-
Manure (Qntl/Ha)	N.A.	13.90	29.44	-	111.77	-
Labour (Man Hr/Ha)	N.A.	577.15	1033.36	-	79.04	-
Ani. Pair (Hr/Ha)	N.A.	70.48	91.33	-	29.59	-
KARNATAKA						
Seeds (Kg.)	N.A.	8.76**	6.94**	-	-20.82	-
Fert. (Kg-Nutr/Ha)	N.A.	20.55**	48.72**	-	137.14	-
Manure (Qntl/Ha)	N.A.	5.14**	36.93**	-	619.18	-
Labour (Man Hr/Ha)	N.A.	437.01**	651.64**	-	49.11	-
Ani. Pair (Hr/Ha)	N.A.	87.26**	91.38**	-	4.72	-
MAHARASHTRA						
Seeds (Kg.)	N.A.	10.75	7.77	-	-27.71	-
Fert. (Kg-Nutr/Ha)	N.A.	21.57	45.74	-	112.09	-
Manure (Qntl/Ha)	N.A.	18.28	23.04	-	26.02	-
Labour (Man Hr/Ha)	N.A.	639.13	734.47	-	14.92	-
Ani. Pair (Hr/Ha)	N.A.	120.41	142.14	-	18.04	-
PUNJAB						
Seeds (Kg.)	13.35	13.97**	16.67	4.64	19.33	24.87
Fert. (Kg-Nutr/Ha)	46.95	40.54**	57.46	-13.64	41.73	22.40
Manure (Qntl/Ha)	20.71	17.31**	8.02	-16.42	-53.69	-61.29
Labour (Man Hr/Ha)	741.58	842.66**	876.49	13.63	4.01	18.19
Ani. Pair (Hr/Ha)	82.52	48.23**	50.99	-41.56	5.72	-38.22

* : Average based on one year data
** : Average based on two year data

Results of input-output analysis in physical term, presented in Table 33 show decline in all the input item per unit of output of cotton in Punjab between early seventies and mid-late eighties and between mid-late eighties and mid-late eighties. As noted earlier in Table 32, marginal decrease or only marginal increase in various input items along with marginal increase in yield between the sub-periods might have brought about declining ratio of input to output of cotton in the case of Punjab. In the case of Gujarat and Karnataka human labour and animal labour inputs per unit of output of cotton are seen to have decreased substantially between mid-late seventies and mid-late eighties. All other input items except manure per unit of output in the case of Karnataka are seen to have changed only marginally. Increase in yield per hectare in these two states, specially in Karnataka, (Table 4) might have more than compensated for increase in physical input per hectare (Table 22) between the sub-periods resulting into declining input-output ratio. Maharashtra is the only State where ratios of input to output are seen to have increased between mid-late seventies and mid-late eighties. This is mainly because of stagnant yield (Table 4) and increasing use of input per hectare that are being seen over the period.

In the case of sugarcane cost on human labour, animal labour, seed, fertilizer and manure and irrigation charges together is seen to account for around 95 per cent of the operational cost in different periods in different States

Table 33 : Main Input Items Per Quintal Of Output Of COTTON Statewise in Different Sub-Periods

Input Items	Ratio of Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
GUJARAT						
Seeds (Kg.)	N.A.	2.36	0.99	-	-57.97	-
Fert. (Kg-Nutr/Ha)	N.A.	5.51	7.94	-	44.18	-
Manure (Qntl/Ha)	N.A.	3.33	2.92	-	-12.35	-
Fert+Manure (Qntl)	N.A.	3.39	3.00	-	-11.43	-
Labour (Man Hr/Ha)	N.A.	138.30	102.48	-	-25.90	-
Ani. Pair (Hr/Ha)	N.A.	16.89	9.06	-	-46.37	-
KARNATAKA						
Seeds (Kg.)	N.A.	2.64**	1.10**	-	-58.44	-
Fert. (Kg-Nutr/Ha)	N.A.	6.20**	7.71**	-	24.48	-
Manure (Qntl/Ha)	N.A.	1.55**	5.85**	-	277.53	-
Fert+Manure (Qntl)	N.A.	1.61**	5.93**	-	267.79	-
Labour (Man Hr/Ha)	N.A.	131.83**	103.19**	-	-21.72	-
Ani. Pair (Hr/Ha)	N.A.	26.32**	14.47**	-	-45.03	-
MAHARASHTRA						
Seeds (Kg.)	N.A.	2.81	1.91	-	-31.86	-
Fert. (Kg-Nutr/Ha)	N.A.	5.63	11.25	-	99.92	-
Manure (Qntl/Ha)	N.A.	4.77	5.66	-	18.79	-
Fert+Manure (Qntl)	N.A.	4.82	5.78	-	19.74	-
Labour (Man Hr/Ha)	N.A.	166.73	180.61	-	8.32	-
Ani. Pair (Hr/Ha)	N.A.	31.41	34.95	-	11.27	-
PUNJAB						
Seeds (Kg.)	1.41	1.67**	1.28	19.13	-23.40	-8.75
Fert. (Kg-Nutr/Ha)	4.94	4.86**	4.42	-1.68	-9.02	-10.55
Manure (Qntl/Ha)	2.18	2.07**	0.62	-4.85	-70.27	-71.71
Fert+Manure (Qntl)	2.23	2.12**	0.66	-4.78	-68.87	-70.36
Labour (Man Hr/Ha)	78.06	100.98**	67.42	29.36	-33.23	-13.63
Ani. Pair (Hr/Ha)	8.69	5.78**	3.92	-33.47	-32.14	-54.85

* : Average based on one year data

** : Average based on two year data

(Table 34). Cost on account of human labour is seen to be around 40 per cent of operational cost and around 25 per cent of the total cost in different States, and the same shows no significant change between two sub-periods except in Maharashtra, where the share increased from around 30 per cent to 40 per cent. Except in Uttar Pradesh animal labour cost is seen to account for a very small proportion of the operational and total cost and even in Uttar Pradesh the same is seen to have declined from mid-late seventies to mid-late eighties. Fertilizer and manure cost is seen to account for around 20 to 30 per cent of the operational cost in all the States except Uttar Pradesh (where it is much lower) in mid-late seventies, but, the same is seen to have declined in all States except in Uttar Pradesh in mid-late eighties. Irrigation charges as percentage of operational and total cost are seen to be comparatively higher in Maharashtra, though show a decline in every State except Uttar Pradesh between mid-late seventies and mid-late eighties. Share of cost on account of seeds is seen to have increased substantially only in the case of Andhra Pradesh, in the case of all other States the share does not show any significant change between the two sub-periods.

From the above analysis we may infer that substantial cost increases between mid-late seventies and mid-late eighties in Andhra Pradesh, Karnataka and specially Maharashtra might have been brought about by increased cost on human labour, seeds,

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Table 34 : Share of Main Cost Items in Operational Cost in respect of SUGAR
Statewise in Different Sub-Periods

	Triennium Averages					
	Sub-periods					
	% Of Operational Cost			% Of Total Cost		
	1	2	3	1	2	3
ANDHRA PRADESH						
Human Labour Cost	-	39.08	44.92	-	22.85	25.22
Animal Labour Cost	-	4.11	3.38	-	2.40	1.90
Seed	-	11.44	18.63	-	6.69	10.46
Ferti & Manure Cost	-	24.52	16.77	-	14.33	9.41
Irrigation Charges	-	14.18	8.27	-	8.29	4.65
KARNATAKA						
Human Labour Cost	-	39.51	38.09	-	21.91	19.29
Animal Labour Cost	-	5.93	5.74	-	3.29	2.91
Seed	-	6.26	8.48	-	3.47	4.30
Ferti & Manure Cost	-	33.20	37.23	-	18.41	18.85
Irrigation Charges	-	9.74	4.83	-	5.40	2.44
MAHARASHTRA						
Human Labour Cost	-	30.61	39.74	-	21.11	28.22
Animal Labour Cost	-	6.17	5.84	-	4.26	4.14
Seed	-	10.10	10.23	-	6.97	7.26
Ferti & Manure Cost	-	23.29	20.10	-	16.06	14.27
Irrigation Charges	-	20.84	17.68	-	14.37	12.55
UTTAR PRADESH						
Human Labour Cost	-	38.52	41.01	-	21.20	24.70
Animal Labour Cost	-	17.59	8.23	-	9.68	4.96
Seed	-	15.61	14.69	-	8.59	8.84
Ferti & Manure Cost	-	11.63	15.16	-	6.40	9.13
Irrigation Charges	-	10.61	13.61	-	5.84	8.19

fertilizer, manure and irrigation. In the State of Karnataka the cost increases are seen to be smaller because of high level of yield and also increase in the same over the sub-periods.

Estimates of different inputs used in physical quantities per hectare in the case of sugarcane are presented in Table 35. It is noted that the use of seeds per hectare increased significantly in Karnataka followed by Andhra Pradesh and Maharashtra between mid-late seventies and mid-late eighties. Uttar Pradesh does not show any change in this respect. Similarly, fertilizer use is seen to have increased in Karnataka and Maharashtra and Uttar Pradesh while the use of manure is seen to have declined in all States between the two sub-periods. Human and animal labour use is also seen to have declined in all the States between the two sub-periods. Use of seeds, fertilizer and manure is seen to be higher in Karnataka compared to other States which may be accounting for relatively high yield in this State, specially in mid-late eighties. Human and animal labour use is seen to be relatively higher in Maharashtra.

From the above analysis we may infer that increases in operational cost between mid-late seventies and mid-late eighties might have been brought about largely by increased use of seeds and fertilizer per hectare and partly by increasing prices of these factor inputs as well as of human and animal labour inputs with relatively smaller increases in yield in Andhra Pradesh and Karnataka and stagnant yield in Maharashtra and relatively very

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Table 35 : Main Input Quantities used Per Hectare Of SUGARCANE Statewise in Different Sub-Periods

	Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
ANDHRA PRADESH						
Seeds (Kg.)	N.A.	39.72	56.12	-	41.28	-
Fert. (Kg-Nutr/Ha)	N.A.	256.34	237.60	-	-7.31	-
Manure (Qntl/Ha)	N.A.	40.15	25.75	-	-35.86	-
Labour (Man Hr/Ha)	N.A.	3242.42	1951.38	-	-39.82	-
Ani. Pair (Hr/Ha)	N.A.	125.11	77.67	-	-37.92	-
KARNATAKA						
Seeds (Kg.)	N.A.	19.41	42.74	-	120.18	-
Fert. (Kg-Nutr/Ha)	N.A.	249.47	330.52	-	32.49	-
Manure (Qntl/Ha)	N.A.	81.41	78.55	-	-3.52	-
Labour (Man Hr/Ha)	N.A.	1824.82	1399.50	-	-23.31	-
Ani. Pair (Hr/Ha)	N.A.	124.06	99.54	-	-19.76	-
MAHARASHTRA						
Seeds (Kg.)	N.A.	29.20	33.53**	-	14.83	-
Fert. (Kg-Nutr/Ha)	N.A.	236.09	312.01**	-	32.16	-
Manure (Qntl/Ha)	N.A.	62.90	37.34**	-	-40.64	-
Labour (Man Hr/Ha)	N.A.	2864.79	2252.38**	-	-21.38	-
Ani. Pair (Hr/Ha)	N.A.	226.24	139.99**	-	-38.12	-
UTTAR PRADESH						
Seeds (Kg.)	N.A.	21.36	21.57	-	0.98	-
Fert. (Kg-Nutr/Ha)	N.A.	36.94	88.53	-	139.67	-
Manure (Qntl/Ha)	N.A.	43.67	19.30	-	-55.80	-
Labour (Man Hr/Ha)	N.A.	1201.55	1051.19	-	-12.51	-
Ani. Pair (Hr/Ha)	N.A.	189.51	65.94	-	-65.20	-

* : Average based on one year data

** : Average based on two year data

low level of, though marginally increasing, yield in Uttar Pradesh (Table 5).

Further probe in this regard in terms of input-output ratios shows decline in the same in respect of all the major input items except seed and fertilizer between mid-late seventies and mid-late eighties in all the four regions (Table 36). As noted earlier, hectare use of manure, human labour and animal labour is seen to have declined and per hectare use of seed and fertilizer is seen to have increased between mid-late seventies and mid-late eighties (Table 35) accompanied by some increase in yield (Table 5). This explains the reason for declining ratio of manure, human labour and animal labour to output over period. Further, more than proportionate increase in seed and fertilizer per hectare to yield seems to have resulted into increasing seed and fertilizer ratios to output of sugarcane over the periods in different regions.

Five items of cost, viz., human labour, animal labour, seeds, fertilizer and manure and irrigation are seen to account for 90 to 95 per cent of the operational cost in the case of groundnut (Table 37). The share of cost on seeds in the operational cost and total cost is seen to be highest, followed by human labour and animal labour. Cost on seeds is seen to account for little over one-third of operational cost in all cases except in mid-late eighties in Gujarat, where the same is seen to have reduced to little above one-fourth. Estimates of seed used per hectare

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Table 36 : Main Input Items Per Quintal Of Output Of SUGARCANE Statewise in Different Sub-Periods

Input Items	Ratio of Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
ANDHRA PRADESH						
Seeds(Kg.)	N.A.	0.06	0.07	-	25.44	-
Fert.(Kg-Nutr/Ha)	N.A.	0.38	0.31	-	-17.70	-
Manure(Qntl/Ha)	N.A.	0.06	0.03	-	-43.05	-
Fert+Manure(Qntl)	N.A.	0.06	0.04	-	-41.53	-
Labour(Man Hr/Ha)	N.A.	4.76	2.54	-	-46.56	-
Ani. Pair(Hr/Ha)	N.A.	0.18	0.10	-	-44.88	-
KARNATAKA						
Seeds(Kg.)	N.A.	0.03	0.05	-	99.63	-
Fert.(Kg-Nutr/Ha)	N.A.	0.32	0.39	-	20.13	-
Manure(Qntl/Ha)	N.A.	0.10	0.09	-	-12.52	-
Fert+Manure(Qntl)	N.A.	0.11	0.10	-	-11.55	-
Labour(Man Hr/Ha)	N.A.	2.35	1.63	-	-30.46	-
Ani. Pair(Hr/Ha)	N.A.	0.16	0.12	-	-27.25	-
MAHARASHTRA						
Seeds(Kg.)	N.A.	0.04	0.04**	-	13.33	-
Fert.(Kg-Nutr/Ha)	N.A.	0.31	0.40**	-	30.44	-
Manure(Qntl/Ha)	N.A.	0.08	0.05**	-	-41.41	-
Fert+Manure(Qntl)	N.A.	0.08	0.05**	-	-38.81	-
Labour(Man Hr/Ha)	N.A.	3.72	2.89**	-	-22.40	-
Ani. Pair(Hr/Ha)	N.A.	0.29	0.18**	-	-38.93	-
UTTAR PRADESH						
Seeds(Kg.)	N.A.	0.06	0.05	-	-8.69	-
Fert.(Kg-Nutr/Ha)	N.A.	0.10	0.22	-	116.72	-
Manure(Qntl/Ha)	N.A.	0.12	0.05	-	-60.03	-
Fert+Manure(Qntl)	N.A.	0.12	0.05	-	-58.55	-
Labour(Man Hr/Ha)	N.A.	3.36	2.66	-	-20.89	-
Ani. Pair(Hr/Ha)	N.A.	0.53	0.17	-	-68.54	-

* : Average based on one year data

** : Average based on two year data

Table 37 : Share of Main Cost Items in Operational Cost in respect of GROUP Statewise in Different Sub-Periods

	Triennium Averages					
	Sub-periods					
	% Of Operational Cost			% Of Total Cost		
	1	2	3	1	2	3
GUJARAT						
Human Labour Cost	-	24.02	26.61	-	18.04	19.89
Animal Labour Cost	-	24.96	15.82	-	18.74	11.82
Seed	-	33.83	26.34	-	25.40	19.69
Ferti & Manure Cost	-	12.31	17.58	-	9.25	13.14
Irrigation Charges	-	2.11	4.70	-	1.58	3.51
KARNATAKA						
Human Labour Cost	-	29.70	28.91	-	21.45	18.66
Animal Labour Cost	-	20.60	15.43	-	14.88	9.96
Seed	-	35.80	38.59	-	25.85	24.90
Ferti & Manure Cost	-	10.49	11.23	-	7.57	7.25
Irrigation Charges	-	0.02	1.11	-	0.02	0.72
TAMIL NADU						
Human Labour Cost	-	34.77	31.37	-	23.29	19.62
Animal Labour Cost	-	17.29	10.74	-	11.58	6.72
Seed	-	34.05	36.90	-	22.80	23.09
Ferti & Manure Cost	-	4.67	6.03	-	3.13	3.77
Irrigation Charges	-	6.13	11.19	-	4.11	7.00

Table 38 : Main Input Quantities used Per Hectare Of GROUNDNUT Statewise in Different Sub-Periods

		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
GUJARAT							
Seeds (Kg.)	N.A.	80.43	96.35	-	19.79	-	
Fert. (Kg-Nutr/Ha)	N.A.	16.13	50.33	-	211.96	-	
Manure (Qntl/Ha)	N.A.	36.02	36.26	-	0.67	-	
Labour (Man Hr/Ha)	N.A.	382.67	535.43	-	39.92	-	
Ani. Pair (Hr/Ha)	N.A.	90.94	80.21	-	-11.80	-	
KARNATAKA							
Seeds (Kg.)	N.A.	88.03	84.41**	-	-4.11	-	
Fert. (Kg-Nutr/Ha)	N.A.	8.60	20.82**	-	142.19	-	
Manure (Qntl/Ha)	N.A.	33.59	21.04**	-	-37.36	-	
Labour (Man Hr/Ha)	N.A.	612.73	521.06**	-	-14.96	-	
Ani. Pair (Hr/Ha)	N.A.	128.38	98.44**	-	-23.33	-	
TAMIL NADU							
Seeds (Kg.)	N.A.	115.98	119.46	-	3.00	-	
Fert. (Kg-Nutr/Ha)	N.A.	4.40	20.03	-	354.88	-	
Manure (Qntl/Ha)	N.A.	27.77	14.41	-	-48.12	-	
Labour (Man Hr/Ha)	N.A.	852.90	847.01	-	-0.69	-	
Ani. Pair (Hr/Ha)	N.A.	145.72	125.98	-	-13.54	-	

* : Average based on one year data

show that the same is highest in Tamil Nadu and that seed used remained more or less at the same level in respective States in both the periods except in Gujarat where it showed some increases in mid-late eighties (Table 38). Cost on account of human labour which is seen to vary between one-third and one-fourth of operational cost in different States is comparatively higher in Tamil Nadu compared to other States though its share is seen to have remained at the same level in respective States in different sub-periods. Human labour use per hectare is seen to have remained at the same level in Tamil Nadu, while the same increased substantially in Gujarat and decreased in Karnataka in mid-late eighties. In the case of animal labour both per hectare use and its share in cost are seen to have decreased in all the States between two sub-periods. Fertilizer use per hectare is seen to have increased significantly in mid-late eighties with Gujarat showing highest fertilizer and manure input per hectare in mid-late eighties. Share of cost on irrigation is seen to be negligible in Gujarat and Karnataka in all the sub-periods, only in Tamil Nadu the same is comparatively large. It is borne out of this analysis that three input items, namely, seed, human labour and animal labour, largely account for the increase in operational cost between mid-late seventies and mid-late eighties.

It may be noted that even though the use of fertilizer-manure per hectare is highest in Gujarat in mid-late eighties

yield per hectare is not as high as in Tamil Nadu and is at comparative level with that in Karnataka. In Tamil Nadu comparatively high yield, even though stagnant between the sub-periods, may have been achieved on account of comparatively higher seed per hectare and irrigation water use. Further that, increases in operational cost between mid-late seventies and mid-late eighties, firstly, may have been on account of increased fertilizer use per hectare in all the three States, specially Gujarat, secondly, on account of increased human labour use per hectare in Gujarat, and thirdly, on account of implied rise in prices of important inputs, such as seed, human labour, animal labour, manure-fertilizer, etc.

The observations made in the earlier section is corroborated by the results of the analysis of input-output relationship presented in Table 39. Except in the case of fertilizer all other input-output ratios are seen to have declined between mid-late seventies and mid-late eighties in all the three regions. Increase in yield as noted in the case of Gujarat and Karnataka and stagnant but high yield as noted in the case of Tamil Nadu between mid-late seventies and mid-late eighties (Table 6) accompanied by either decrease or marginal increase in seed, manure, human labour and animal labour per hectare and substantial increase in fertilizer use per hectare between sub-periods as noted in Table 26 earlier, explain the reason for declining input-output ratio in respect of seed, manure, human and animal labour and increasing ratio in respect of fertilizer.

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Table 39 : Main Input Items Per Quintal Of Output Of GROUNDNUT Statewise in Different Sub-Periods

Input Items	Ratio of Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
GUJARAT						
Seeds (Kg.)	N.A.	18.98	13.20	-	-30.44	-
Fert. (Kg-Nutr/Ha)	N.A.	3.81	6.90	-	81.14	-
Manure (Qntl/Ha)	N.A.	8.50	4.97	-	-41.55	-
Fert+Manure (Qntl)	N.A.	8.54	5.04	-	41.00	-
Labour (Man Hr/Ha)	N.A.	90.32	73.38	-	-18.76	-
Ani. Pair (Hr/Ha)	N.A.	21.46	10.99	-	-48.79	-
KARNATAKA						
Seeds (Kg.)	N.A.	17.03	11.73**	-	-31.10	-
Fert. (Kg-Nutr/Ha)	N.A.	1.66	2.89**	-	74.02	-
Manure (Qntl/Ha)	N.A.	6.50	2.92**	-	-54.99	-
Fert+Manure (Qntl)	N.A.	6.51	2.95**	-	-54.66	-
Labour (Man Hr/Ha)	N.A.	118.52	72.42**	-	-38.90	-
Ani. Pair (Hr/Ha)	N.A.	24.83	13.68**	-	-44.91	-
TAMIL NADU						
Seeds (Kg.)	N.A.	9.79	10.50	-	7.22	-
Fert. (Kg-Nutr/Ha)	N.A.	0.37	1.76	-	373.54	-
Manure (Qntl/Ha)	N.A.	2.34	1.27	-	-45.99	-
Fert+Manure (Qntl)	N.A.	2.35	1.28	-	-45.33	-
Labour (Man Hr/Ha)	N.A.	72.02	74.45	-	3.38	-
Ani. Pair (Hr/Ha)	N.A.	12.30	11.07	-	10.00	-

* : Average based on one year data

** : Average based on two year data

As regards rapeseed mustard, human labour, animal labour, seed, fertilizer-manure and irrigation are seen to account for around 90 per cent of the operational cost (Table 40). Human labour cost is seen to constitute the bulk of the operational (one-third to more than one-half) as well as total costs (one-fifth to more than one-third), specially in Assam, where the crop is grown entirely rainfed. The share is seen to remain at the same level in respective States in late seventies and mid-late eighties. Human labour hour use per hectare also does not seem to have changed sufficiently between the two sub-periods in the respective States and between the States Assam shows the highest labour use per hectare (Table 41). Animal labour cost shows a substantial decrease in its share in Haryana in mid-late eighties accompanied by corresponding decrease in its use per hectare. Animal labour use per hectare is seen to be very large in Assam compared to other two States. In other two States the share of animal labour cost is seen to have remained more or less unchanged at around 25 per cent of operational cost. Further, animal labour hour used is seen to have remained at the same level in respective States between the sub-periods. While share of irrigation charges is seen to have decreased in Haryana and Rajasthan in mid-late eighties, the share of fertilizer-manure, though small is seen to have increased in mid-late eighties in all the three States, specially in Haryana. Use of seed per hectare is seen to be much larger in Assam compared to the other two States and the same has

Table 40 : Share of Main Cost Items in Operational Cost in respect of RAPESEED MUSTARD Statewise in Different Sub-Periods

	Triennium Averages					
	Sub-periods					
	% Of Operational Cost			% Of Total Cost		
	1	2	3	1	2	3
ASSAM						
Human Labour Cost	-	56.67	57.96	-	31.21	37.62
Animal Labour Cost	-	25.57	24.81	-	14.08	16.10
Seed	-	10.77	7.33	-	5.93	4.76
Ferti & Manure Cost	-	4.18	8.26	-	2.30	5.36
Irrigation Charges	-	-	-	-	-	-
HARYANA						
Human Labour Cost	-	33.19	31.09	-	17.92	16.38
Animal Labour Cost	-	31.63	18.59	-	17.07	9.80
Seed	-	1.38	2.46	-	0.75	1.30
Ferti & Manure Cost	-	3.76	15.52	-	2.03	8.18
Irrigation Charges	-	16.93	11.44	-	9.14	6.03
RAJASTHAN						
Human Labour Cost	-	44.83	41.05	-	25.05	20.86
Animal Labour Cost	-	23.01	20.80	-	12.86	10.57
Seed	-	3.00	2.74	-	1.68	1.39
Ferti & Manure Cost	-	3.32	6.78	-	1.85	3.45
Irrigation Charges	-	15.08	12.83	-	8.42	6.52

Table 41 :- Main Input Quantities used Per Hectare Of RAPESEED MUSTARD State in Different Sub-Periods

	Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over 3 Over 3 Over		
	1	2	3	1	2	1
ASSAM						
Seeds (Kg.)	N.A.	15.22	15.78	-	3.63	-
Fert. (Kg-Nutr/Ha)	N.A.	N.A.	4.19	-	-	-
Manure (Qntl/Ha)	N.A.	2.87	9.57	-	233.45	-
Labour (Man Hr/Ha)	N.A.	496.00	527.97	-	6.45	-
Ani. Pair (Hr/Ha)	N.A.	208.00	244.55	-	17.57	-
HARYANA						
Seeds (Kg.)	N.A.	3.16 *	3.64	-	15.30	-
Fert. (Kg-Nutr/Ha)	N.A.	7.05 *	46.46	-	559.05	-
Manure (Qntl/Ha)	N.A.	N.A.	0.17 *	-	-	-
Labour (Man Hr/Ha)	N.A.	315.53 *	275.57	-	-12.66	-
Ani. Pair (Hr/Ha)	N.A.	86.65 *	61.63	-	-28.88	-
RAJASTHAN						
Seeds (Kg.)	N.A.	4.70	4.74	-	0.85	-
Fert. (Kg-Nutr/Ha)	N.A.	6.20	10.29	-	66.00	-
Manure (Qntl/Ha)	N.A.	0.31**	5.33	-	1647.54	-
Labour (Man Hr/Ha)	N.A.	327.16	346.73	-	5.98	-
Ani. Pair (Hr/Ha)	N.A.	59.05	58.87	-	-0.29	-

* : Average based on one year data

** : Average based on two year data

remained at the same level in respective States in late seventies and mid-late eighties. Foregoing account indicates clearly that increase in operational cost between late seventies-early eighties and mid-late eighties in the States of Assam and Haryana are largely on account of human and animal labour.

From the above analysis we can infer that comparable and relatively higher levels of yield in Haryana and Rajasthan in late seventies-early eighties and mid-late eighties may be attributed to relatively higher fertilizer use, specially in Haryana in mid-late eighties. Further that, in Assam yield level decrease in mid-eighties is seen to be accompanied by comparatively higher seed input and higher and marginally increasing human labour inputs. While large increases in operational cost between late seventies-early eighties and mid-late eighties in Assam can be attributed largely to human labour input, animal-labour input and to some extent to seed input accompanied by low and declining yield between the sub-periods, marginal increases in the same in Haryana may be attributed largely to increased use of fertilizer and partly to irrigation input accompanied by relatively high and increasing yield between the sub-periods.

Further examination of main input items per unit of rapeseed mustard output reveals an increase in the ratio in most of the cases between late seventies and late eighties (Table 42). Since the yield is seen to have declined in Assam (Table 7) between two sub-periods accompanied by marginal

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Table 42 : Main Input Items Per Quintal Of Output Of RAPESEED MUSTARD State in Different Sub-Periods

Input Items	Ratio of Triennium Averages			%Increase/Decrease		
	Sub-periods			2 Over	3 Over	3 Over
	1	2	3	1	2	1
ASSAM						
Seeds (Kg.)	N.A.	2.69	3.32	-	23.43	-
Fert. (Kg-Nutr/Ha)	N.A.	N.A.	0.88	-	-	-
Manure (Qntl/Ha)	N.A.	0.51	2.02	-	297.14	-
Fert+Manure (Qntl)	N.A.	0.51	2.02	-	298.88	-
Labour (Man Hr/Ha)	N.A.	87.74	111.23	-	26.78	-
Ani. Pair (Hr/Ha)	N.A.	36.79	51.52	-	40.03	-
HARYANA						
Seeds (Kg.)	N.A.	0.44 *	0.40	-	-8.43	-
Fert. (Kg-Nutr/Ha)	N.A.	0.98 *	5.13	-	423.41	-
Manure (Qntl/Ha)	N.A.	N.A.	0.02 *	-	-	-
Fert+Manure (Qntl)	N.A.	0.01 *	0.00	-	487.24	-
Labour (Man Hr/Ha)	N.A.	43.88 *	30.44	-	-30.64	-
Ani. Pair (Hr/Ha)	N.A.	12.05 *	6.81	-	-43.52	-
RAJASTHAN						
Seeds (Kg.)	N.A.	0.75	0.53	-	-29.92	-
Fert. (Kg-Nutr/Ha)	N.A.	0.99	1.14	-	15.35	-
Manure (Qntl/Ha)	N.A.	0.05**	0.59	-	1114.27	-
Fert+Manure (Qntl)	N.A.	0.04	0.60	-	1322.92	-
Labour (Man Hr/Ha)	N.A.	52.37	38.57	-	-26.36	-
Ani. Pair (Hr/Ha)	N.A.	9.45	6.55	-	-30.72	-

* : Average based on one year data

** : Average based on two year data

increase in all the input items and large increase in manure per hectare (Table 42), input-output ratios with respect to main input items are seen to have increased between two sub-periods in Assam. In the case of Haryana and Rajasthan yield increases observed are seen to have been less than proportionate to increase in fertilizer-manure leading to rising input-output ratio. At the same time marginal increase and/or decrease in seed, human labour and animal labour per hectare between two sub-periods is seen to have resulted into rising input-output ratio for rapeseed mustard with respect to those inputs.

On the whole, based on the above analysis for different crops in different regions we may summarize that human labour and animal labour costs account for the bulk of the operational cost and total cost of production in the case of paddy, wheat, gram, cotton and rapeseed-mustard. While sugarcane shows bulk of the operational and total costs to be accounted for by human labour, fertilizer-manure and irrigation, in the case of groundnut seed cost, followed by cost of human labour and animal labour account for the bulk of the operational cost.

As regards share of fertilizer cost it is seen to be worth considering only in the States which experienced technological change of reasonable degree like Andhra Pradesh, Haryana, Karnataka, Punjab and Tamil Nadu in the case of paddy, the States of Haryana, Punjab and to some extent Uttar Pradesh in the case of wheat, the States of Gujarat, Karnataka, Maharashtra

and Punjab in the case of cotton, States of Andhra Pradesh, Karnataka and Maharashtra in the case of sugarcane and the States of Gujarat and Karnataka in the case of groundnut.

Share of seed cost in operational and total costs is seen to be significant mainly in the case of groundnut in all the States. To a considerable extent the same is seen to account for the operational and total costs in the case of gram also in all the States and to a lesser extent in the case of sugarcane in all the States.

While cost on machine hours constitutes a small share of operational and total costs only in the case of wheat that too only in Punjab and Haryana, cost on insecticide accounts for a considerable share of operational and total costs only in the case of cotton and that too only in Gujarat and Karnataka.

Keeping with the above observations fertilizer use in reasonable quantity is seen to be confined to paddy and wheat in the States having experienced technological change of various degrees, viz., Andhra Pradesh, Haryana, Karnataka, Punjab and Tamil Nadu in the case of paddy, Haryana, Punjab and Uttar Pradesh in the case of wheat and to sugarcane in the case of all the States followed by cotton in all the States. However, the use of fertilizer per hectare for each of the crops considered is seen to be at much lower level than recommended doses in most of the States. Even in the State of Punjab, Haryana, the level of fertilizer use per hectare is not up to the recommended doses.

Components of Fixed Cost

As mentioned earlier, we now turn to examining the share of different items of fixed cost in the case of crops and regions considered for study. The main items of fixed cost which account for the bulk of the fixed cost in the case of all crops are (i) rental value of own land, (ii) rent paid on leased land, (iii) depreciation on implements and buildings, and (iv) interest on fixed capital.

Estimates of the share of main items in the fixed cost in respect of paddy are presented in Table 43. Four items are seen to account for 95 per cent or thereabouts of the fixed cost in different periods. Rental value of own land is seen to be the most important item of fixed cost accounting for around 70 per cent and above of the fixed cost and 25 per cent and above of the total cost in different sub-periods in different States. Further, that there does not seem to be any systematic decrease or increase in the same over different sub-periods in different States. However, the States of Haryana, Punjab, Tamil Nadu and Uttar Pradesh, known for having experienced technological change in Paddy, show relatively smaller share of rental value of own land (below 70 per cent) compared to other States. Interest on fixed capital is the other item of fixed cost which is seen to account for almost the remaining share of fixed cost in different sub-periods in

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Table 43 : Share of Main Cost Items in Fixed Cost in respect of PADDY
Statewise in Different Sub-Periods

	Triennium Averages					
	Sub-periods					
	% Of Fixed Cost			% Of Total Cost		
	1	2	3	1	2	3
ANDHRA PRADESH						
Rental Val Own Land	74.57	70.27	84.14	32.62	25.42	29.05
Rent Paid Leased Land	6.74	2.83	1.11	2.95	1.02	0.38
Dep.on Impl.& Build	5.32	8.42	4.46	2.33	3.05	1.54
Int.on Fixed Capital	9.44	15.24	8.85	4.13	5.51	3.05
ASSAM						
Rental Val Own Land	77.07	78.34	68.83	32.42	27.65	23.35
Rent Paid Leased Land	5.03	4.53	8.15	2.12	1.60	2.76
Dep.on Impl.& Build	6.01	5.12	10.60	2.53	1.81	3.60
Int.on Fixed Capital	9.33	10.25	11.25	3.92	3.62	3.82
BIHAR						
Rental Val Own Land	88.91	78.61	84.60	40.20	32.37	40.81
Rent Paid Leased Land	0.36	0.13	0.54	0.16	0.05	0.26
Dep.on Impl.& Build	2.35	3.53	2.14	1.06	1.45	1.03
Int.on Fixed Capital	7.37	15.83	10.89	3.33	6.52	5.25
HARYANA						
Rental Val Own Land	-	59.81	72.70	-	17.19	22.13
Rent Paid Leased Land	-	3.05	1.70	-	0.88	0.52
Dep.on Impl.& Build	-	5.10	3.27	-	1.46	0.99
Int.on Fixed Capital	-	31.12	22.28	-	8.94	6.78
KARNATAKA						
Rental Val Own Land	-	77.58	81.77	-	33.53	32.31
Rent Paid Leased Land	-	8.12	0.03	-	3.51	0.01
Dep.on Impl.& Build	-	3.91	3.29	-	1.69	1.30
Int.on Fixed Capital	-	9.45	14.31	-	4.08	5.65
MADHYA PRADESH						
Rental Val Own Land	79.92	75.15	75.13	34.67	32.02	30.45
Rent Paid Leased Land	-	-	0.02	-	-	0.01
Dep.on Impl.& Build	6.55	10.11	6.89	2.84	4.31	2.79
Int.on Fixed Capital	12.75	14.43	17.55	5.53	6.15	7.11
PUNJAB						
Rental Val Own Land	-	64.85	66.93	-	23.43	26.34
Rent Paid Leased Land	-	12.73	11.41	-	4.60	4.49
Dep.on Impl.& Build	-	3.75	3.19	-	1.35	1.26
Int.on Fixed Capital	-	18.51	18.32	-	6.69	7.21
TAMIL NADU						
Rental Val Own Land	61.98	69.93	65.56	23.33	24.94	23.43
Rent Paid Leased Land	13.95	9.33	12.96	5.25	3.33	4.63
Dep.on Impl.& Build	6.48	2.32	2.62	2.44	0.83	0.94
Int.on Fixed Capital	14.42	14.71	16.95	5.43	5.24	6.06
UTTAR PRADESH						
Rental Val Own Land	-	67.70	66.31	-	23.22	24.32
Rent Paid Leased Land	-	2.42	2.45	-	0.83	0.90
Dep.on Impl.& Build	-	5.82	6.84	-	2.00	2.51
Int.on Fixed Capital	-	21.04	23.11	-	7.22	8.48
WEST BENGAL						
Rental Val Own Land	82.49	80.75	80.44	33.75	24.46	28.70
Rent Paid Leased Land	3.06	0.81	4.05	1.25	0.25	1.45
Dep.on Impl.& Build	3.28	2.72	2.87	1.34	0.82	1.03
Int.on Fixed Capital	8.45	13.08	11.68	3.46	3.96	4.17

different regions, specially in Haryana, Uttar Pradesh, and Punjab; the share in different States varying between 10 per cent and 20 per cent. Rent paid on leased-in land is seen to be important^{only} in the case of Punjab and Tamil Nadu, accounting for around 12 per cent of the fixed cost.

In the case of wheat, estimated shares of different items of fixed cost for which are presented in Table 44, also shows that the bulk of the fixed cost is contributed by rental value of own land varying between 60 and around 80 per cent of the fixed cost in different States in different sub-periods. Further, the share does not show any systematic increasing or decreasing trend over the sub-periods in different regions. Interest on fixed capital is seen to account for around 15 to 25 per cent of the fixed cost in different States in different sub-periods. Again no particular trend is noticed in this share over different sub-periods in different States.

Estimates of the share of different items of fixed cost for gram are presented in Table 45. Share of rental value of own land is seen to account for between 60 and 75 per cent of the fixed cost in different States in different sub-periods. The other item, interest on fixed capital is seen to account for varying between 20 per cent and 30 per cent in different sub-periods in different States. There does^{not} seem to be any trend over the sub-periods in these two shares in fixed cost in different States.

Table 44: Share of Main Cost Items in Fixed Cost in respect of WHEAT
Statewise in Different Sub-Periods

	Triennium Averages					
	Sub-periods					
	% Of Fixed Cost			% Of Total Cost		
	1	2	3	1	2	3
HARYANA						
Rental Val Own Land	72.85	62.60	68.65	26.45	19.30	23.06
Rent Paid Leased Land	2.51	4.40	0.61	0.91	1.36	0.21
Dep.on Impl.& Build	7.27	7.51	5.16	2.64	2.32	1.73
Int.on Fixed Capital	15.75	24.30	25.45	5.72	7.49	8.55
MADHYA PRADESH						
Rental Val Own Land	68.10	77.20	71.82	25.88	30.26	30.16
Rent Paid Leased Land	0.70	-	0.20	0.27	-	0.08
Dep.on Impl.& Build	11.73	5.90	7.50	4.46	2.31	3.15
Int.on Fixed Capital	17.31	15.47	19.98	6.58	6.07	8.39
PUNJAB						
Rental Val Own Land	73.36	59.49	60.07	30.16	22.93	25.20
Rent Paid Leased Land	8.75	13.83	15.27	3.60	5.33	6.41
Dep.on Impl.& Build	5.70	5.39	4.67	2.34	2.08	1.96
Int.on Fixed Capital	11.32	20.97	19.82	4.66	8.08	8.32
RAJASTHAN						
Rental Val Own Land	-	66.59	55.07	-	20.74	21.21
Rent Paid Leased Land	-	1.97	15.45	-	0.61	5.95
Dep.on Impl.& Build	-	2.13	2.27	-	0.66	0.88
Int.on Fixed Capital	-	28.36	26.68	-	8.83	10.27
UTTAR PRADESH						
Rental Val Own Land	80.34	71.03	78.13	29.79	23.03	23.75
Rent Paid Leased Land	0.63	0.75	1.09	0.23	0.24	0.33
Dep.on Impl.& Build	4.60	5.91	5.25	1.70	1.92	1.60
Int.on Fixed Capital	12.52	19.93	14.78	4.64	6.46	4.49

Table 45 : Share of Main Cost Items in Fixed Cost in respect of GRAM
Statewise in Different Sub-Periods

	Triennium Averages					
	Sub-periods					
	% Of Fixed Cost			% Of Total Cost		
	1	2	3	1	2	3
HARYANA						
Rental Val Own Land	-	73.52	71.86	-	29.00	34.86
Rent Paid Leased Land	-	4.64	4.81	-	1.83	2.33
Dep.on Impl.& Build	-	7.71	5.59	-	3.04	2.71
Int.on Fixed Capital	-	26.61	20.34	-	10.50	9.87
MADHYA PRADESH						
Rental Val Own Land	63.72	68.07	75.87	28.12	32.55	33.88
Rent Paid Leased Land	1.68	-	-	0.74	-	-
Dep.on Impl.& Build	9.57	9.34	6.46	4.22	4.46	2.89
Int.on Fixed Capital	23.77	21.68	16.99	10.49	10.37	7.59
RAJASTHAN						
Rental Val Own Land	-	58.11	53.67	-	19.74	25.18
Rent Paid Leased Land	-	0.83	16.80	-	0.28	7.88
Dep.on Impl.& Build	-	4.77	3.63	-	1.62	1.70
Int.on Fixed Capital	-	34.27	25.12	-	11.64	11.79
UTTAR PRADESH						
Rental Val Own Land	-	69.19	74.20	-	28.95	30.24
Rent Paid Leased Land	-	4.30	3.48	-	1.80	1.42
Dep.on Impl.& Build	-	5.86	5.56	-	2.45	2.27
Int.on Fixed Capital	-	20.49	15.67	-	8.57	6.39

In the case of cotton the share of rental value of own land and share of interest on fixed capital are seen to be around 70 to 80 per cent and 15 to 25 per cent respectively of the fixed cost in different States in different sub-periods. No well-defined trend is observed in these shares over different sub-periods in different States (Table 46).

In the case of sugarcane share of rental value of own land is on the further higher side, is seen to be varying between 80 and 90 per cent of the fixed cost in different sub-periods in different States. Consequently, the share of interest on fixed capital is seen to be ranging between 5 and 15 per cent in different sub-periods in different States (Table 47). No definite trend is noticed in these shares over the sub-periods in different States.

The shares of rental value of owned land and interest on fixed capital are seen to account for between 65 and 75 per cent and 20 and 30 per cent respectively of the total fixed cost in the case of groundnut in different States in different sub-periods. Interest on fixed capital on the other hand is seen to account for between 10 and 25 per cent in different sub-periods in different regions. Further, there does not seem to be any definite trends in these shares over the sub-periods in different States (Table 48).

In the case of rapeseed-mustard the share of rental value of owned land is seen to be varying between 70 and 85 per cent in different sub-periods in Assam and Haryana and the same is

Table 46 : Share of Main Cost Items in Fixed Cost in respect of COTTON
Statewise in Different Sub-Periods

	Triennium Averages					
	Sub-periods					
	% Of Fixed Cost			% Of Total Cost		
	1	2	3	1	2	3
GUJARAT						
Rental Val Own Land	-	71.26	77.18	-	18.33	18.66
Rent Paid Leased Land	-	3.65	0.43	-	0.94	0.10
Dep.on Impl.& Build	-	3.52	2.91	-	0.90	0.70
Int.on Fixed Capital	-	18.80	18.16	-	4.83	4.39
KARNATAKA						
Rental Val Own Land	-	78.55	68.36	-	34.70	24.66
Rent Paid Leased Land	-	-	-	-	-	-
Dep.on Impl.& Build	-	3.43	5.87	-	1.51	2.12
Int.on Fixed Capital	-	16.94	25.43	-	7.48	9.17
MAHARASHTRA						
Rental Val Own Land	-	72.22	59.60	-	26.29	17.03
Rent Paid Leased Land	-	-	1.86	-	-	0.53
Dep.on Impl.& Build	-	7.38	10.01	-	2.69	2.86
Int.on Fixed Capital	-	17.66	26.38	-	6.43	7.54
PUNJAB						
Rental Val Own Land	74.92	68.23	71.12	31.49	26.31	27.98
Rent Paid Leased Land	8.65	6.74	12.61	3.64	2.60	4.96
Dep.on Impl.& Build	4.59	4.24	3.59	1.93	1.63	1.41
Int.on Fixed Capital	11.26	19.13	12.78	4.73	7.38	5.03

Table 47 : Share of Main Cost Items in Fixed Cost in respect of SUGARCANE
Statewise in Different Sub-Periods

	Triennium Averages					
	Sub-periods					
	% Of Fixed Cost			% Of Total Cost		
	1	2	3	1	2	3
ANDHRA PRADESH						
Rental Val Own Land	-	82.84	93.49	-	34.41	40.99
Rent Paid Leased Land	-	1.39	-	-	0.58	-
Dep.on Impl.& Build	-	2.78	0.72	-	1.15	0.32
Int.on Fixed Capital	-	10.48	5.48	-	4.35	2.40
KARNATAKA						
Rental Val Own Land	-	88.77	89.36	-	39.56	44.11
Rent Paid Leased Land	-	-	-	-	-	-
Dep.on Impl.& Build	-	1.11	1.94	-	0.50	0.96
Int.on Fixed Capital	-	9.94	8.51	-	4.43	4.20
MAHARASHTRA						
Rental Val Own Land	-	78.39	78.60	-	26.05	22.80
Rent Paid Leased Land	-	0.72	-	-	0.24	-
Dep.on Impl.& Build	-	1.91	2.78	-	0.64	0.81
Int.on Fixed Capital	-	9.72	15.14	-	3.23	4.39
UTTAR PRADESH						
Rental Val Own Land	-	82.09	79.78	-	36.91	31.73
Rent Paid Leased Land	-	1.89	0.16	-	0.85	0.06
Dep.on Impl.& Build	-	3.22	4.18	-	1.45	1.66
Int.on Fixed Capital	-	11.33	14.59	-	5.09	5.80

Table 48 : Share of Main Cost Items in Fixed Cost in respect of GROUNDNUT Statewise in Different Sub-Periods

	Triennium Averages					
	Sub-periods					
	% Of Fixed Cost			% Of Total Cost		
	1	2	3	1	2	3
GUJARAT						
Rental Val Own Land	-	62.14	69.79	-	15.47	17.63
Rent Paid Leased Land	-	2.66	5.99	-	0.66	1.51
Dep.on Impl.& Build	-	5.30	3.65	-	1.32	0.92
Int.on Fixed Capital	-	27.29	21.45	-	6.80	5.42
KARNATAKA						
Rental Val Own Land	-	67.85	75.25	-	18.78	26.69
Rent Paid Leased Land	-	0.59	0.32	-	0.16	0.11
Dep.on Impl.& Build	-	5.40	5.32	-	1.49	1.89
Int.on Fixed Capital	-	23.92	18.93	-	6.62	6.71
TAMIL NADU						
Rental Val Own Land	-	76.86	67.98	-	25.38	25.45
Rent Paid Leased Land	-	7.49	2.71	-	2.47	1.01
Dep.on Impl.& Build	-	4.04	2.44	-	1.33	0.91
Int.on Fixed Capital	-	10.13	26.21	-	3.35	9.81

Table 49 : Share of Main Cost Items in Fixed Cost in respect of RAPESEED MUSTARD Statewise in Different Sub-Periods

	Triennium Averages					
	Sub-periods					
	% Of Fixed Cost			% Of Total Cost		
	1	2	3	1	2	3
ASSAM						
Rental Val Own Land	-	86.21	70.36	-	38.71	24.69
Rent Paid Leased Land	-	2.06	3.92	-	0.92	1.37
Dep.on Impl.& Build	-	3.09	12.57	-	1.39	4.41
Int.on Fixed Capital	-	7.40	11.90	-	3.32	4.18
HARYANA						
Rental Val Own Land	-	75.80	67.09	-	34.88	31.74
Rent Paid Leased Land	-	-	0.41	-	-	0.20
Dep.on Impl.& Build	-	4.01	4.82	-	1.85	2.28
Int.on Fixed Capital	-	18.37	27.19	-	8.45	12.87
RAJASTHAN						
Rental Val Own Land	-	54.88	55.64	-	24.21	27.36
Rent Paid Leased Land	-	6.75	11.10	-	2.98	5.46
Dep.on Impl.& Build	-	2.83	2.97	-	1.25	1.46
Int.on Fixed Capital	-	34.65	29.69	-	15.29	14.60

seen to be around only 55 per cent in Rajasthan (Table 49). Consequently, the share of interest on fixed capital is seen to be around 30 to 35 per cent in Rajasthan as against 10 to 25 per cent in the case of other two States.

The above account shows that bulk of the fixed cost is accounted for by the rental value of owned land in the case of all the different crops grown in different States. Rental value of owned land happens to be an imputed cost and such an imputation does not show any definite trend presumably because the land valuation does not show any definite trend. Interest on fixed capital is the other item which accounts for some share, albeit small share, of fixed cost in the case of different crops in different sub-periods in different States. Other two items, viz., rent on leased-in land and depreciation on implements and buildings, account for negligible share of fixed cost.

Analyses carried out above show the following :

1) In the case of paddy and wheat, the two important cereals grown in different parts of the country, the ratio of operational cost to fixed cost is found to be on an average 3:1, i.e., two-third is to one-third. More technologically advanced in production a State is relatively higher is the share of operational cost. Cost on account of human-labour is seen to account for the largest share of operational cost followed by the cost of animal labour in all the States in all sub-periods. In the case of the states having experienced

technological change, the other important component of operational cost is seen to be cost on fertilizer-manure. However, fertilizer, a yield raising input, contrary to popular belief, accounts for only 15 to 20 per cent of the total cost in the case of paddy and wheat in the States having experienced technological change and 10 per cent and less in other States. Rental value of owned land, which is an imputed cost, is rather high varying between 25 per cent and 40 per cent of total cost in the case of paddy in different States and between 20 and 30 per cent in the case of wheat in different States.

2) In the case of gram, the only pulse crop considered in our study, the share of operational cost is found to be 60 per cent of the total cost. Human labour cost is seen to account for the bulk of the operational cost in all the States and in all the sub-periods. Cost on animal labour and on seed are seen to be the other important items of operational cost. Rental value of owned land varies between one-fifth and one-third of total cost. Till mid-late eighties no technological break-through in the production of gram seems to have occurred.

3) In the case of cotton, the States of Punjab, Karnataka and Haryana show operational and fixed costs in the proportion of 60:40 but, the same is in the proportion of 75:25 in the State of Gujarat. Cost on account of human labour constitutes the bulk of the operational cost, specially in Punjab. Cost on animal labour and fertilizer-manure are seen to be ^{the} other

important items of operational cost. Cost on insecticide in the total operational cost is also seen to be considerable. Fertilizer accounts for 10 to 15 per cent of the total cost in different States. Rental value of own land varies between 25 and 30 per cent of total cost in different States. The States of Punjab and Gujarat are seen to have gained in yield owing to improved technology of production.

4) In the case of sugarcane, operational cost and fixed cost to the total cost are seen to be in the proportion of around 55:45. Largest share of operational cost is seen to be on account of human labour in all the States and in all the sub-periods. Cost on fertilizer is also seen to account for considerable share of the operational cost in all the States followed by cost on seed and irrigation charges. Rental value of owned land comprises 25 to 45 per cent of the total cost in different States in different sub-periods.

5) In the case of groundnut, an important oilseed crop grown in India, share of operational cost varies between 65 and 75 per cent in different States. Seed cost at around 35 percent of operational cost and 20 to 25 per cent of the total cost is on the higher side and is seen to account for the largest share of operational cost in all the three States in both the sub-periods. Fertilizer cost comprising around 4 to 10 per cent of the total cost is again in the lower side. Rental value of owned land at around 15 to 25 per cent is comparatively

on the lower side.

6) In the case of rapeseed-mustard operational cost and fixed cost are in the proportion of 55:45, showing a relatively higher share of fixed cost in different States. Cost on account of human labour in the operational cost is seen to be very high in all the regions, specially Assam. Animal labour cost is the other important item of operational cost. Rental value of own land varies between 25 and 35 per cent in different States.

The State specific picture for all crops shows that Punjab, Haryana, Karnataka, Gujarat, Andhra Pradesh, Tamil Nadu end of the spectrum while Assam, Bihar, Madhya Pradesh, and Uttar Pradesh to an extent lie at the upper/Maharashtra and West Bengal are towards the lower end. "This comparison, though strictly not permitted since comparison across crops is not desirable, reflects that areas which are rainfed, semi-arid or ones where controlled irrigation is low, yield lower return than other", is the conclusion of another study (Acharya,1992).

Any enquiry into cost of production with a view to ascertain basis for determining producers' prices must take into consideration the weightages of various items of cost in total cost. As it turns out, may be contrary to popular impression, costs on account of human labour, animal labour and rental value of own land account for the bulk of the total cost in the case of all the crops grown in different regions considered in this study. Costs on fertilizer, seed, etc., individually account for relatively smaller share of total cost in the case of majority of the crops considered in this study.

Operational Cost and Value of Output

An alternative way of examining the significance and/or influence of each main item of operational cost is to express each of these main components of operational cost as percentage of the value of output of respective crops. In the following we discuss the results of such an analysis.

In the case of paddy the states like Punjab, Haryana and Karnataka which have shown relatively higher yield and increasing over the periods, total operational cost is seen to constitute around 40 per cent of the total value of output. Indeed in Karnataka the same is seen to constitute little over 30 per cent of the value of output and no perceptible change in the share of operational cost to the value of output is seen to have occurred in these States between different sub-periods. As expected human labour cost followed by cost on fertilizer manure are seen to account for the bulk of the share of operational cost in the value of output (around 17 percent and 9 to 14 per cent respectively). Share of cost on account of irrigation charges is also seen to be high in the case of Haryana and Punjab (around 10 per cent) where paddy is grown largely under irrigated condition (Table 50). In the case of Tamil Nadu and Andhra Pradesh, which also have shown relatively higher yield, operational cost is seen to account for 50 to 55 percent of the value of output, contributed mainly by human labour (between 20 and 25 per cent), fertilizer-manure (13 to

Table 50 : Share of Main Operational Cost Items in Value of Output in resp of PADDY Statewise in Different Sub-Periods

	Triennium Averages		
	Sub-periods		
	% Of Value of Output		
	1	2	3
ANDHRA PRADESH			
Human Labour Cost	18.00	24.47	23.76
Animal Labour Cost	5.73	7.26	6.67
Seed	4.00	3.74	3.15
Ferti & Manure Cost	13.27	19.11	18.02
Irrigation Charges	1.87	5.54	3.41
ASSAM			
Human Labour Cost	23.24	28.34	36.55
Animal Labour Cost	11.95	16.38	15.49
Seed	6.90	5.19	5.74
Ferti & Manure Cost	0.37	0.62	0.57
Irrigation Charges	-	NEG	NEG
BIHAR			
Human Labour Cost	16.04	21.66	20.20
Animal Labour Cost	13.12	16.10	10.86
Seed	2.90	4.12	3.40
Ferti & Manure Cost	4.23	5.94	4.89
Irrigation Charges	0.15	0.50	1.41
HARYANA			
Human Labour Cost	-	17.15	18.56
Animal Labour Cost	-	4.05	2.84
Seed	-	0.85	1.41
Ferti & Manure Cost	-	9.61	8.78
Irrigation Charges	-	9.88	9.40
KARNATAKA			
Human Labour Cost	-	11.97	16.18
Animal Labour Cost	-	5.81	5.61
Seed	-	2.45	2.45
Ferti & Manure Cost	-	9.51	9.62
Irrigation Charges	-	0.13	0.83

Contd

5c

Table 50 : Share of Main Operational Cost Items in Value of Output in resp of PADDY Statewise in Different Sub-Periods

	Triennium Averages		
	Sub-periods		
	% Of Value of Output		
	1	2	3
MADHYA PRADESH			
Human Labour Cost	17.55	17.76	20.70
Animal Labour Cost	9.89	12.33	11.76
Seed	6.36	6.62	5.59
Ferti & Manure Cost	5.47	6.31	8.08
Irrigation Charges	0.38	0.13	0.68
PUNJAB			
Human Labour Cost	-	16.79	17.55
Animal Labour Cost	-	1.89	1.78
Seed	-	1.83	1.56
Ferti & Manure Cost	-	14.11	11.42
Irrigation Charges	-	9.98	8.92
TAMIL NADU			
Human Labour Cost	25.18	21.90	22.66
Animal Labour Cost	8.56	9.35	7.26
Seed	3.86	3.88	3.58
Ferti & Manure Cost	12.86	12.99	13.29
Irrigation Charges	4.05	2.84	4.13
UTTAR PRADESH			
Human Labour Cost	-	36.19	24.45
Animal Labour Cost	-	16.99	12.70
Seed	-	5.55	5.21
Ferti & Manure Cost	-	9.28	9.70
Irrigation Charges	-	3.61	3.45
WEST BENGAL			
Human Labour Cost	21.79	35.31	26.92
Animal Labour Cost	11.02	18.95	12.49
Seed	3.50	3.77	3.47
Ferti & Manure Cost	4.05	7.47	7.71
Irrigation Charges	0.18	1.11	1.24

to 19 per cent) and animal labour (6 to 9 per cent). In the case of remaining States of Assam, Bihar, Madhya Pradesh, Uttar Pradesh and West-Bengal, where the yield levels are seen to be low and stagnant the operational cost is seen to vary between 40 and 45 per cent in Bihar and Madhya Pradesh (using low level of input per hectare) and 50 and 60 per cent in Assam, Uttar Pradesh and West Bengal (using relatively high level of human and animal labour inputs per hectare). Thus, a big chunk of the value of output is seen to be consumed on account of cost on human labour and animal labour, in that order, in the case of Assam, Uttar Pradesh, West Bengal and Madhya Pradesh, showing low yield of paddy. While in the case of Andhra Pradesh, Haryana, Karnataka, Punjab and Tamil Nadu, showing relatively high yield, cost on human and animal labour fertilizer-manure and irrigation consumes a sizeable chunk of the value of output. These findings are corroborated by the earlier discussion on share of main input items in operational and total cost (Table 22).

In the case of wheat cost on human labour is seen to account for on an average, 14 per cent of the value of output in different States in different sub-periods with minor variations (Table 51). In the States of Haryana and Punjab, showing relatively very high yield, fertilizer-manure cost is also seen to account for considerable share of the value of output (around 10 to 15 per cent). In other three States, share of animal labour (cost) in the value of output is seen to be

Table 51 : Share of Main Operational Cost Items in Value of Output in respect of WHEAT Statewise in Different Sub-Periods

	Triennium Averages		
	Sub-periods		
	% Of Value of Output		
	1	2	3
HARYANA			
Human Labour Cost	13.38	20.79	12.04
Animal Labour Cost	9.85	14.54	4.29
Seed	5.28	5.31	6.01
Ferti & Manure Cost	5.17	12.72	11.84
Irrigation Charges	5.07	8.68	5.84
MADHYA PRADESH			
Human Labour Cost	14.61	16.00	13.42
Animal Labour Cost	12.97	9.73	10.12
Seed	10.22	10.12	8.03
Ferti & Manure Cost	3.48	9.30	6.13
Irrigation Charges	0.59	1.17	6.05
PUNJAB			
Human Labour Cost	15.74	13.76	13.69
Animal Labour Cost	7.70	4.33	1.85
Seed	3.46	4.21	3.55
Ferti & Manure Cost	11.72	18.14	13.55
Irrigation Charges	4.94	2.80	2.98
RAJASTHAN			
Human Labour Cost	-	15.00	12.33
Animal Labour Cost	-	8.87	6.85
Seed	-	7.32	4.49
Ferti & Manure Cost	-	6.99	4.18
Irrigation Charges	-	9.79	6.64
UTTAR PRADESH			
Human Labour Cost	13.98	15.75	14.47
Animal Labour Cost	13.05	18.12	9.31
Seed	5.43	6.02	5.16
Ferti & Manure Cost	5.57	10.45	11.17
Irrigation Charges	5.87	5.57	5.28

considerable (around 9 to 12 per cent). The pattern of change from one sub-period to the other is seen to be of similar nature as observed earlier (Table 25). In the case of Haryana and Punjab total operational cost is seen to share between 35 and 40 per cent of the value of output owing to higher yield recorded along with relatively intensive use of inputs. While in Madhya Pradesh and Uttar Pradesh the same is seen to account for between 40 and 50 per cent of the value of output mainly because of relatively low yield, in Rajasthan only around 35 to 40 per cent of the value of output is seen to be shared by the operational cost, mainly owing to low relative yield as well as less intensive use of inputs.

As regards gram share of operational cost in the value of output is seen to be varying between 35 and 45 per cent in different sub-periods in different regions. Human labour, animal labour and seed, in that order, account for the bulk of the share (Table 52). This finding is corroborated by the earlier discussion on the results of the share of main items in operational cost (Table 28).

In the case of cotton, Maharashtra is the only State in our study where the operational cost in mid-late eighties is seen to share 60 per cent of the value of output (Table 53) mainly because of stagnant yield in the face of increasing operational cost per hectare. In the remaining three States, the share of the same in the value of output is seen to be varying between 35 per cent and 45 per cent in different

Table 52 : Share of Main Operational Cost Items in Value of Output in resp of GRAM Statewise in Different Sub-Periods

	Triennium Averages		
	Sub-periods		
	% Of Value of Output		
	1	2	3
HARYANA			
Human Labour Cost	-	16.65	14.07
Animal Labour Cost	-	14.84	11.45
Seed	-	7.71	8.15
Ferti & Manure Cost	-	0.15	0.20
Irrigation Charges	-	2.41	2.20
MADHYA PRADESH			
Human Labour Cost	15.08	11.04	12.05
Animal Labour Cost	16.20	9.15	9.11
Seed	12.29	10.29	12.14
Ferti & Manure Cost	1.93	0.74	2.34
Irrigation Charges	0.54	0.86	1.62
RAJASTHAN -			
Human Labour Cost	-	21.09	10.63
Animal Labour Cost	-	12.12	6.79
Seed	-	11.81	8.68
Ferti & Manure Cost	-	0.70	0.55
Irrigation Charges	-	0.59	1.10
UTTAR PRADESH			
Human Labour Cost	-	15.74	16.46
Animal Labour Cost	-	15.75	14.15
Seed	-	8.90	10.47
Ferti & Manure Cost	-	1.10	0.53
Irrigation Charges	-	1.69	0.95

Table 53 : Share of Main Operational Cost Items in Value of Output in resp :
of COTTON Statewise in Different Sub-Periods

	Triennium Averages		
	Sub-periods		
	% Of Value of Output		
	1	2	3
GUJARAT			
Human Labour Cost	-	14.10	18.08
Animal Labour Cost	-	13.26	7.79
Seed	-	4.09	3.43
Ferti & Manure Cost	-	7.94	12.94
Irrigation Charges	-	5.54	6.07
KARNATAKA			
Human Labour Cost	-	13.29	18.71
Animal Labour Cost	-	8.48	7.59
Seed	-	2.06	4.58
Ferti & Manure Cost	-	6.03	11.09
Irrigation Charges	-	0.41	1.51
MAHARASHTRA			
Human Labour Cost	-	15.52	23.10
Animal Labour Cost	-	7.61	12.63
Seed	-	2.74	4.96
Ferti & Manure Cost	-	9.92	17.88
Irrigation Charges	-	NEG	1.22
PUNJAB			
Human Labour Cost	23.13	24.32	23.25
Animal Labour Cost	6.74	5.41	3.68
Seed	1.05	1.08	1.43
Ferti & Manure Cost	6.45	5.05	4.29
Irrigation Charges	2.95	2.53	2.15

sub-periods. Human and animal labour and fertilizer cost, in that order, accounts for the bulk of the share of operational cost in the value of output of cotton. Discussion on the share of main input items in operational cost, presented earlier (Table 31), corroborates the above observations.

In the case of Sugarcane, while in Maharashtra and Andhra Pradesh the share of operational cost in the value of output is seen to vary between 35 and 45 per cent, in Uttar Pradesh the same is seen to be around one-third and in Karnataka as low as 22 to 27 per cent (Table 54). The reason for such a low share of operational cost in the value of sugarcane in Karnataka is to be found in the high relative yield and relatively low human labour use per hectare. Uttar Pradesh is seen to depict both low output and low per hectare of input use. Human labour cost is seen to account for the bulk of the share of operational cost in the value of output followed by fertilizer-manure. These findings are of similar nature as observed in earlier discussion on the share of different main items of input in the operational cost (Table 34).

In the case of groundnut, the share of operational cost in the value of output is seen to be very high and varying between 46 per cent and 71 per cent in different states in different sub-period (Table 55). The bulk of the share of operational cost is seen to be on account of costs on seed, human labour and animal labour in that order. A similar

Table 54 : Share of Main Operational Cost Items in Value of Output in re
of SUGARCANE Statewise in Different Sub-Periods

	Triennium Averages		
	Sub-periods		
	% Of Value of Output		
	1	2	3
ANDHRA PRADESH			
Human Labour Cost	-	18.57	18.40
Animal Labour Cost	-	1.95	1.38
Seed	-	5.43	7.63
Ferti & Manure Cost	-	11.65	6.87
Irrigation Charges	-	6.73	3.39
KARNATAKA			
Human Labour Cost	-	11.05	8.73
Animal Labour Cost	-	1.66	1.31
Seed	-	1.75	1.94
Ferti & Manure Cost	-	9.29	8.53
Irrigation Charges	-	2.73	1.11
MAHARASHTRA			
Human Labour Cost	-	12.00	19.76
Animal Labour Cost	-	2.42	2.90
Seed	-	3.96	5.09
Ferti & Manure Cost	-	9.13	9.99
Irrigation Charges	-	8.17	8.79
UTTAR PRADESH			
Human Labour Cost	-	13.93	13.88
Animal Labour Cost	-	6.36	2.79
Seed	-	5.65	4.97
Ferti & Manure Cost	-	4.21	5.13
Irrigation Charges	-	3.84	4.61

Table 55 : Share of Main Operational Cost Items in Value of Output in respect of GROUNDNUT Statewise in Different Sub-Periods

	Triennium Averages		
	Sub-periods		
	% Of Value of Output		
	1	2	3
GUJARAT			
Human Labour Cost	-	14.13	18.06
Animal Labour Cost	-	14.68	10.73
Seed	-	19.90	17.88
Ferti & Manure Cost	-	7.24	11.93
Irrigation Charges	-	1.24	3.19
KARNATAKA			
Human Labour Cost	-	21.72	13.91
Animal Labour Cost	-	15.07	7.42
Seed	-	26.18	18.57
Ferti & Manure Cost	-	7.67	5.41
Irrigation Charges	-	NEG	0.53
TAMIL NADU			
Human Labour Cost	-	21.52	17.84
Animal Labour Cost	-	10.70	6.11
Seed	-	21.07	20.99
Ferti & Manure Cost	-	2.89	3.43
Irrigation Charges	-	3.79	6.36

Table 56 : Share of Main Operational Cost Items in Value of Output in respect of RAPESEED MUSTARD Statewise in Different Sub-Periods

	Triennium Averages		
	Sub-periods		
	% Of Value of Output		
	1	2	3
ASSAM			
Human Labour Cost	-	19.13	35.36
Animal Labour Cost	-	8.63	15.14
Seed	-	3.63	4.47
Ferti & Manure Cost	-	1.41	5.04
Irrigation Charges	-	-	-
HARYANA			
Human Labour Cost	-	12.78	9.09
Animal Labour Cost	-	12.18	5.44
Seed	-	0.53	0.72
Ferti & Manure Cost	-	1.45	4.54
Irrigation Charges	-	6.52	3.35
RAJASTHAN			
Human Labour Cost	-	16.14	11.37
Animal Labour Cost	-	8.28	5.76
Seed	-	1.08	0.76
Ferti & Manure Cost	-	1.19	1.88
Irrigation Charges	-	5.43	3.55

picture also emerged in our earlier discussion while considering share of main input items in the total operational cost (Table 37).

As regards rapeseed-mustard except in the case of Assam in mid-late eighties, this share of operational cost in the value of output is seen to vary between 23 per cent and 33 per cent in all the States in two sub-periods (Table 56). There does not appear to be any systematic trend though human labour cost and animal labour cost are seen to account for the bulk of the share of operational cost in the value of output. A similar picture also emerged in our earlier discussion while considering share of main input items in the total operational cost (Table 40).

Cost Analysis at Constant Price

. So far we have discussed the cost of production at the current prices, i.e., at the prices of various input items and of output prevailing in respective regions in different sub-periods. Since increasing cost of production leading to high cost syndrome is a matter of concern, let us analyse the cost data little differently, i.e., at constant prices, so as to get a better insight into the aspect of increasing cost. We have noted in the discussion presented earlier that the cost of production between early seventies and mid-late seventies and between mid-late seventies and mid-late eighties depicted a clear increasing trend for all the crops and in all the

states considered in this study. We shall presently examine as to what extent is the increase in cost over the sub-periods is attributable to increased input use and to increased prices of the respective inputs.

Methodology

This analysis though more meaningful, is influenced substantially by the kind of deflator used. Further, appropriate deflators for various items/groups are always not available. Since there are difficulties in getting hold of appropriate deflator and since construction of composite price indices may give rise to other difficulties, we have resorted to direct valuation of input quantities, wherever available by multiplying each input quantity by the respective first or second sub-periods prices, as the case may be. Where such quantity data are not available we have used the deflator relevant for the variables under consideration. Following this approach, main input items reported in physical term per hectare, viz., seed, fertilizer, manure, human labour and animal labour for each of the sub-periods are multiplied by the corresponding prices of the input of first or second sub-period, as the case may be, in order to get the value of each of these inputs per hectare at constant prices. In the case of items of operational cost like irrigation charges and charges on account of machine hours since data in quantity terms (physical unit) are not available and what is available is only in value terms, we have no easy

way of decomposing these values into quantities and prices. Therefore, in order to convert the current values on account of these two operational cost items into values at constant prices we have used the composite price index of machinery and fuel oil as the deflator. The sum of all these values of the inputs (i.e., seed, fertilizer, manure, human labour, animal labour, irrigation and machine hours) per hectare at constant price in each sub-period divided by the output (yield) in the corresponding sub-period give us the operational cost of production at constant prices in each sub-period.

The prices of each item of operational cost (viz., seed fertilizer-manure, human labour and animal labour) are computed by dividing the triennium average value per hectare of each of these inputs in each sub-period by the corresponding quantity per hectare of input used. This computation gives us the average value (price) of each input in each sub-period. For estimating value of these inputs at constant price, as mentioned earlier, we have used the average value (price) of each input so obtained of the first or second sub-periods, as the case may be.

The components of fixed cost, viz., rental value of own land, rent on leased-in land, land revenue and cess, interest on fixed capital and depreciation also can not be factored into quantity and price; requiring the use of deflators for converting the current values into values at constant prices. It is reasonable to assume that the rent paid per hectare on

leased in land, land revenue etc., per hectare, depreciation rates and interest rates on own fixed capital have remained unchanged in different sub-periods. Therefore, any change (increase) in the value of each of these items of fixed cost in different sub-periods is presumably on account of changes (increase) in corresponding physical quantity of these items. We have, therefore, used the values for each of these items, as reported in different sub-periods, as the values at constant prices. In any case, these items constitute less than 50 per cent of the fixed cost. Rental value of own land, comprising bulk of the fixed cost, however, has been deflated by the land price index for the second and third sub-periods, as the case may be.

Changes in Average Value (Prices)
of Inputs and Outputs

When we examine the average value (Price) of different items of operational cost in different sub-periods, average prices of human labour, animal labour are seen to have increased the largest in the case of most of the crops in most of the regions. The average price of seed is also seen to have increased considerably, specially in the case of groundnut, cotton, gram and sugarcane in most of the regions. Some increase in average prices of manure and fertilizer is also observed in the case of some of the crops and in some of the regions. As noted earlier, since bulk of the operational cost is seen to be accounted for by the cost on human and animal labour, any significant increase

in average price of these inputs would have considerable influence on the increase in the operational cost in sub-periods 2 and 3. Since the use of human labour and bullock labour input per hectare in physical term is not seen to have increased in any significant manner in sub-periods 2 and 3 in any region and for any crop (Tables 16,18,20,22,24,26 and 28), it is obvious that increase in cost on account of these two items in sub-periods 2 and 3 is due to increased average prices of these inputs. Further, since cost on these two items comprise bulk of the operational cost, increase in operational cost in sub-periods 2 and 3 can be mainly attributed to the increased average price of human and animal labour. Similar explanation that the rise in average price and not quantity used per hectare is mainly responsible for some contribution to the increase in operational cost in sub-periods 2 and 3 in all the regions and for all the crops holds good for the input item seed also. It is only in the case of fertilizer-manure that increased use of quantity per hectare rather than increase in average price is seen to be largely responsible for any contribution to the increase in operational cost in sub-periods 2 and 3 in all the regions and for all the crops.

The other aspect of the values based on current year's prices is the value of output of different crops in different States in different sub-periods. The average values of outputs (prices) in respect of almost all the crops in almost all the

States are seen to be increasing less than proportionately to rise in the average value (price) of important inputs like human and animal labour and in many cases also less than proportionately to rise in the average value (prices) of many other input.

Cost of Production at Constant Prices

In the case of paddy, by and large, the States like Haryana, Punjab, Karnataka, specially, and Tamil Nadu and Andhra Pradesh, to a large extent, show either the same level or marginally higher or lower level of cost of production at constant price compared to the States of Assam, Bihar, Madhya Pradesh, Uttar Pradesh and West Bengal in all the sub-periods and in particular in sub-periods 2 and 3 (Table 57). The former five States, specially Punjab also show relatively much higher level of yield. Further, in the case of these States, the proportionate increase in yield is seen to be either of higher order or of similar order as that in total cost at constant price. In other words, any increase in cost of production at constant price in sub-periods 2 and 3, as the case may be, is seen to be either matched or more than matched by corresponding yield increases. All these results indicate that these states have benefited considerably from the technological change experienced during different sub-periods. In the case of the other five States of Assam, Bihar, Madhya Pradesh, Uttar Pradesh and West-Bengal, not only the yield levels are seen to be comparatively lower,

Table : 57 Cost of Production (Rs./qtl) at Constant Price, Constant Average Price of Output (Value in Rs./qtl) and Yield (qtl./Ha) of PADDY in Different Sub-Periods

State/Item	Triennium Averages Sub-Periods			Percentage Change in Sub-Periods		
	1	2	3	2 over 1	3 over 2	3 over 1
ANDHRA PRADESH						
Operational cost	35.75	44.73	44.61	25.11	-0.26	24.78
Fixed cost	29.12	33.60	34.37	15.38	2.29	18.02
Total cost	64.87	78.33	78.98	20.74	0.82	21.75
Yield/Ha.	23.41	29.17	32.60	24.60	11.75	39.25
Av.Price (value of output)	72.30	72.30	72.30	-	-	-
ASSAM						
Operational cost	27.67	23.46	24.17	-15.21	3.02	-12.64
Fixed cost	21.23	26.54	34.90	25.01	31.61	64.53
Total cost	48.90	50.00	59.10	2.24	18.20	20.85
Yield/Ha.	15.80	18.44	18.25	16.70	-1.03	15.50
Av.Price (value of output)	63.58	63.58	63.58	-	-	-
BIHAR						
Operational cost	42.39	39.22	46.68	-7.47	19.02	10.12
Fixed cost	37.28	36.21	47.00	-2.87	29.79	26.07
Total cost	79.67	75.43	93.68	-5.32	24.19	17.58
Yield/Ha.	16.41	18.83	18.01	14.74	-4.35	9.75
Av.Price (value of output)	97.03	97.03	97.03	-	-	-
HARYANA						
Operational cost	-	59.19	56.79	-	-4.05	-
Fixed cost	-	24.67	32.73	-	32.67	-
Total cost	-	83.87	89.53	-	6.74	-
Yield/Ha.	-	34.57	37.56	-	8.64	-
Av.Price (value of output)	-	89.93	89.93	-	-	-
KARNATAKA						
Operational cost	-	39.62	38.95	-	-1.69	-
Fixed cost	-	27.56	34.89	-	26.59	-
Total cost	-	67.19	73.85	-	9.91	-
Yield/Ha.	-	34.39	36.69	-	6.68	-
Av.Price (value of output)	-	120.57	120.57	-	-	-

contd

Table : 57 Cost of Production(Rs./qtl) at Constant Price, Constant Average Price of Output(Value in Rs./qtl) and Yield(qtl./Ha.) of PADDY in Different Sub-Periods

State/Item	Triennium Averages Sub-Periods			Percentage Change in Sub-Periods		
	1	2	3	2 over 1	3 over 2	3 over 1
MADHYA PRADESH						
Operational cost	39.65	37.14	40.57	-6.33	9.23	2.32
Fixed cost	32.23	46.50	50.78	44.27	9.20	57.55
Total cost	71.88	83.65	91.36	16.37	9.21	27.10
Yield/Ha.	12.90	13.71	13.93	6.27	1.60	7.98
Av.Price(value of output)	90.49	90.49	90.49	-	-	-
PUNJAB						
Operational cost	-	61.67	59.59	-	-3.37	-
Fixed cost	-	36.43	41.34	-	13.47	-
Total cost	-	98.10	100.94	-	2.89	-
Yield/Ha.	-	53.93	53.71	-	-0.40	-
Av.Price(value of output)	-	130.95	130.95	-	-	-
TAMILNADU						
Operational cost	42.02	36.78	37.28	-12.47	1.35	-11.28
Fixed cost	26.68	32.46	35.81	21.66	10.32	34.22
Total cost	68.70	69.25	73.10	0.80	5.55	6.40
Yield/Ha.	24.93	32.90	37.88	31.96	15.13	51.94
Av.Price(value of output)	66.36	66.36	66.36	-	-	-
UTTAR PRADESH						
Operational cost	-	58.28	54.03	-	-7.29	-
Fixed cost	-	28.46	38.69	-	35.94	-
Total cost	-	86.75	92.72	-	6.88	-
Yield/Ha.	-	20.68	20.91	-	1.11	-
Av.Price(value of output)	-	71.33	71.33	-	-	-
WEST BENGAL						
Operational cost	42.86	43.90	43.72	2.42	-0.41	2.00
Fixed cost	30.26	35.54	42.87	17.44	20.62	41.67
Total cost	73.12	79.45	86.59	8.65	8.98	18.42
Yield/Ha.	17.79	20.64	23.35	16.02	13.12	31.25
Av.Price(value of output)	86.96	86.96	86.96	-	-	-

at
the cost increases/constant price in sub-periods 2 and 3 are seen to be much higher than yield increases except in West Bengal indicating that these States until mid-late eighties had not experienced the benefit of yield increasing technology. The other interesting point to be noted is that bulk of the increase in total cost is seen to be accounted for by the fixed cost rather than operational cost in sub-periods 2 and 3 in the case of all the States.

As regards wheat the States of Haryana, Punjab and Uttar Pradesh show marginal to reasonable rise in the cost of production at constant prices from early seventies to mid-late seventies and from mid-late seventies to mid-late eighties, but, these cost increases are seen to have been matched or more than matched by the corresponding yield increases (Table 58). Besides, the yield levels are also seen to be high in these States, specially in Punjab and Haryana. All these indicate the benefits of technological change that these States have been experiencing in the cultivation of wheat. To an extent the same is true of Rajasthan also. Only in the State of Madhya Pradesh, cost increases even at constant price are seen to be far outweighing the yield increases in sub-period 3 over 2 and overall (in sub-period 3 over 1) indicating absence of experience of technological change in wheat cultivation until mid-eighties. In the case of wheat also we find that increase in fixed cost account for the bulk of the increase in total cost at constant price.

In the case of gram, the increases in cost of production

Table : 58 Cost of Production(Rs./qtl) at Constant Price, Constant Average Price of Output(Value in Rs./qtl) and Yield(qtl./Ha) of WHEAT in Different Sub-Periods

State/Item	Triennium Averages Sub-Periods			Percentage Change in Sub-Periods		
	1	2	3	2 over 1	3 over 2	3 over 1
HARYANA						
Operational cost	38.10	48.16	40.80	26.40	-15.28	7.08
Fixed cost	23.20	34.94	41.59	50.60	19.03	79.26
Total cost	61.30	83.11	82.40	35.57	- 0.85	34.42
Yeild/Ha.	20.24	23.79	29.48	17.53	23.91	45.65
Av.Price(value of output)	74.91	74.91	74.91	-	-	-
MADHYA PRADESH						
Operational cost	40.39	41.09	43.25	1.73	5.25	7.08
Fixed cost	26.36	40.05	61.00	51.93	52.30	131.41
Total cost	66.76	81.14	104.25	21.53	28.48	56.15
Yield/Ha.	9.16	12.03	12.19	31.33	1.33	33.07
Av.Price(value of output)	84.04	84.04	84.04	-	-	-
PUNJAB						
Operational cost	40.60	45.50	44.10	12.06	-3.07	8.62
Fixed cost	29.24	42.66	55.61	45.89	30.35	90.18
Total cost	69.85	88.17	99.71	26.22	13.08	42.74
Yield/Ha.	24.48	26.87	33.35	9.76	24.11	36.23
Av.Price(value of output)	75.70	75.70	75.70	-	-	-
RAJASTHAN						
Operational cost	-	70.26	55.83	-	-20.53	-
Fixed cost	-	31.79	52.55	-	65.30	-
Total cost	-	102.05	108.3	-	6.20	-
Yield/Ha.	-	19.99	23.32	-	16.65	-
Av.Price(value of output)	-	126.60	126.60	-	-	-
UTTAR PRADESH						
Operational cost	50.32	47.16	45.29	-6.27	-3.96	-9.99
Fixed cost	30.95	35.09	36.56	13.37	4.18	18.12
Total cost	81.28	82.26	81.86	1.20	-0.48	0.71
Yield/Ha.	19.34	21.07	25.41	8.94	20.59	31.38
Av.Price(value of output)	94.73	94.73	94.73	-	-	-

at constant price over the sub-periods, in all the four States, brought about mainly by increase in fixed cost, is not seen to be matched by any corresponding increase in yield (Table 59). In fact, the yield levels are not only seen to be low, but, are also seen to be either stagnant or declining. It is obvious from the above observations that technological breakthrough in the case of cultivation of gram had not been achieved till mid-late eighties.

Cotton is an important cash crop grown in India. In the case of States of Gujarat, Karnataka and Punjab, the total cost of production at constant price is seen to have increased only marginally, specially in Gujarat, where as in the case of Maharashtra, the same is seen to have increased considerably in mid-late eighties, over mid-late seventies (Table 60). Further, the yield increases are seen to have far outweighed any increase in costs in Gujarat, Karnataka and Punjab. The Maharashtra, on the other hand, the yield levels are not only seen to be relatively low, but, is also found to be stagnating. Maharashtra cotton growers, it appears, have not had the opportunity of experiencing the benefit of technological change in cotton cultivation. Increase in fixed cost is seen to have marginally higher contribution towards increase in total cost as compared to the operational cost.

In the case of the other important cash crop, sugarcane, total cost at constant prices is seen to have declined marginally in mid-late eighties over mid-late seventies in Andhra Pradesh

Table 59: Cost of Production(Rs./qtl) at Constant Price, Constant Average Price of output(Value in Rs/qtl) and Yield(qtl/Ha.) of GRAM in Different Sub-Periods

State/Item	Triennium Averages Sub-Periods			Percentage Change in Sub-Periods		
	1	2	3	2 over 1	3 over 2	3 over 1
HARYANA						
Operational cost	-	96.48	100.18	-	3.83	-
Fixed cost	-	76.22	121.56	-	59.48	-
Total cost	-	172.70	221.74	-	28.39	-
Yeild/ha.	-	6.49	6.52	-	0.46	-
Av.Price(value of output)	-	204.11	204.11	-	-	-
MADHYA PRADESH						
Operational cost	61.78	49.42	68.09	-20.00	37.77	10.21
Fixed cost	51.71	74.47	97.38	44.01	30.76	88.31
Total cost	113.49	123.90	165.47	9.17	33.55	45.80
Yield/ha.	7.12	8.95	7.04	25.70	-21.34	-1.12
Av.Price(value of output)	116.95	116.95	116.95	-	-	-
RAJASTHAN						
Operational cost	-	67.96	91.60	-	34.78	-
Fixed cost	-	33.29	100.99	-	203.36	-
Total cost	-	101.25	192.60	-	90.22	-
Yield/ha.	-	6.81	6.14	-	- 9.83	-
Av.Price(value of output)	-	121.92	121.92	-	-	-
UTTAR PRADESH						
Operational cost	-	129.80	149.51	-	15.18	-
Fixed cost	-	86.53	82.80	-	-4.31	-
Total cost	-	216.34	232.32	-	7.38	-
Yield/ha.	-	10.07	10.19	-	1.19	-
Av.Price(value of output)	-	265.95	265.95	-	-	-

Table 60 : Cost of Production(Rs./qtl) at Constant Price, Constant Average Price of output(Value in Rs/qtl) and Yield(qtl/Ha) of COTTON in Different Sub-Periods

State/Item	Triennium Averages Sub-Periods			Percentage Change in Sub-Periods		
	1	2	3	2 over 1	3 over 2	3 over 1
GUJARAT						
Operational cost	-	233.04	231.82	-	-0.52	-
Fixed cost	-	79.08	90.17	-	14.02	-
Total cost	-	312.13	321.99	-	3.15	-
Yeild/Ha.	-	4.17	10.08	-	141.72	-
Av.Price(value of output)	-	393.34	393.34	-	-	-
KARNATAKA						
Operational cost	-	148.65	155.00	-	4.27	-
Fixed cost	-	106.61	135.08	-	26.70	-
Total cost	-	255.26	290.09	-	13.64	-
Yield/Ha.	-	3.32	6.31	-	90.06	-
Av.Price(value of output)	-	423.78	423.78	-	-	-
MAHARASHTRA						
Operational cost	-	163.16	217.20	-	33.12	-
Fixed cost	-	86.26	119.67	-	38.73	-
Total cost	-	249.43	336.87	-	35.05	-
Yield/Ha.	-	3.83	4.07	-	6.26	-
Av.Price(value of output)	-	425.63	425.63	-	-	-
PUNJAB						
Operational cost	122.35	147.46	117.03	20.52	-20.63	-4.34
Fixed cost	86.05	99.73	109.83	15.89	10.12	27.63
Total cost	208.41	247.19	226.86	18.60	- 8.22	8.85
Yield/Ha.	9.5	8.35	13.00	-12.10	55.68	36.84
Av.Price(value of output)	248.32	248.32	248.32	-	-	-

and Karnataka and is seen to have increased only very marginally in the case of Uttar Pradesh. It is only in the State of Maharashtra that the total cost of production at constant price is seen to have increased considerably (Table 61). Yield levels are seen to be stagnant in Maharashtra against increasing cost of production indicating a scenario of high cost syndrome in respect of sugarcane production in Maharashtra. As against this yield levels are seen to have increased in Andhra Pradesh and Karnataka in the face of decreasing cost of production indicating favourable economic situation for the cane growers in these two States in mid-late eighties owing to increasing yield brought about through technological improvement. In the case of Uttar Pradesh though the increase in yield in mid-late eighties over mid-late seventies is seen to be larger than the increase in cost of production at constant price, the level of yield achieved by mid-late eighties is considerably lower than the corresponding yield levels achieved in Andhra Pradesh, Karnataka and Maharashtra.

In the case of groundnut, out of the three States considered in our study, in Gujarat and Karnataka the total cost of production at constant price is seen to have declined while the yield is seen to have increased considerably in mid-late eighties over mid-late seventies. This indicates an improving input-output relationship in the cultivation of groundnut in these two States as existed in mid-late eighties. In the case

Table 61 : Cost of Production(Rs./qtl) at Constant Price, Constant Average Price of output(Value in Rs/qtl) and Yield(qtl/Ha) of SUGARCANE in Different Sub-Periods

State/Item	Triennium Averages Sub-Periods			Percentage Change in Sub-Periods		
	1	2	3	2 over 1	3 over 2	3 over 1
ANDHRA PRADESH						
Operational cost	-	5.96	4.38	-	-26.51	
Fixed cost	-	4.25	5.53	-	30.11	
Total cost	-	10.22	9.92	-	-2.93	
Yield/Ha.	-	681.23	767.25	-	12.62	
Av.Price(value of output)	-	13.12	13.12	-	-	
KARNATAKA						
Operational cost	-	5.52	5.14	-	-6.88	
Fixed cost	-	4.11	4.15	-	0.97	
Total cost	-	9.64	9.29	-	-3.63	
Yield/Ha.	-	776.20	856.07	-	10.28	
Av.Price(value of output)	-	20.22	20.22	-	-	
MAHARASHTRA						
Operational cost	-	5.11	5.33	-	4.30	
Fixed cost	-	2.68	4.31	-	60.82	
Total cost	-	7.79	9.65	-	23.87	
Yield/Ha.	-	770.04	780.20	-	1.31	
Av.Price(value of output)	-	14.34	14.34	-	-	
UTTAR PRADESH						
Operational cost	-	4.49	4.16	-	-7.34	
Fixed cost	-	3.43	4.10	-	19.53	
Total cost	-	7.92	8.26	-	4.29	
Yield/Ha.	-	357.35	395.20	-	10.59	
Av.Price(value of output)	-	12.01	12.01	-	-	

of Tamil Nadu, on the other hand, cost of production at constant price is seen to have increased considerably in the face of marginally declining yield level in mid-late eighties over mid-late seventies (Table 62) indicating deteriorating input-output relationship in groundnut cultivation in Tamil Nadu. However, the yield level achieved in Tamil Nadu is seen to be considerably higher than that in Gujarat and Karnataka. It appears the yield level of groundnut reached a plateau in mid-late seventies in Tamil Nadu and that fresh technological break-through is required to raise the yield level further.

In the case of rapeseed mustard in the State of Assam the yield level is not only seen to be low, but, also declining in mid-late eighties as compared to mid-late seventies in the face of rising total cost of production at constant price indicating no break through of technology in the production of this crop in Assam. In the case of Haryana and Rajasthan, however, cost of production decreases at constant price are seen to be accompanied by yield increases of substantial order in mid-late eighties over mid-late seventies indicating improving input-output relationship that existed in mid-late eighties in rapeseed mustard production in these two States (Table 63).

Inferences that can be drawn and conclusions that can be arrived at on the basis of the cost analysis at constant price are as follows :

- 1) The production efficiency as revealed by the input-

Table 62 : Cost of Production(Rs./qtl) at Constant Price, Constant Average Price of output(Value in Rs/qtl) and Yield(qtl/Ha) of GROUNDNUT in Different Sub-Periods

State/Item	Triennium Averages Sub-Periods			Percentage Change in Sub-Periods		
	1	2	3	2 over 1	3 over 2	3 over 1
GUJARAT						
Operational cost	-	218.67	179.56	-	-17.88	-
Fixed cost	-	68.25	91.45	-	33.99	-
Total cost	-	286.93	271.02	-	-5.54	-
Yield/Ha.	-	4.24	7.30	-	72.16	-
Av.Price(value of output)	-	355.66	355.66	-	-	-
KARNATAKA						
Operational cost	-	167.50	114.54	-	-31.61	-
Fixed cost	-	61.22	105.19	-	71.82	-
Total cost	-	228.73	219.74	-	-3.93	-
Yield/Ha.	-	5.17	7.19	-	39.07	-
Av.Price(value of output)	-	206.07	206.07	-	-	-
TAMILNADU						
Operational cost	-	87.17	101.00	-	15.86	-
Fixed cost	-	39.59	90.02	-	127.38	-
Total cost	-	126.76	191.03	-	50.70	-
Yield/Ha.	-	11.84	11.38	-	- 3.88	-
Av.Price(value of output)	-	130.57	130.57	-	-	-

Table 63 : Cost of Production(Rs./qtl) at Constant Price, Constant Average Price of output (Value in Rs/qtl) and Yield(qtl/Ha) of RAPESEED MUSTARD in Different Sub-Periods

State/Item	Triennium Averages Sub-Periods			Percentage Change in Sub-Periods		
	1	2	3	2 over 1	3 over 2	3 over 1
ASSAM						
Operational cost	-	102.59	143.56	-	39.93	-
Fixed cost	-	79.17	111.01	-	40.21	-
Total cost	-	181.58	215.31	-	18.57	-
Yield/ha.	-	5.65	4.75	-	-15.92	-
Av.Price(value of output)	-	311.30	311.30	-	-	-
HARYANA						
Operational cost	-	137.90	116.02	-	-15.86	-
Fixed cost	-	110.64	114.26	-	3.27	-
Total cost	-	248.55	230.29	-	-7.34	-
Yield/ha.	-	7.19	9.05	-	25.86	-
Av.Price(value of output)	-	382.37	382.37	-	-	-
RAJASTHAN						
Operational cost	-	125.85	103.51	-	-17.75	-
Fixed cost	-	100.27	106.74	-	6.45	-
Total cost	-	226.13	210.26	-	-7.01	-
Yield/ha.	-	6.25	8.99	-	43.84	-
Av.Price(value of output)	-	378.40	378.40	-	-	-

output relationship is seen to be high and increasing with respect to cultivation of paddy in the States of Punjab, Haryana, Karnataka, Tamil Nadu and Andhra Pradesh in that order. Marginal increase in cost of production at constant prices is only because of significantly large yield increases. These States are known to have had the experience of technological change in the cultivation of paddy from late seventies onwards which is borne out by this analysis. In the remaining States of Assam, Bihar, Madhya Pradesh, Uttar Pradesh and West-Bengal production efficiency is low indicating absence of technological breakthrough in the cultivation of paddy in these States even in mid-late eighties.

- 2) The States of Punjab, Haryana and Uttar Pradesh are known to have experienced technological change in the cultivation of wheat in mid-seventies onwards. This observation is borne out by the increased production efficiency as revealed by large yield increases and consequent marginal increase in cost of production in the sub-period mid-late eighties.
- 3) No technological break-through is seen to have been achieved in the cultivation of gram even until the period mid-late eighties in any of the four States of Haryana, Madhya Pradesh, Rajasthan and Uttar Pradesh considered in this study.

- 4) Except the state of Maharashtra, all the other three States Gujarat, Karnataka and Punjab have shown the impact of technological change of some degree in the cultivation of cotton in mid-late eighties as revealed by marginal increase in cost owing to large increases in yield.
- 5) Andhra Pradesh and Karnataka are seen to have experienced the impact of technological change in sugarcane production as revealed by declining cost of production in mid-late eighties brought about by more than proportionate corresponding increase in yield. It appears Maharashtra reached plateau in respect of yield of sugarcane by mid-late seventies brought about by early breakthrough in technology and hence has shown rising cost of production in mid-late eighties brought about by almost stagnant but comparable to Andhra and Karnataka yield of cane. The State of Uttar Pradesh is seen to have been operating at a low level of technology in the cultivation of sugarcane as revealed by very low level of yield though rising in mid-late eighties.
- 6) Technological breakthrough of some degree is seen to have occurred in the cultivation of groundnut in Gujarat and Karnataka in mid-late eighties as revealed by declining cost of production brought about by more than proportionate corresponding yield

increases. However, in Tamil Nadu yield level though high, brought about by early break-through in technology, appears to have reached a plateau in mid-late seventies as revealed by stagnant level of yield between mid-late seventies and mid-late eighties resulting into considerable increase in cost of production.

- 7) In the case of rapeseed-mustard the State of Assam does not appear to have had any impact of technological change in the cultivation of rapeseed mustard as revealed by low and declining yield and increasing cost of production at constant price in mid-late eighties. In the case of other two States of Haryana and Rajasthan some degree of technological change is noticed in comparatively higher and increasing yield accompanied by declining cost of production at constant price in mid-late seventies.

IV

ANALYSIS OF COST-PRICE RELATIONSHIPS

We now turn our attention to the analysis of the prices in respect of each of the crops considered in our study with a view to examine the trends and correlation in different prices during the period chosen for study and also to examine the trends in various cost-price ratios.

For the above price analysis we have considered the farm harvest price, procurement/support price and the wholesale price of the crops considered in this study. Before undertaking such an analysis it is necessary to point out that these prices for each crop do not necessarily relate to the same quality/variety of the crop concerned. Hence, comparison of trends and correlation in different set of prices may not yield very meaningful results. However, considering that the procurement/support prices are announced for fair average quality (faq) which comprise the bulk of production of cereals in different regions in India, quality and/or varietal differences in relation to these three sets of prices may not mar the analysis and the results of the analysis can be considered as indicative in nature.

Trends in Prices

Estimates of triennium averages of (i) Farm-harvest price (ii) Procurement/Support price and (iii) Wholesale price in respect of paddy are presented in Table 64 . In all the States for all the three sub-periods farm harvest prices prevailing

Table 64 : Farm Harvest Prices(A), Procurement Prices(B) and Wholesale Prices(C)
CROP : PADDY (Rs.per Quintal)

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over 1	3 Over 2	3 Over 1
		1	2	3			
ANDHRA PRADESH	A	78.60	90.71	136.58	15.40	50.58	73.76
	B	55.67	81.00**	123.00	45.51	51.85	120.96
	C	92.10	102.28	158.09	11.06	54.56	71.65
ASSAM	A	71.74	113.63	164.08	58.40	44.40	128.72
	B	58.50	115.00 *	141.00	96.58	22.61	141.03
	C	N.A.	N.A.	N.A.	-	-	-
BIHAR	A	105.63	97.99**	149.25	-7.23	52.32	41.30
	B	64.42	75.50**	123.00	17.21	62.91	90.94
	C	126.49	101.38**	194.45	-19.86	91.81	53.73
HARYANA	A	N.A.	88.03	178.08	-	102.30	-
	B	N.A.	81.00**	145.33	-	79.42	-
	C	N.A.	91.45	168.86	-	84.65	-
KARNATAKA	A	N.A.	118.65	178.43	-	50.39	-
	B	N.A.	70.33	141.00	-	100.47	-
	C	N.A.	123.82	187.05	-	51.07	-
MADHYA PRADESH	A	117.44**	124.78	139.59	6.25	11.87	18.86
	B	64.33	123.00	141.00	91.19	14.63	119.17
	C	220.73	313.36	339.74	41.97	8.42	53.92
PUNJAB	A	N.A.	118.70	176.10	-	48.36	-
	B	N.A.	123.00	145.33	-	18.16	-
	C	N.A.	148.61	174.69	-	17.55	-
TAMIL NADU	A	110.70	156.50	213.98**	41.37	36.73	93.29
	B	54.33	81.00**	115.00 *	49.08	41.98	111.66
	C	95.66	171.40	225.09**	79.18	31.32	135.31
UTTAR PRADESH	A	N.A.	72.63	122.73	-	68.98	-
	B	N.A.	75.00	123.00	-	64.00	-
	C	N.A.	86.45	143.88	-	66.44	-
WEST BENGAL	A	163.85	202.48	317.79	23.58	56.94	93.95
	B	58.33	85.00 *	130.33	45.71	53.33	123.43
	C	183.17	221.43	303.53	20.89	37.08	65.71

* : Average based on one year data

** : Average based on two year data

at the farm sites in the immediate post harvest period are reported to be higher than the respective procurement prices announced by the state agencies, but, lower than the respective wholesale prices prevailing in wholesale markets. Differences between farm harvest price, procurement price and wholesale price are seen to be relatively much smaller in Haryana, Punjab, Uttar Pradesh, Andhra Pradesh and Karnataka, known for having experienced, technological change of varying degrees. Further that, whereas increases in all the three prices are seen to be of the same order in respective states between mid-late seventies and mid-late eighties, increases in procurement prices in respective states are seen to outweigh the increases in other two prices between early seventies and mid-late seventies. Thus, hefty increases in procurement prices to act as incentives for augmenting production through adoption of new technology seem to have been the official policy during seventies. Once the procurement prices were increased substantially in mid-seventies from their low level the effort in mid-late eighties seems to have been to maintain it within certain lower limits of the wholesale (open-market) prices by periodic up-ward revisions in procurement prices.

Estimates of triennium average prices in respect of wheat are presented in Table 65 . In the case of wheat the states of Haryana and Punjab which experienced technological change in good measure and the state of Uttar Pradesh which also experienced

Table 65 : Farm Harvest Prices(A), Procurement Prices(B) and Wholesale Prices(C)
CROP : WHEAT (Rs.per Quintal)

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
HARYANA	A	83.67	112.67	184.84	34.65	64.06	120.91
	B	76.00	112.50	166.67	48.03	48.15	119.30
	C	87.67	118.48	200.65	35.14	69.35	128.86
MADHYA PRADESH	A	84.27	131.18**	191.32	55.66	45.85	127.04
	B	76.00	105.00**	161.33	38.16	53.65	112.28
	C	96.78	143.69**	234.31	48.47	63.07	142.11
PUNJAB	A	76.90	122.13	171.52	58.81	40.44	123.03
	B	76.00	115.00 *	166.67	51.32	44.93	119.30
	C	80.05	128.94	196.28	61.08	52.22	145.19
RAJASTHAN	A	N.A.	134.02**	185.65	-	38.53	-
	B	N.A.	105.00**	161.33	-	53.65	-
	C	N.A.	128.13**	196.35	-	53.25	-
UTTAR PRADESH	A	98.76	115.43	167.04**	16.88	44.72	69.14
	B	85.67	113.75**	163.50**	32.78	43.74	90.86
	C	107.82	127.39	193.67**	18.15	52.03	79.62

* : Average based on one year data
** : Average based on two year data

Table 65 : Farm Harvest Prices(A), Procurement Prices(B) and Wholesale Prices(C)
CROP : WHEAT (Rs.per Quintal)

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
HARYANA	A	83.67	112.67	184.84	34.65	64.06	120.91
	B	76.00	112.50	166.67	48.03	48.15	119.30
	C	87.67	118.48	200.65	35.14	69.35	128.86
MADHYA PRADESH	A	84.27	131.18**	191.32	55.66	45.85	127.04
	B	76.00	105.00**	161.33	38.16	53.65	112.28
	C	96.78	143.69**	234.31	48.47	63.07	142.11
PUNJAB	A	76.90	122.13	171.52	58.81	40.44	123.03
	B	76.00	115.00 *	166.67	51.32	44.93	119.30
	C	80.05	128.94	196.28	61.08	52.22	145.19
RAJASTHAN	A	N.A.	134.02**	185.65	-	38.53	-
	B	N.A.	105.00**	161.33	-	53.65	-
	C	N.A.	128.13**	196.35	-	53.25	-
UTTAR PRADESH	A	98.76	115.43	167.04**	16.88	44.72	69.14
	B	85.67	113.75**	163.50**	32.78	43.74	90.86
	C	107.82	127.39	193.67**	18.15	52.03	79.62

* : Average based on one year data

** : Average based on two year data

technological change in considerable measure are seen to be showing much smaller difference between farm harvest prices, procurement prices and wholesale prices in early seventies and mid-late seventies, although procurement prices are reported to be lower than other two prices in respective states in both the sub-periods. In sub-period three (mid-late eighties), however, there is some indication of increase in the difference between the three sets of prices in the case of all the states reported. By and large percentage increase in procurement price in the case of most of the states is seen to be larger than the increases in other two prices between early seventies and mid-late seventies mainly because the low level of procurement prices were sought to be brought somewhat nearer to the open market price. However, between mid-late seventies and mid-late eighties the relative increase in procurement price is seen to be smaller than the same specially, the wholesale prices. But, with few exceptions increases in all the three prices in respective states have been within a narrow range. Procurement prices evidently seen to have been attempted to be used as incentive to producers, specially during the period early seventies to mid-late seventies with a view to encourage the producers to adopt the package of new technology.

In the case of gram, the estimates of average prices for which are presented in Table 66, it is noted that except in Uttar Pradesh procurement prices are not reported in sub-period

Table 66 : Farm Harvest Prices(A), Procurement Prices(B) and Wholesale Prices(C)
CROP : GRAM (Rs.per Quintal)

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
HARYANA	A	N.A.	222.50**	443.20	-	99.19	-
	B	N.A.	N.A.	275.00	-	-	-
	C	N.A.	219.16**	465.51	-	112.41	-
MADHYA PRADESH	A	116.98**	243.12	382.71	107.83	57.42	227.16
	B	N.A.	206.67	275.00	-	33.06	-
	C	139.30**	293.82	462.20	110.93	57.31	231.81
RAJASTHAN	A	N.A.	139.14	387.64	-	178.61	-
	B	N.A.	N.A.	260.00	-	-	-
	C	N.A.	154.56	392.57	-	153.99	-
UTTAR PRADESH	A	N.A.	254.02	364.86	-	43.64	-
	B	N.A.	206.67	260.00	-	25.81	-
	C	N.A.	291.90	403.65	-	38.28	-

Table 67 : Farm Harvest Prices(A), Procurement Prices(B) and Wholesale Prices(C)
CROP : COTTON (Rs.per Quintal)

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
GUJARAT	A	N.A.	359.73	456.02**	-	26.77	-
	B	N.A.	208.33	386.67	-	85.60	-
	C	N.A.	418.29	515.55	-	23.25	-
KARNATAKA	A	N.A.	367.63**	436.73**	-	18.79	-
	B	N.A.	237.50**	482.50**	-	103.16	-
	C	N.A.	334.20**	N.A.	-	-	-
MAHARASHTRA	A	N.A.	275.80	487.89	-	76.90	-
	B	N.A.	228.33	386.67	-	69.34	-
	C	N.A.	290.67	435.00 *	-	49.66	-
PUNJAB	A	275.21	344.16**	495.58	25.05	44.00	80.07
	B	169.00	289.50**	458.33	71.30	58.32	171.20
	C	238.83	360.04**	505.11	50.75	40.29	111.50

* : Average based on one year data

** : Average based on two year data

2 (late seventies-early eighties) in the case of Haryana, Madhya Pradesh and Rajasthan. In sub-period 3 (mid-late eighties) the procurement prices are seen to be at a much lower level than the other two prices in the case of all the states. Absolute levels of farm harvest price and wholesale price are seen to be much higher in the case of Haryana as compared to the other states. Wholesale prices are seen to be higher than the farm harvest prices in the case of all states in all the sub-periods though the difference between the two is found to be small. Between late seventies-early eighties and mid-late eighties the prices are seen to have doubled except in the case of Uttar Pradesh. Procurement price does not seem to have worked as incentive to the producers of gram.

Cotton also shows procurement prices in both the sub-periods in respective states to be smaller than farm harvest and wholesale prices (Table 67). Absolute levels of prices are seen to be higher in the case of Gujarat, Karnataka and Maharashtra compared to Punjab and the difference between wholesale price and farm harvest price is seen to have narrowed down in mid-late eighties compared to mid-late seventies in the case of all the states. In addition it is also seen that increases in procurement prices are of relatively much higher order than other two prices between mid-late seventies and mid-late eighties except in Maharashtra, where monopoly procurement of cotton is in practice, mainly because the procurement prices were relatively

at much lower level during mid-seventies. It appears that procurement prices have been attempted to be used as incentives to cotton growers, specially in mid-late eighties.

Procurement prices are seen to be smaller than the farm harvest and wholesale prices in both the sub-periods in all the states in the case of sugarcane (Table 68). Absolute levels of all the three prices are seen to be higher in Maharashtra compared to the other three states. Increase in farm harvest prices and wholesale prices between mid-late seventies and mid-late eighties is noted to be larger than the procurement prices in respective states. The sugar factories are reported to be paying a higher price for cane delivered than the procurement prices fixed by the state agencies. Therefore, procurement prices do not seem to have acted as incentives to cane growers.

Prices of groundnut, specially farm harvest prices and wholesale prices, seem to have doubled between mid-late seventies and mid-late eighties (Table 69). Absolute levels of prices are seen to be higher in the case of Karnataka than Gujarat and Tamilnadu. Procurement prices of groundnut do not seem to have acted as incentive to the producers.

Procurement prices in the case of rapeseed mustard are not reported for any of the three states covered under this study in the sub-period late seventies-early eighties (Table 70). In the sub-period mid-late eighties, the procurement prices are seen to be smaller than the farm harvest and wholesale prices. Absolute

Table 68 : Farm Harvest Prices(A), Procurement Prices(B) and Wholesale Prices(C)
CROP : SUGARCANE (Rs.per Quintal)

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over 1	3 Over 2	3 Over 1
		1	2	3			
ANDHRA PRADESH	A	N.A.	152.54	329.81	-	116.22	-
	B	N.A.	12.81	19.64	-	53.33	-
	C	N.A.	182.40	334.90	-	83.61	-
KARNATAKA	A	N.A.	19.82	23.68	-	19.50	-
	B	N.A.	19.00	18.63	-	-1.96	-
	C	N.A.	N.A.	N.A.	-	-	-
MAHARASHTRA	A	N.A.	200.39	329.99**	-	64.67	-
	B	N.A.	10.00	19.75**	-	97.50	-
	C	N.A.	219.95	458.27**	-	108.35	-
UTTAR PRADESH	A	N.A.	11.58	21.11	-	82.27	-
	B	N.A.	10.00	20.30	-	103.03	-
	C	N.A.	159.67	324.57	-	103.32	-

Table 69 : Farm Harvest Prices(A), Procurement Prices(B) and Wholesale Prices(C)
CROP : GROUNDNUT (Rs.per Quintal)

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over 1	3 Over 2	3 Over 1
		1	2	3			
GUJARAT	A	N.A.	212.33	395.46	-	86.24	-
	B	N.A.	N.A.	293.33	-	-	-
	C	N.A.	207.31 *	430.85	-	107.83	-
KARNATAKA	A	N.A.	219.28	458.20**	-	108.95	-
	B	N.A.	165.00**	360.00**	-	118.18	-
	C	N.A.	248.86	439.82**	-	76.73	-
TAMIL NADU	A	N.A.	220.42	375.07	-	70.16	-
	B	N.A.	N.A.	293.33	-	-	-
	C	N.A.	328.71	637.11	-	93.82	-

Table 70 : Farm Harvest Prices(A), Procurement Prices(B) and Wholesale Prices(C)
CROP : RAPESEED MUSTARD (Rs.per Quintal)

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over 1	3 Over 2	3 Over 1
		1	2	3			
ASSAM	A	N.A.	343.90	452.64	-	31.62	-
	B	N.A.	N.A.	394.33	-	-	-
	C	N.A.	429.59	604.58	-	40.74	-
HARYANA	A	N.A.	368.00 *	656.22	-	78.32	-
	B	N.A.	N.A.	412.67	-	-	-
	C	N.A.	435.10 *	620.83**	-	42.69	-
RAJASTHAN	A	N.A.	390.75	478.47	-	22.45	-
	B	N.A.	N.A.	394.33	-	-	-
	C	N.A.	409.31	N.A.	-	-	-

* : Average based on one year data

** : Average based on two year data

levels of prices are seen to be higher in the case of Haryana compared to other two states and, similarly, the price increases between two sub-periods are also seen to be larger in the case of Haryana as compared to the other two states.

From the above account it can be inferred that procurement price by and large lead the wholesale (open market) price and, further, that only in the case of crops and regions that have experienced technological change, the procurement prices seem to have been used as incentive to producers to adopt the package of new technology by attempting to narrow the difference between the procurement/support price and the open market price.

We shall now examine to what extent has the procurement/support prices might have worked as incentives to farmers to augment production of the crops considered from the long term perspective. The most controversial issue in respect of administered pricing is determining the 'fairness' of the prices from the producers' point of view. It will, however, depend upon the extent of government intervention. In the case of the crops considered in this study the state intervention is limited to the extent of a firm commitment to buy any amount voluntarily offered for sale by the producers at or around farm site at the announced prices except in the case of monopoly procurement of cotton in Maharashtra. In the event of such a marginal intervention arguably cost of production seems to be a fair basis of determining support prices. In determining the procurement/

support prices, the commission on Agricultural Costs and Pricing, in addition to cost of cultivation, also considers trends in open market prices and inter-crop price parity.

Price-Cost Ratios

In the case of paddy even though the ratio of farm harvest prices to cost of production (cost C2) show that the former has kept abreast of the latter in all the sub-periods in all the regions, there is an unmistakable evidence of decline in the ratio between early seventies and mid-late seventies. However, between mid-late seventies and mid-late eighties except the states of Madhya Pradesh and Karnataka all other states show some increases in the ratio; of these states, Haryana, Punjab and West-Bengal show relatively high increase in the ratio compared to Andhra Pradesh, Assam, Bihar, Tamil Nadu and Uttar Pradesh where the increase in the ratio is seen to be marginal (Table 71). Besides, the ratio is seen to be not much greater than unity in terms of cost C2 in most of the regions in most of the sub-periods; in Haryana, Punjab, Andhra Pradesh and Uttar Pradesh in particular, the regions which have experienced technological change of varying degree.

Similarly, the ratio of procurement prices to cost of production show either decline or a very marginal increase in all the states between early seventies and mid-late seventies and except in Assam and Madhya Pradesh the same shows an increase in all other states between mid-late seventies and

Table 71 : Ratio of Farm Harvest Prices to Cost of Production
CROP : PADDY

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
ANDHRA PRADESH	a	2.67	1.68	1.78	-37.02	5.81	-33.36
	b	1.39	1.01	1.09	-27.06	7.85	-21.34
ASSAM	a	4.18	3.07	2.74	-26.61	-10.87	-34.58
	b	1.54	1.37	1.53	-11.42	12.24	-0.58
BIHAR	a	3.20	2.10	2.77	-34.32	31.68	-13.51
	b	1.40	1.06	1.17	-23.81	10.40	-15.88
HARYANA	a	N.A.	1.50	2.11	-	40.40	-
	b	N.A.	0.98	1.28	-	30.22	-
KARNATAKA	a	N.A.	3.36	3.13	-	-6.92	-
	b	N.A.	1.78	1.60	-	-10.15	-
MADHYA PRADESH	a	4.13	2.27	1.88	-44.97	-17.15	-54.41
	b	1.75	1.17	0.96	-33.22	-17.46	-44.88
PUNJAB	a	N.A.	1.70	2.19	-	28.30	-
	b	N.A.	1.08	1.31	-	20.58	-
TAMIL NADU	a	2.99	3.02	2.87	1.02	-5.08	-4.11
	b	1.87	1.84	1.88	-1.63	2.42	0.76
UTTAR PRADESH	a	N.A.	1.85	1.92	-	3.64	-
	b	N.A.	0.89	1.02	-	14.69	-
WEST BENGAL	a	6.66	3.44	4.19	-48.38	21.90	-37.07
	b	2.93	1.84	2.26	-37.35	23.26	-22.78

Table 72 : Ratio of Procurement Prices to Cost of Production
CROP : PADDY

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
ANDHRA PRADESH	a	1.89	1.50	1.60	-20.58	6.71	-15.25
	b	0.98	0.90	0.98	-8.03	8.76	0.03
ASSAM	a	3.41	3.11	2.35	-8.91	-24.32	-31.06
	b	1.26	1.38	1.32	9.94	-4.70	4.77
BIHAR	a	1.95	1.62	2.28	-17.01	40.84	16.88
	b	0.85	0.82	0.97	-3.73	18.09	13.68
HARYANA	a	N.A.	1.38	1.72	-	24.52	-
	b	N.A.	0.90	1.04	-	15.50	-
KARNATAKA	a	N.A.	1.99	2.47	-	24.09	-
	b	N.A.	1.06	1.26	-	19.78	-
MADHYA PRADESH	a	2.26	2.24	1.90	-0.98	-15.10	-15.93
	b	0.96	1.15	0.97	20.17	-15.41	1.64
PUNJAB	a	N.A.	1.77	1.81	-	2.19	-
	b	N.A.	1.12	1.08	-	-3.96	-
TAMIL NADU	a	1.47	1.57	1.54	6.53	-1.44	5.00
	b	0.92	0.95	1.01	3.73	6.36	10.33
UTTAR PRADESH	a	N.A.	1.91	1.92	-	0.58	-
	b	N.A.	0.92	1.02	-	11.31	-
WEST BENGAL	a	2.37	1.44	1.72	-39.13	19.10	-27.51
	b	1.04	0.77	0.93	-26.13	20.43	-11.04

a : with respect to Cost A2
b : with respect to Cost C2

mid-late eighties (Table 72). However, the ratio is seen to be smaller than unity with respect to cost C2 in all the sub-periods in Andhra Pradesh, Bihar, Haryana, Madhya Pradesh, Tamilnadu, Uttar Pradesh and West-Bengal and the same is seen to be marginally higher than unity in the states of Assam, Karnataka and Punjab. It is only with respect to cost A2 (i.e. out of pocket expenses) that the ratio, though either stagnant or falling marginally over the sub-periods, is substantially greater than unity in all the states.

Even the ratio of wholesale price to cost of production (cost C2) shows a declining trend over the sub-periods in most of the states, besides the ratio is seen to be considerably higher than unity only in the case of Madhya Pradesh, Tamilnadu and West-Bengal (Table 73).

Thus it appears from the above analysis that the procurement prices either did not cover the cost of production or barely covered the same in any of the sub-periods, i.e. early seventies, mid-late seventies and mid-late eighties in any of the states. This observation along with the findings of declining ratio of farm harvest prices to cost of production and that the ratio is not found to be much greater than unity and the declining trend in the ratio of wholesale price to cost of production indicate either a deteriorating or stagnant and poor profitability positions of the paddy growers. It may be argued that paddy growers, even in the regions having experienced technological change of varying degrees, have not benefited much

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Table 52 : Ratio of Wholesale Prices to Cost of Production
CROP : PADDY

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
ANDHRA PRADESH	a	3.13	1.90	2.06	-39.38	8.61	-34.16
	b	1.63	1.14	1.26	-29.80	10.70	-22.29
ASSAM	a	N.A.	N.A.	N.A.	-	-	-
	b	N.A.	N.A.	N.A.	-	-	-
BIHAR	a	3.83	2.17	3.60	-43.25	65.82	-5.90
	b	1.67	1.10	1.53	-34.17	39.03	-8.48
HARYANA	a	N.A.	1.56	2.00	-	28.15	-
	b	N.A.	1.02	1.21	-	18.86	-
KARNATAKA	a	N.A.	3.51	3.28	-	-6.49	-
	b	N.A.	1.86	1.68	-	-9.74	-
MADHYA PRADESH	a	7.77	5.71	4.58	-26.47	-19.71	-40.96
	b	3.28	2.93	2.34	-10.77	-20.00	-28.62
PUNJAB	a	N.A.	2.13	2.17	-	1.66	-
	b	N.A.	1.36	1.30	-	-4.46	-
TAMIL NADU	a	2.59	3.31	3.02	28.04	-8.83	16.73
	b	1.61	2.01	1.98	24.68	-1.62	22.66
UTTAR PRADESH	a	N.A.	2.21	2.25	-	2.08	-
	b	N.A.	1.06	1.20	-	12.96	-
WEST BENGAL	a	7.45	3.76	4.00	-49.50	6.47	-46.23
	b	3.28	2.01	2.16	-38.72	7.66	-34.02

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Table 53 : Ratio of Farm Harvest Prices to Cost of Production
CROP : WHEAT

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
HARYANA	a	2.86	1.86	2.33	-34.99	25.66	-18.31
	b	1.46	1.02	1.37	-30.07	35.02	-5.58
MADHYA PRADESH	a	3.26	2.56	2.42	-21.46	-5.48	-25.76
	b	1.54	1.30	1.24	-15.73	-4.70	-19.69
PUNJAB	a	2.39	1.83	2.03	-23.66	11.05	-15.22
	b	1.23	1.11	1.22	-9.33	9.83	-0.42
RAJASTHAN	a	N.A.	2.82	2.76	-	-2.14	-
	b	N.A.	1.44	1.46	-	0.85	-
UTTAR PRADESH	a	3.05	2.16	2.08	-29.32	-3.42	-31.74
	b	1.52	1.14	1.27	-25.41	12.09	-16.39

a : with respect to Cost A2
b : with respect to Cost C2

in terms of net income. Against out of pocket expenses (cost A2), however, though the ratio with each prices shows overall decline between seventies and eighties, is seen to be reasonably high (near 2) in the case of all the states. This shows that against out of pocket expenses returns are reasonably high for paddy growers.

In the case of wheat the ratio of farm harvest price to cost of production (cost C2) is seen to have decreased between early seventies and mid-late seventies in all the states and then it is seen to have increased marginally between mid-late seventies and mid-late eighties, showing an over all decrease between seventies and eighties (Table 74). The ratio is also seen to be marginally higher than unity in the case of all states.

Table 75 shows the ratio of procurement price to cost of production of wheat. In this case also the ratio is seen to have declined between early seventies and mid-late seventies in all the states indicating that the procurement price announced and made effective did not keep pace with increasing cost of production (cost C2) between early seventies and mid-late seventies. Between mid-late seventies and mid-late eighties, however, the ratio shows a marginal increase, hence an overall decrease in the ratio is observed between seventies and eighties in the case of all the states. Further, the ratio is seen to be marginally higher than unity in all the states, specially in mid-late seventies and mid-late eighties. This shows that procurement/support prices announced by the state agencies might not have acted as

Table 75 : Ratio of Procurement Prices to Cost of Production
CROP : WHEAT

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
HARYANA	a	2.60	1.86	2.10	-28.53	13.47	-18.91
	b	1.32	1.02	1.24	-23.13	21.93	-6.27
MADHYA PRADESH	a	2.94	2.05	2.04	-30.29	-0.42	-30.59
	b	1.39	1.04	1.04	-25.21	0.40	-24.91
PUNJAB	a	2.36	1.72	1.97	-27.26	14.60	-16.64
	b	1.21	1.05	1.19	-13.61	13.34	-2.09
RAJASTHAN	a	N.A.	2.21	2.40	-	8.55	-
	b	N.A.	1.13	1.27	-	11.86	-
UTTAR PRADESH	a	2.65	2.13	2.04	-19.71	-4.07	-22.98
	b	1.32	1.12	1.25	-15.26	11.34	-5.65

Table 76 : Ratio of Wholesale Prices to Cost of Production
CROP : WHEAT

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
HARYANA	a	2.99	1.95	2.53	-34.75	29.70	-15.37
	b	1.53	1.07	1.49	-29.82	39.37	-2.18
MADHYA PRADESH	a	3.74	2.80	2.96	-25.09	5.68	-20.84
	b	1.77	1.42	1.52	-19.63	6.55	-14.36
PUNJAB	a	2.49	1.93	2.32	-22.57	20.36	-6.80
	b	1.28	1.18	1.40	-8.04	19.04	9.48
RAJASTHAN	a	N.A.	2.69	2.92	-	8.27	-
	b	N.A.	1.38	1.54	-	11.57	-
UTTAR PRADESH	a	3.33	2.38	2.42	-28.55	1.46	-27.51
	b	1.66	1.25	1.48	-24.60	17.76	-11.21

a : with respect to Cost A2
b : with respect to Cost C2

incentives for the producers to augment supply. But, since the ratio is seen to have remained consistently above unity, albeit marginally in most cases, and since farm harvest prices are seen to have remained at higher level than the procurement prices in all the sub-periods, the producers of wheat might not have unduly suffered on account of rising cost of production.

The scenario does not seem to change when the ratio of wholesale prices to cost of production is considered (Table 76). The ratio, though considerably greater than unity, is seen to decline between early seventies and mid-late seventies and then seen to increase marginally between mid-late seventies and mid-late eighties leading to over all decline in the ratio between seventies and eighties in most of the cases.

The above analysis shows that though the wheat growers on an average fared comparatively better than the paddy growers, net gains from wheat production does not seem to be economically very encouraging and the procurement prices announced by the state agencies may have acted as weak incentives to the wheat producers even in the regions known for having experienced technological change. It may however be pointed out that the ratio of each of the prices (farm harvest, procurement and wholesale) to cost A2 of production, though shows overall decline between seventies and eighties in most of the cases, is seen to be very high (greater than 2) in the case of all the states. This shows that against our of the pocket expenses, the returns have been very considerably high for wheat growers.

In the case of gram the ratio of farm harvest prices to cost of production (cost C2) is seen to have increased between late seventies-early eighties and mid-late eighties in the case of all the states and also to have been around or more than 1.40 in the case of all states except Madhya Pradesh (Table 77).

Since the procurement price data were not available for the sub-period late seventies-early eighties, nothing could be said about changes in the ratio of procurement prices to cost of production, however, the ratio is seen to be either smaller than unity or near unity in the case of all the four states in the sub-period mid-late eighties (Table 78). Procurement prices thus do not seem to have covered cost of production in eighties and hence could not have acted as incentive price to gram producers.

Ratio of wholesale price to cost of production shows increase in mid-late eighties over late seventies-early eighties in the case of all the four states and further that the ratio is seen to be greater than 1.40 in all the states except Madhya Pradesh (Table 79).

The above analysis shows that even though the procurement prices did not cover the cost of production, since there is no procurement of gram by the state agencies, the procurement prices announced by the state agencies remain in-operative and further that since the farm harvest prices and wholesale prices remained considerably above unity and rising gram

Table 77 : Ratio of Farm Harvest Prices to Cost of Production
CROP : GRAM

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
HARYANA	a	N.A.	2.72	3.46	-	26.91	-
	b	N.A.	1.16	1.37	-	18.67	-
MADHYA PRADESH	a	2.02	2.65	2.59	31.29	-2.34	28.22
	b	1.00	1.09	1.28	8.58	17.54	27.62
RAJASTHAN	a	N.A.	3.46	3.31	-	-4.34	-
	b	N.A.	1.47	1.66	-	12.81	-
UTTAR PRADESH	a	N.A.	2.47	3.01	-	21.66	-
	b	N.A.	1.19	1.43	-	19.92	-

Table 78 : Ratio of Procurement Prices to Cost of Production
CROP : GRAM

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
HARYANA	a	N.A.	N.A.	2.14	-	-	-
	b	N.A.	N.A.	0.85	-	-	-
MADHYA PRADESH	a	N.A.	2.25	1.86	-	-17.45	-
	b	N.A.	0.93	0.92	-	-0.65	-
RAJASTHAN	a	N.A.	N.A.	2.22	-	-	-
	b	N.A.	N.A.	1.11	-	-	-
UTTAR PRADESH	a	N.A.	2.01	2.14	-	6.56	-
	b	N.A.	0.97	1.02	-	5.03	-

Table 79 : Ratio of Wholesale Prices to Cost of Production
CROP : GRAM

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
HARYANA	a	N.A.	2.68	3.63	-	35.34	-
	b	N.A.	1.14	1.44	-	26.54	-
MADHYA PRADESH	a	2.40	3.20	3.12	33.25	-2.41	30.04
	b	1.19	1.32	1.55	10.20	17.46	29.44
RAJASTHAN	a	N.A.	3.84	3.35	-	-12.79	-
	b	N.A.	1.63	1.68	-	2.84	-
UTTAR PRADESH	a	N.A.	2.84	3.33	-	17.12	-
	b	N.A.	1.37	1.58	-	15.45	-

a : with respect to Cost A2

b : with respect to Cost C2

producers' net income-positions except perhaps in Madhya Pradesh may have improved. Further, against, out of pocket expenses (Cost A2) improvement in net income position is seen to be even higher.

As regards cotton the ratio of farm harvest prices to cost of production (cost C2) is seen to have declined between mid-late seventies and mid-late eighties in all the states except Punjab and further that farm harvest prices are seen to have remained lower than cost of production in mid-late eighties in all the states except Punjab (Table 80). However, even in Punjab over all decrease in the ratio is seen to have taken place between seventies and eighties.

The ratio of procurement prices to cost production though is seen to have increased between mid-late seventies and mid-late eighties in all the states reported except in Maharashtra, the same is seen to have remained less than unity or just unity except in Punjab (Table 81). The procurement prices announced by the state agencies therefore do not seem to have covered the cost of production in Punjab in early seventies and mid-late seventies and in Gujarat, Karnataka and Maharashtra in mid-late seventies and mid-late eighties.

The ratio of wholesale prices to cost of production is seen to have declined between mid-late seventies and mid-late eighties in all the states except Punjab. In fact in Maharashtra, the same is even much smaller than unity (Table 82).

Table 80 : Ratio of Farm Harvest Prices to Cost of Production
CROP : COTTON

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
GUJARAT	a	N.A.	1.69	1.49	-	-11.54	-
	b	N.A.	1.11	0.96	-	-13.38	-
KARNATAKA	a	N.A.	2.81	1.52	-	-45.83	-
	b	N.A.	1.36	0.92	-	-32.36	-
MAHARASHTRA	a	N.A.	1.88	1.47	-	-21.76	-
	b	N.A.	1.06	0.97	-	-8.84	-
PUNJAB	a	3.14	2.11	2.81	-32.83	33.29	-10.47
	b	1.44	1.07	1.40	-25.84	31.46	-2.51

Table 81 : Ratio of Procurement Prices to Cost of Production
CROP : COTTON

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
GUJARAT	a	N.A.	0.98	1.27	-	29.52	-
	b	N.A.	0.64	0.82	-	26.82	-
KARNATAKA	a	N.A.	1.82	1.68	-	-7.36	-
	b	N.A.	0.88	1.02	-	15.67	-
MAHARASHTRA	a	N.A.	1.56	1.17	-	-25.11	-
	b	N.A.	0.88	0.77	-	-12.73	-
PUNJAB	a	1.93	1.77	2.60	-7.99	46.54	34.84
	b	0.88	0.90	1.30	1.59	44.54	46.83

Table 82 : Ratio of Wholesale Prices to Cost of Production
CROP : COTTON

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
GUJARAT	a	N.A.	1.96	1.69	-	-13.99	-
	b	N.A.	1.29	1.09	-	-15.78	-
KARNATAKA	a	N.A.	2.56	N.A.	-	-	-
	b	N.A.	1.24	N.A.	-	-	-
MAHARASHTRA	a	N.A.	1.98	1.31	-	-33.81	-
	b	N.A.	1.12	0.86	-	-22.88	-
PUNJAB	a	2.72	2.20	2.86	-19.02	29.86	5.15
	b	1.25	1.12	1.43	-10.60	28.08	14.51

a : with respect to Cost A2

b : with respect to Cost C2

The above account clearly shows the deteriorating net income of the cotton growers in the three states of Gujarat, Karnataka and Maharashtra. Maharashtra cotton growers who are under the monopoly procurement scheme for cotton seem to have fared worst among the four states considered in this study. Punjab is the only state where the farm harvest price, procurement price and wholesale price in mid-late eighties seem to have improved the net income position of the cotton growers and further that the procurement price/announced by the state agencies may have acted as incentives to the cotton growers in this state. In terms of cost A2, out of pocket expenses, however, though the ratios with respect to each of the prices, in general, show declining trend between mid-late seventies and mid-late eighties in all the states except Punjab, these are considerably above unity indicating reasonably good net income position against out of pocket expenses in all the states.

As regards sugarcane, the ratio of farm harvest price to cost of production (cost C2) is seen to be considerably greater than unity in all the four states considered in this study and the same is also seen to have increased between mid-late seventies and mid-late eighties in all the states except Maharashtra (Table 83). The state of Maharashtra, known for sugarcane production in India shows a declining trend in the ratio.

Except Uttar Pradesh, having highest area under sugarcane in India, the other three states show decline in the ratio of procurement price to cost of production between mid-late seventies

Table 83 : Ratio of Farm Harvest Prices to Cost of Production
CROP : SUGARCANE

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
ANDHRA PRADESH	a	N.A.	24.97	32.87	-	31.67	-
	b	N.A.	14.18	18.37	-	29.43	-
KARNATAKA	a	N.A.	3.92	4.16	-	6.19	-
	b	N.A.	1.92	2.05	-	6.66	-
MAHARASHTRA	a	N.A.	41.18	28.92	-	-29.71	-
	b	N.A.	25.42	19.65	-	-22.67	-
UTTAR PRADESH	a	N.A.	3.58	3.73	-	4.17	-
	b	N.A.	1.53	1.65	-	7.63	-

Table 84 : Ratio of Procurement Prices to Cost of Production
CROP : SUGARCANE

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
ANDHRA PRADESH	a	N.A.	2.10	1.96	-	-6.63	-
	b	N.A.	1.19	1.09	-	-8.22	-
KARNATAKA	a	N.A.	3.76	3.28	-	-12.88	-
	b	N.A.	1.84	1.61	-	-12.50	-
MAHARASHTRA	a	N.A.	2.05	1.73	-	-15.70	-
	b	N.A.	1.27	1.18	-	-7.26	-
UTTAR PRADESH	a	N.A.	3.09	3.59	-	16.04	-
	b	N.A.	1.33	1.59	-	19.89	-

Table 85 : Ratio of Wholesale Prices to Cost of Production
CROP : SUGARCANE

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
ANDHRA PRADESH	a	N.A.	29.85	33.38	-	11.81	-
	b	N.A.	16.97	18.65	-	9.91	-
KARNATAKA	a	N.A.	N.A.	N.A.	-	-	-
	b	N.A.	N.A.	N.A.	-	-	-
MAHARASHTRA	a	N.A.	45.16	40.16	-	-11.07	-
	b	N.A.	27.88	27.29	-	-2.16	-
UTTAR PRADESH	a	N.A.	49.32	57.30	-	16.20	-
	b	N.A.	21.15	25.39	-	20.06	-

a : with respect to Cost A2

b : with respect to Cost C2

and mid-late eighties (Table 84). The ratio is, however, seen to be marginally higher than unity in Andhra Pradesh and Maharashtra and considerably greater than unity in Karnataka and Uttar Pradesh, in mid-late eighties.

The wholesale price data was not available for Karnataka but, out of the remaining three states, states of Andhra Pradesh and Uttar Pradesh showed increase and the state of Maharashtra showed decrease in the ratio of wholesale prices to cost of production though the ratio is seen to be higher than 2 in Maharashtra and Uttar Pradesh, two important states for sugarcane production and slightly below 2 in Andhra Pradesh (Table 85).

The above analysis shows that procurement prices announced by the state agencies did cover cost of production but the procurement price seems to have remained in-operative as the farm harvest prices of cane as well as the prices paid by sugar factories to the cane growers seem to have been much higher in all the states indicating a reasonable net income position of the cane growers. Thus, it appears that cane growers in all the states have benefited from productivity increases even though brought about through increased cost of production. In the state of Maharashtra even though cost of production is seen to be higher than that of Karnataka, because of relatively higher prices of cane received by the farmers through co-operative sugar factories, the profitability positions of Maharashtra cane growers appear to be comparatively better.

In the case of groundnut, the ratio of farm harvest price to cost of production is seen to have declined substantially in Tamilnadu and increased marginally in Gujarat and Karnataka

between mid-late seventies and mid-late eighties. The ratio is however, near unity or marginally higher than unity in all the states (Table 86).

The ratio of procurement price to cost of production presented in Table 87 shows that in the period mid-late eighties the procurement prices announced by the state agencies hardly covered the cost of production in all the three states.

Similarly, the ratio of wholesale price to cost of production presented in Table 88 shows that the wholesale prices prevailing in mid-late seventies and mid-late eighties barely covered cost of production of groundnut in Gujarat and Karnataka. Only in the state of Tamilnadu, though the ratio shows a decline, it is still greater than 2 in the sub-period mid-late eighties.

It may be inferred from the above analysis that procurement prices announced by the state agencies could not have been an incentive for the groundnut producers and might have been in-operative. Further, farm harvest price and procurement price hardly covering the cost of production and wholesale price keeping barely above the cost of production, the groundnut producers net income position in Gujarat and Tamilnadu might have either deteriorated or at best remained stagnant. Only in the case of Tamilnadu, the wholesale prices keeping much abreast of cost of production, the net income position of the groundnut growers seems to be comparatively better. In terms of cost A2, out of pocket expenses, however, the ratios to farm harvest, procurement and wholesale prices being considerably higher than

Table 86 : Ratio of Farm Harvest Prices to Cost of Production
CROP : GROUNDNUT

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
GUJARAT	a	N.A.	1.51	1.48	-	-2.04	-
	b	N.A.	0.84	1.00	-	19.10	-
KARNATAKA	a	N.A.	1.74	2.10	-	20.40	-
	b	N.A.	1.05	1.27	-	21.76	-
TAMIL NADU	a	N.A.	3.18	2.17	-	-31.64	-
	b	N.A.	1.83	1.30	-	-28.88	-

Table 87 : Ratio of Procurement Prices to Cost of Production
CROP : GROUNDNUT

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
GUJARAT	a	N.A.	N.A.	1.10	-	-	-
	b	N.A.	N.A.	0.74	-	-	-
KARNATAKA	a	N.A.	1.31	1.65	-	25.72	-
	b	N.A.	0.79	1.00	-	27.13	-
TAMIL NADU	a	N.A.	N.A.	1.70	-	-	-
	b	N.A.	N.A.	1.02	-	-	-

Table 88 : Ratio of Wholesale Prices to Cost of Production
CROP : GROUNDNUT

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
GUJARAT	a	N.A.	1.47	1.61	-	9.32	-
	b	N.A.	0.82	1.09	-	32.90	-
KARNATAKA	a	N.A.	1.98	2.01	-	1.83	-
	b	N.A.	1.19	1.22	-	2.98	-
TAMIL NADU	a	N.A.	4.74	3.69	-	-22.13	-
	b	N.A.	2.72	2.21	-	-18.99	-

a : with respect to Cost A2

b : with respect to Cost C2

unity in all the sub-periods in all the states, the net income positions seem to ^{be} considerably better for the groundnut growers.

In the case of rapeseed-mustard except in the case of Assam, the other two states of Haryana and Rajasthan show increases in the ratio of farm harvest prices to cost of production (cost C2) between late seventies-early eighties and mid-late eighties, and the ratio in these two states are seen to very considerably greater than unity (Table 89).

Assam also shows a smaller than unity ratio of procurement prices to cost of production in mid-late eighties depicting that procurement price announced by state agencies was not covering the cost of production. In Haryana and Rajasthan, however, the procurement prices are seen to be considerably higher than cost of production in mid-late eighties, (Table 90).

As regards the ratio of wholesale price to cost of production, all the states show it to be very considerably larger than unity in all the sub-periods (Table 91).

From the above analysis we may infer that in the case of Assam, the procurement price, not covering cost of production and farm harvest price barely covering cost of production, the rapeseed-mustard growers' net income position might have deteriorated during eighties. In the case of other two states, the procurement prices might have acted as incentives to the producers and their net income positions might have improved in eighties. In the case of Assam, however, net income against

Table 89 : Ratio of Farm Harvest Prices to Cost of Production
CROP : RAPESEED MUSTARD

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
ASSAM	a	N.A.	5.04	2.57	-	-49.10	
	b	N.A.	1.79	1.07	-	-40.16	
HARYANA	a	N.A.	3.15	4.89	-	55.22	
	b	N.A.	1.34	2.07	-	54.09	
RAJASTHAN	a	N.A.	3.77	4.43	-	17.48	
	b	N.A.	1.54	1.76	-	14.37	

Table 90 : Ratio of Procurement Prices to Cost of Production
CROP : RAPESEED MUSTARD

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
ASSAM	a	N.A.	N.A.	2.24	-	-	-
	b	N.A.	N.A.	0.93	-	-	-
HARYANA	a	N.A.	N.A.	3.08	-	-	-
	b	N.A.	N.A.	1.30	-	-	-
RAJASTHAN	a	N.A.	N.A.	3.65	-	-	-
	b	N.A.	N.A.	1.45	-	-	-

Table 91 : Ratio of Wholesale Prices to Cost of Production
CROP : RAPESEED MUSTARD

State		Triennium Averages			%Increase/Decrease		
		Sub-periods			2 Over	3 Over	3 Over
		1	2	3	1	2	1
ASSAM	a	N.A.	6.30	3.43	-	-45.57	-
	b	N.A.	2.24	1.43	-	-36.01	-
HARYANA	a	N.A.	3.73	4.63	-	24.21	-
	b	N.A.	1.58	1.95	-	23.30	-
RAJASTHAN	a	N.A.	3.95	N.A.	-	-	-
	b	N.A.	1.61	N.A.	-	-	-

a : with respect to Cost A2

b : with respect to Cost C2

cost A2, as depicted by the ratios of farm harvest, procurement and wholesale prices each to cost of production, seems to have been considerably better, though declining over sub-periods.

Analysis of cost-price relationships, as mentioned earlier, is based, on the one hand, on the farm harvest price, procurement/support price and wholesale price and, on the other, on the cost of production of the sample producers. Admittedly, the actual output of the sample producers would be of heterogenous quality and the quality might also be changing and the price data, obtained from different sources, therefore, would not represent the average value (price) for the heterogenous quality of output for each crop. In our opinion, however, this discrepancy in data is not of such order as to invalidate the analysis carried out. The results of the analysis can, therefore, be considered as indicative in nature with greater degree of confidence.

The overall picture that emerges from the analysis is as follows. Firstly, in the case of two cereals crops (paddy and wheat), for which price data were available for all the three sub-periods, a decrease in the ratio of prices to cost, with respect to all the three sets of prices, is observed between early seventies and mid-late eighties in the case of all the states. This decrease is mainly seen to be on account of a relatively large decrease in these ratios between early seventies and mid-late seventies which override the impact of any increase in these ratios between mid-late seventies and mid-eighties in many states. Thus, there appears to be strong indication towards

deteriorating net return realisable by the producers of rice and wheat in mid-late eighties compared to what existed in mid-seventies. Further, in the case of paddy the ratio of procurement price to full cost of production is seen to have been less than 1 or near 1 in different sub-periods in almost all the states, including the states which experienced technological change of different degrees. The procurement prices announced for paddy do not seem to be of the level as to cover the cost of production and therefore may have been a disincentive for the paddy producers in adopting package of new technology. In this respect the wheat producers seemed to have fared better as the procurement price announced is seen to be higher than (albiet marginally in many cases) the full cost of production in all the sub-periods for all the regions.

Secondly, in the case of the pulse crop gram, the procurement price announced, being consistently lower than full cost of production, seem to have been in-operative in both the periods in all the regions. However, the increasing ratio of farm harvest price and wholesale price to full cost of production over the period and the ratio being significantly higher than 1, seemsto have improved the net return of the producers.

Thirdly, in the case of cotton the procurement prices announced in mid-late seventies and mid-late eighties are seen to be smaller than the full cost of production and, further, that ratios with respect to all the prices to cost are seen to be falling from mid-late seventies to mid eighties in almost all

the states except Punjab. This is an indication of deteriorating net return positions of the cotton growers over the years in all the regions except Punjab.

Fourthly, the sugarcane growers seem to have been able to maintain the reasonable level of net return mainly because the farm harvest price and factory gate price have been considerably higher in both the sub-periods in all the four regions, specially in Uttar Pradesh accounting for largest area under cane in the country. Only the state of Maharashtra shows a declining trend in all the price-cost ratios showing some erosion in net return of sugarcane producers in mid-late eighties over mid-late seventies.

Fifthly, the net returns to the groundnut producers do not seem to have changed any significantly in any of the three regions in mid-late eighties over mid-late seventies. Procurement price-full cost ratio being less than 1 or very near 1, the procurement prices do not seem to have acted as incentive to the groundnut producers.

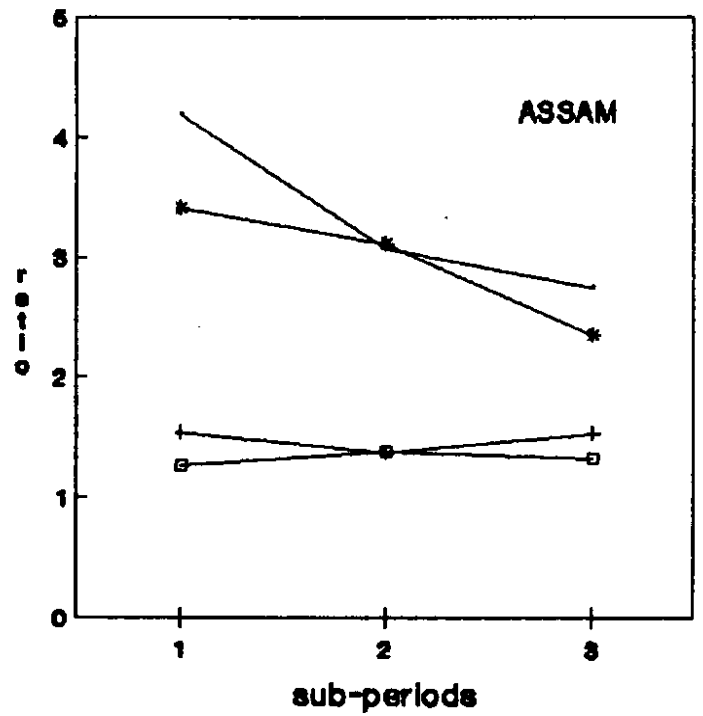
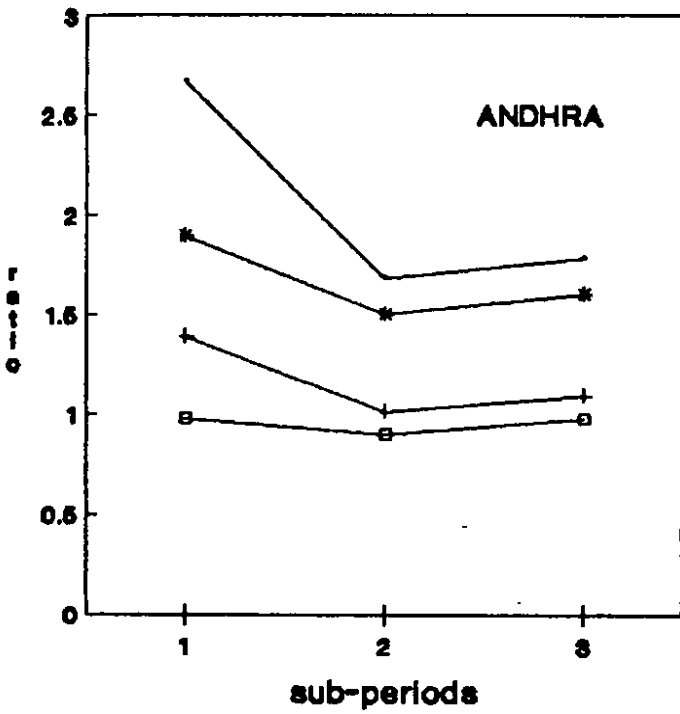
Lastly, the rapeseed-mustard producers in Haryana seem to have improved net return from rapeseed-mustard production owing to increased farm harvest procurement/support and wholesale prices relative to cost of production. Producers of this oilseed crop in Assam, on the other hand, seem to have suffered on account of deteriorating price-cost relationship on the whole.

It is, however, necessary to remember here that the wholesale prices (open market) is positively correlated to the

procurement prices. Hence, any attempt to stem the deteriorating price-cost relationship through hike in procurement price with a view to improve the net return of agricultural producer will lead to increases in market prices of agricultural produce which in turn will push agricultural production, e.g., foodgrains, edible oil and raw material for agro-processing industries, like cotton, sugarcane, etc. into high cost syndrome, which the country can ill afford at this juncture. As noted earlier, the main reason for rising cost of production is largely on account of increase in prices of inputs and secondly on account of increased use of input. Analysis at constant price show that in the case of states and crops that experienced technological change, over the sub-periods either the cost of production decreased marginally or increased marginally. There is, however, evidence that the yield levels in the case of many crops and regions having experienced technological change have reached their plateau by eighties. Under these circumstances costs are bound to increase to maintain the same yield level. Besides, we have seen in our discussion in the earlier section that cost increases on account of operational costs are mainly due to cost on human and animal labour and, further, the cost increases on account of fixed cost are mainly due to cost on the imputed value of own land.

Judicious and efficient use of these factor inputs are called for to improve productivity and decrease cost. Rental value of own land which is an imputed cost should reflect the productive

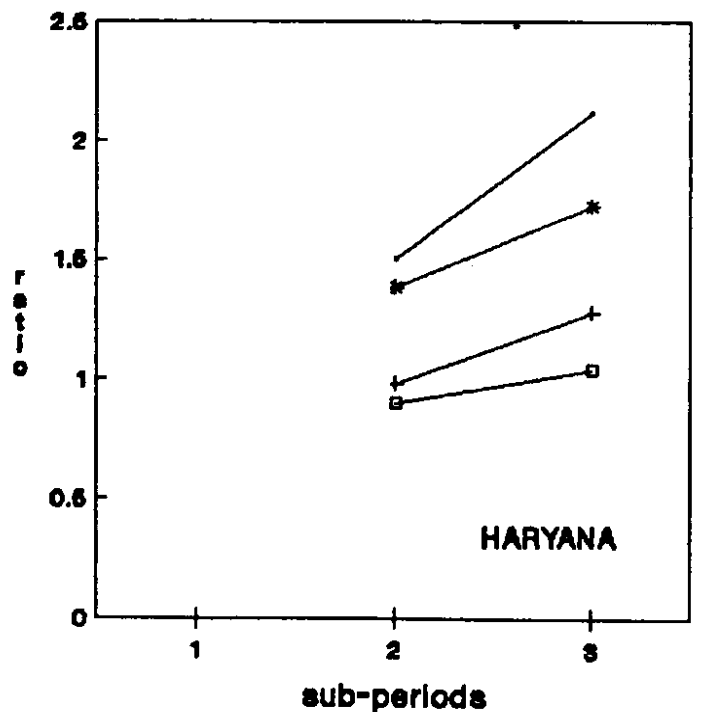
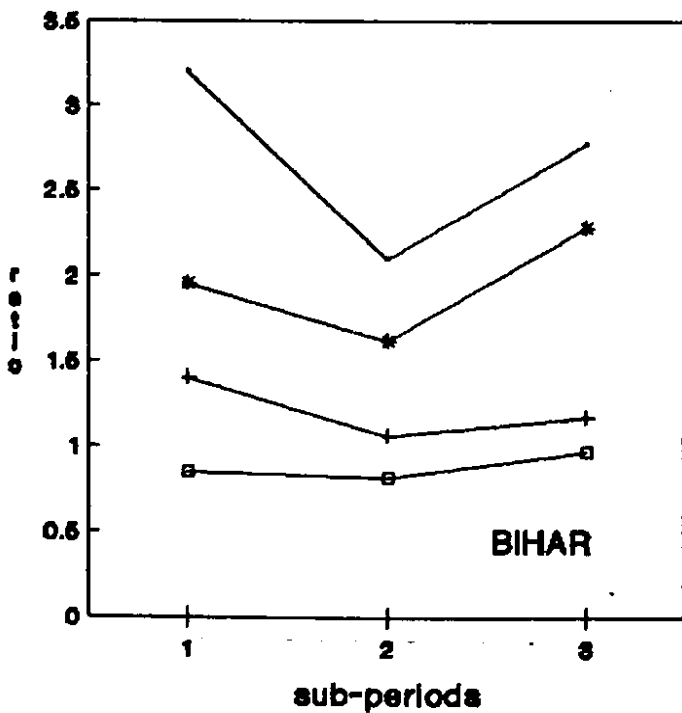
Figure 1 : Ratios of Procurement Price (PP) and Farm Harvest Price (FP) to Cost of Production of Paddy



— A1 + B1 * A2 — B2

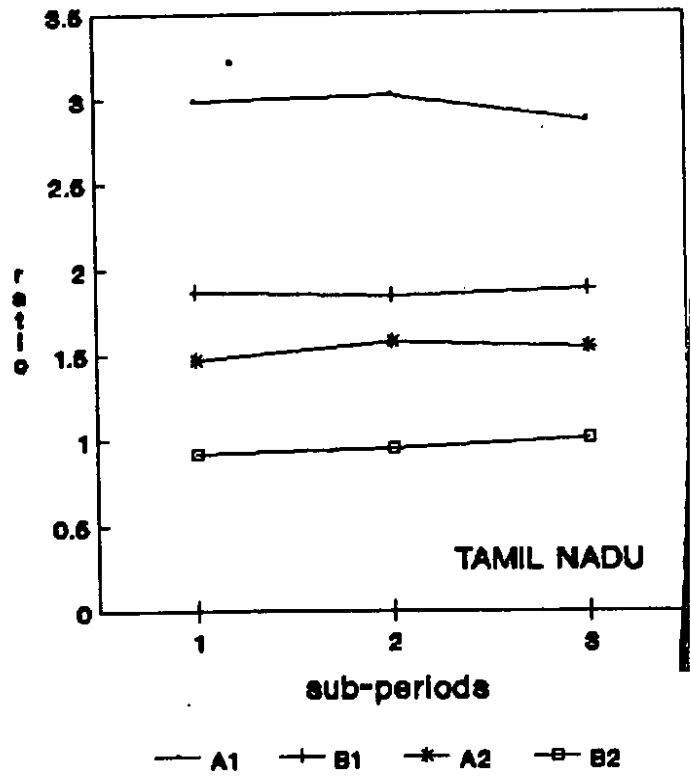
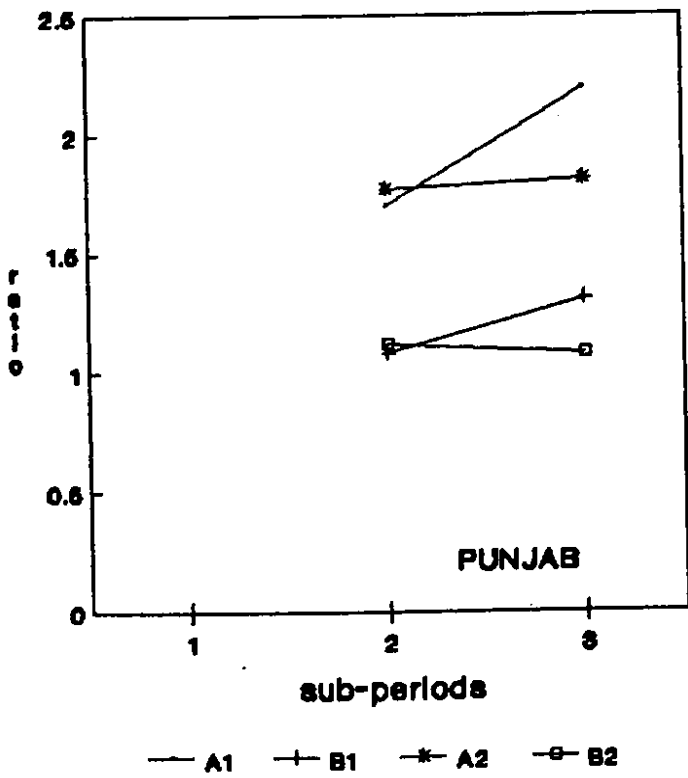
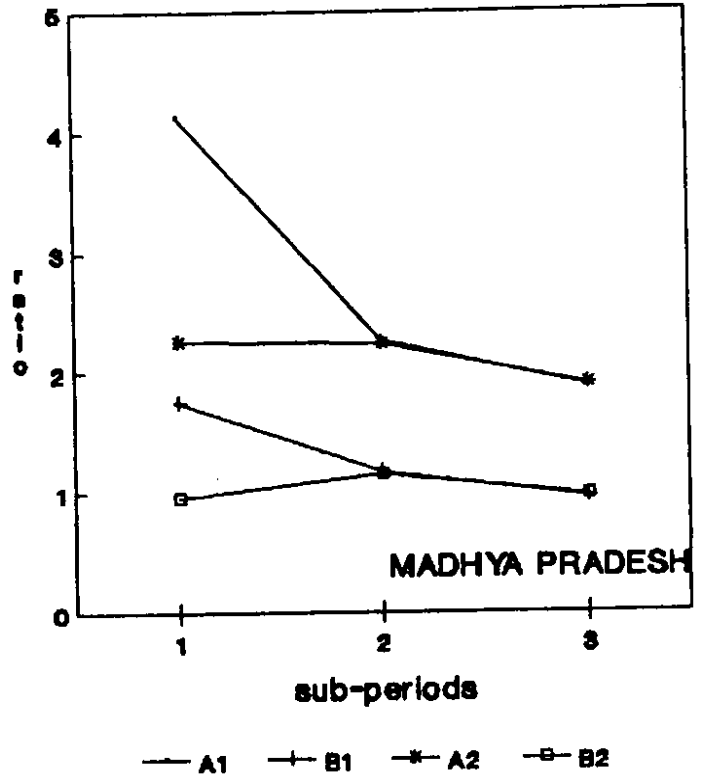
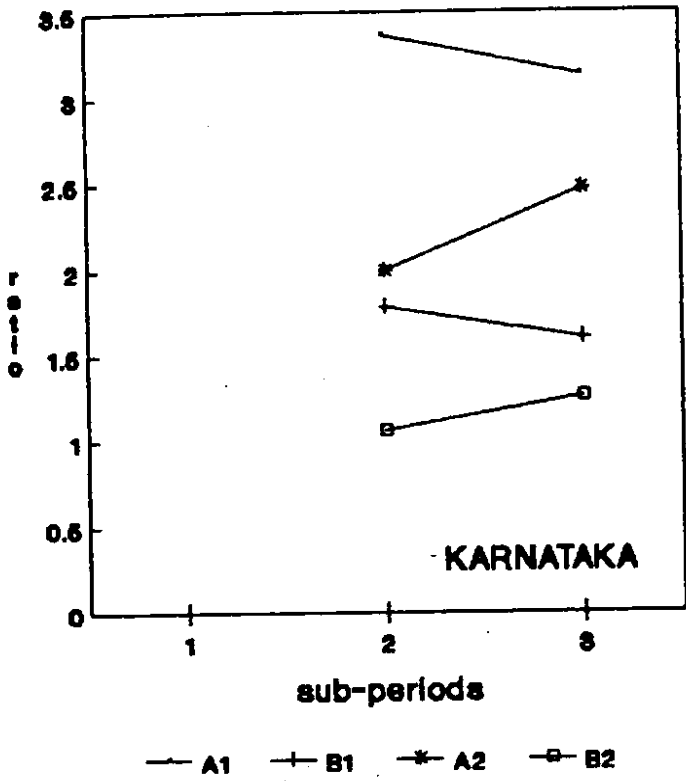
— A1 + B1 * A2 — B2

A1 = Ratio of FP with respect to Cost A2
 B1 = Ratio of FP with respect to Cost C2
 A2 = Ratio of PP with respect to Cost A2
 B2 = Ratio of PP with respect to Cost C2

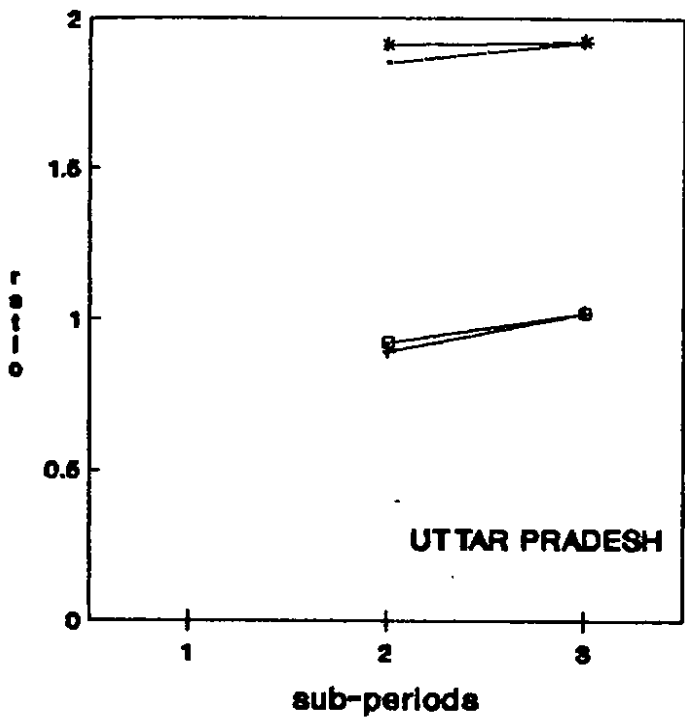


— A1 + B1 * A2 — B2

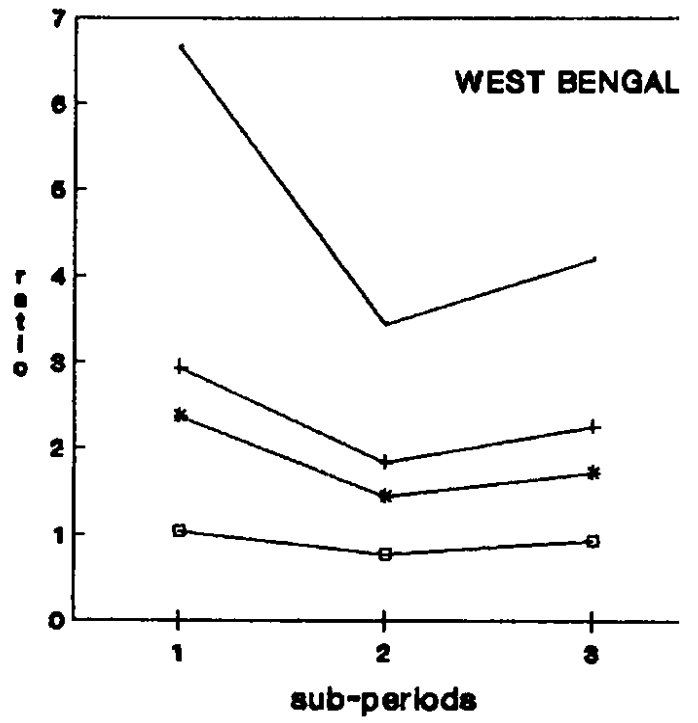
— A1 + B1 * A2 — B2



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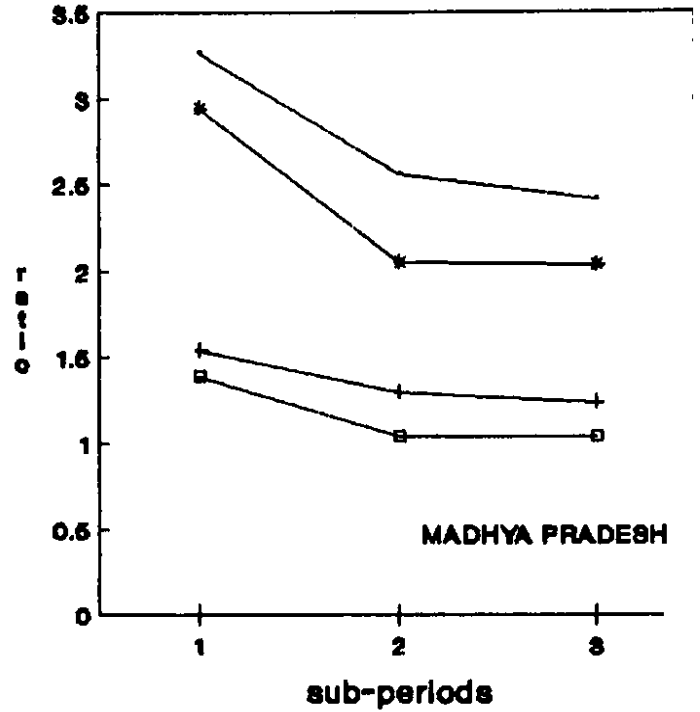
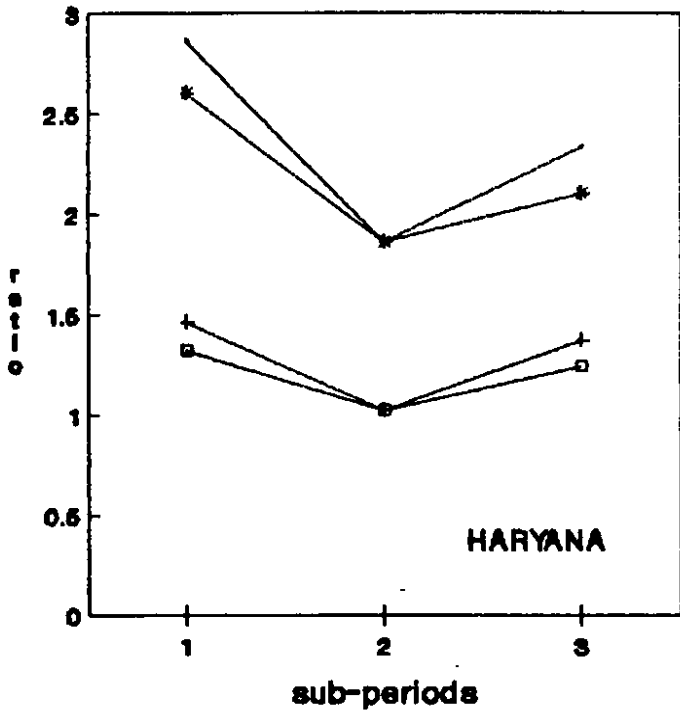


— A1 + B1 * A2 □ B2



— A1 + B1 * A2 □ B2

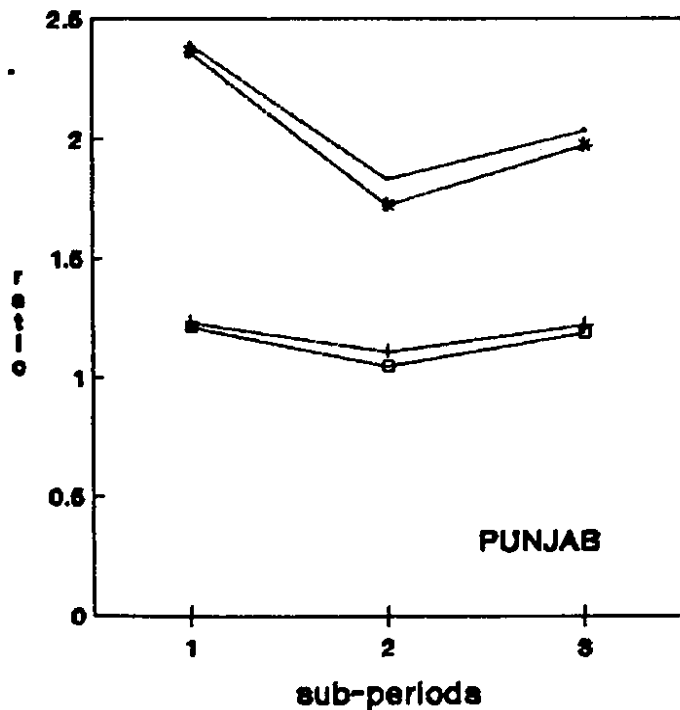
Figure 2 : Ratios of Procurement Price (PP) and Farm Harvest Price (FP) to Cost of Production of Wheat



— A1 + B1 * A2 □ B2

— A1 + B1 * A2 □ B2

A₁ = Ratio of FP with respect to Cost A₂
 B₁ = Ratio of FP with respect to Cost C₂
 A₂ = Ratio of PP with respect to Cost A₂
 B₂ = Ratio of PP with respect to Cost C₂



— A1 + B1 * A2 □ B2

contd.

contd.

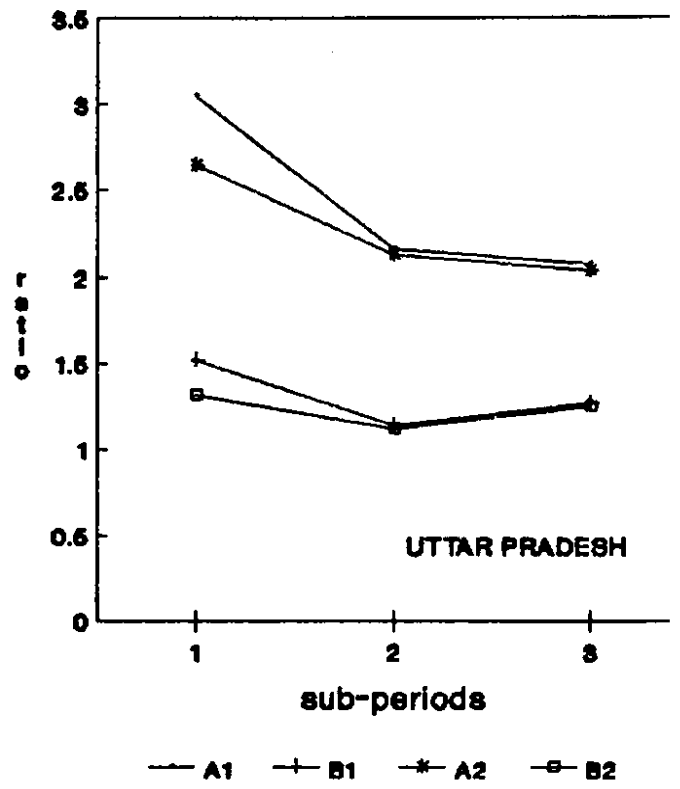
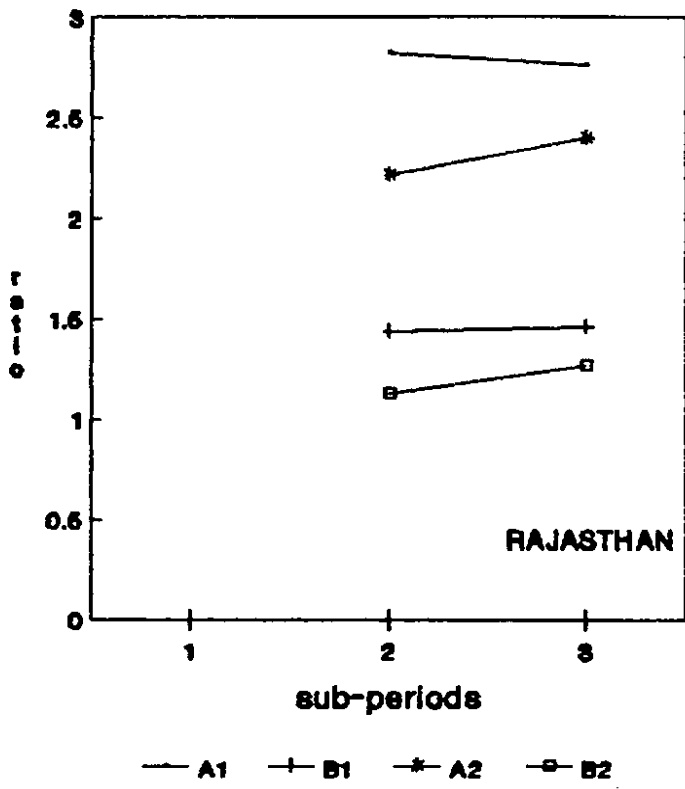
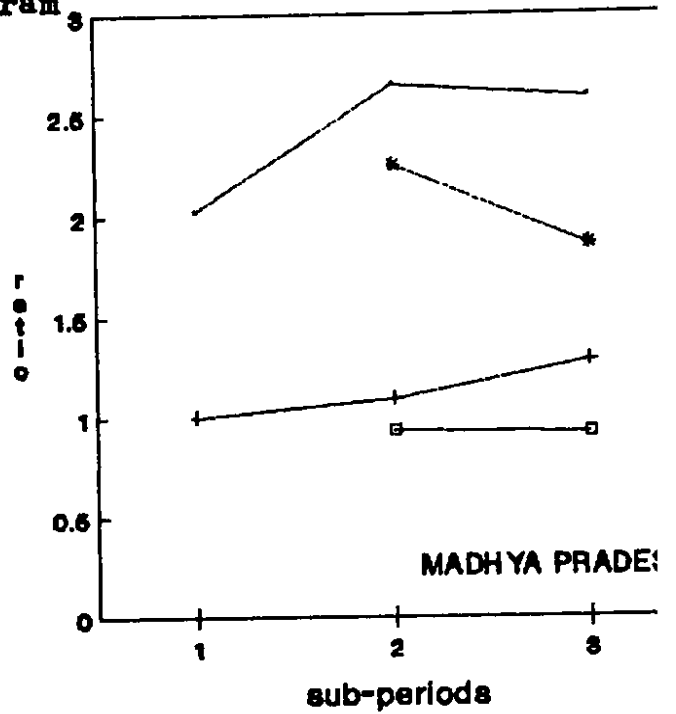
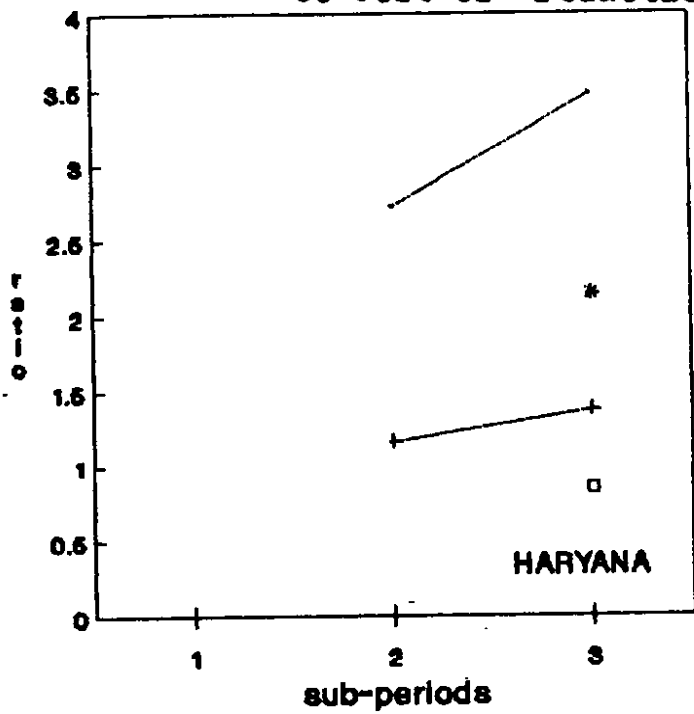


Figure 3 : Ratios of Procurement Price (PP) and Farm Harvest Price (FP) to Cost of Production of Gram



— A1 —+ B1 —* A2 —□ B2

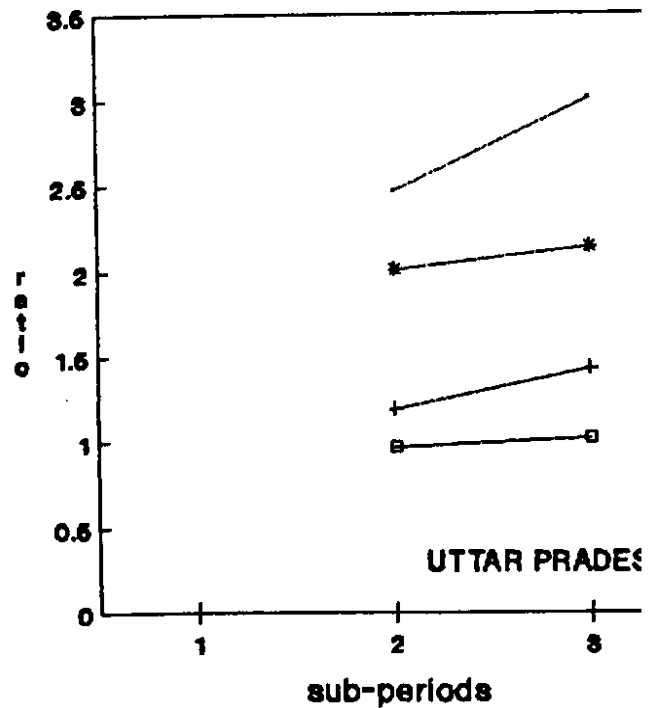
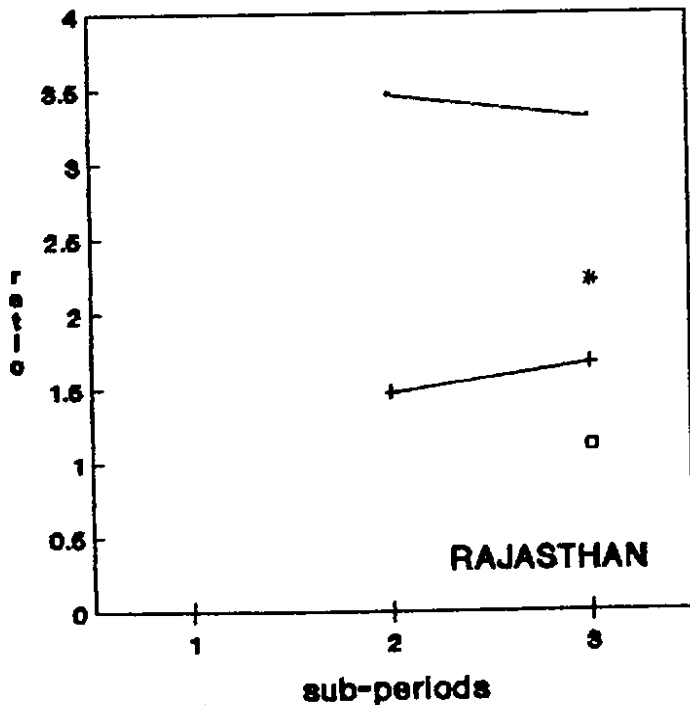
— A1 —+ B1 —* A2 —□ B2

A₁ = Ratio of FP with respect to Cost A₂

B₁ = Ratio of FP with respect to Cost C₂

A₂ = Ratio of PP with respect to Cost A₂

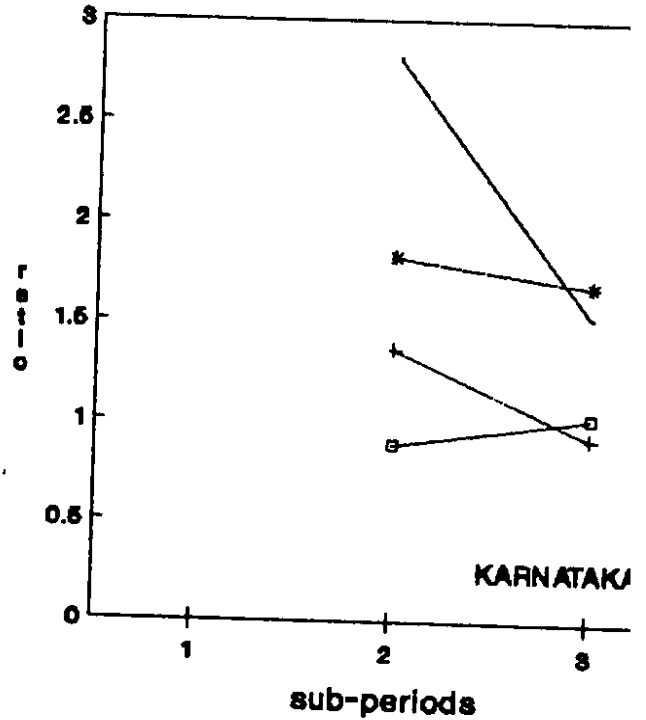
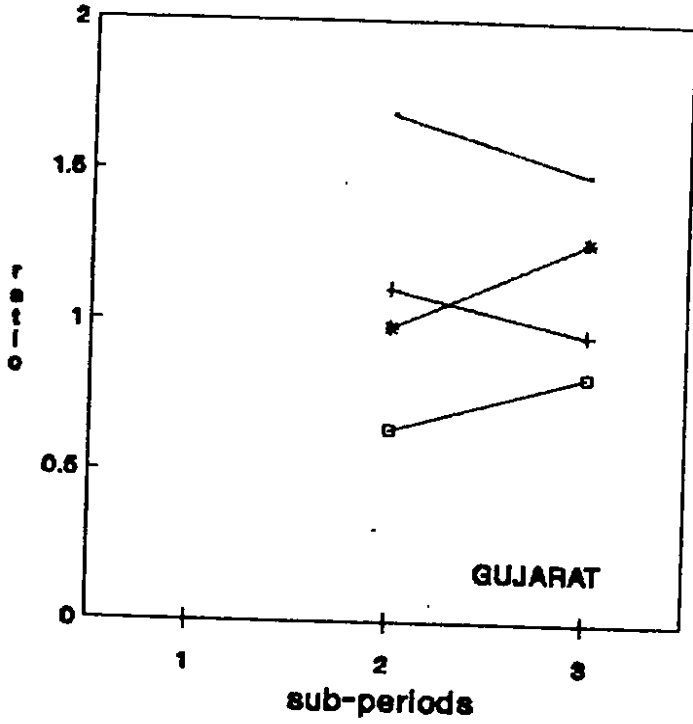
B₂ = Ratio of PP with respect to Cost C₂



— A1 —+ B1 —* A2 —□ B2

— A1 —+ B1 —* A2 —□ B2

Figure 4 : Ratios of Procurement Price (PP) and Farm Harvest Price to Cost of Production of Cotton



— A1 —+ B1 —* A2 —□ B2

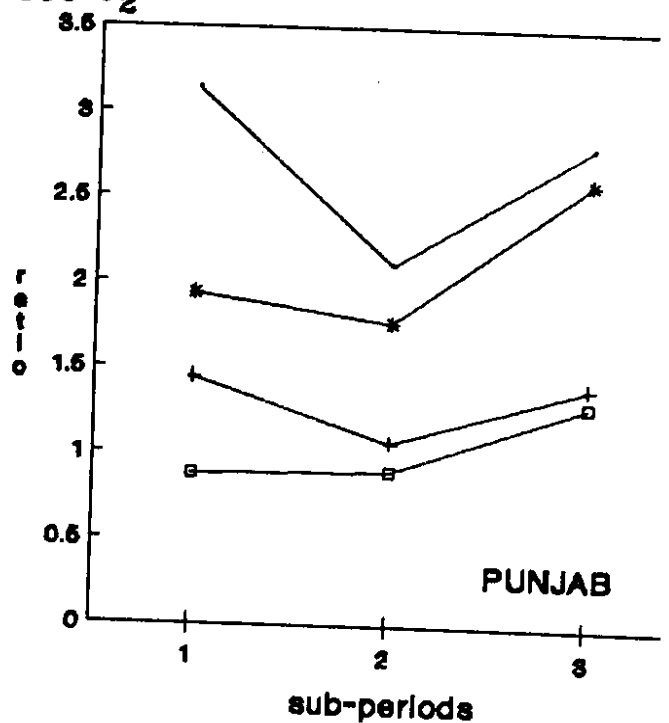
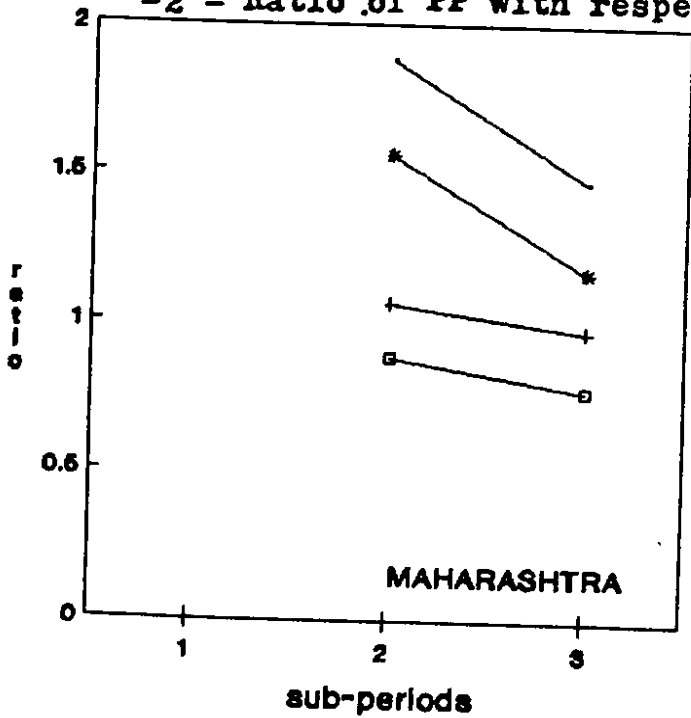
— A1 —+ B1 —* A2 —□ B2

A₁ = Ratio of FP with respect to Cost A₂

B₁ = Ratio of FP with respect to Cost C₂

A₂ = Ratio of PP with respect to Cost A₂

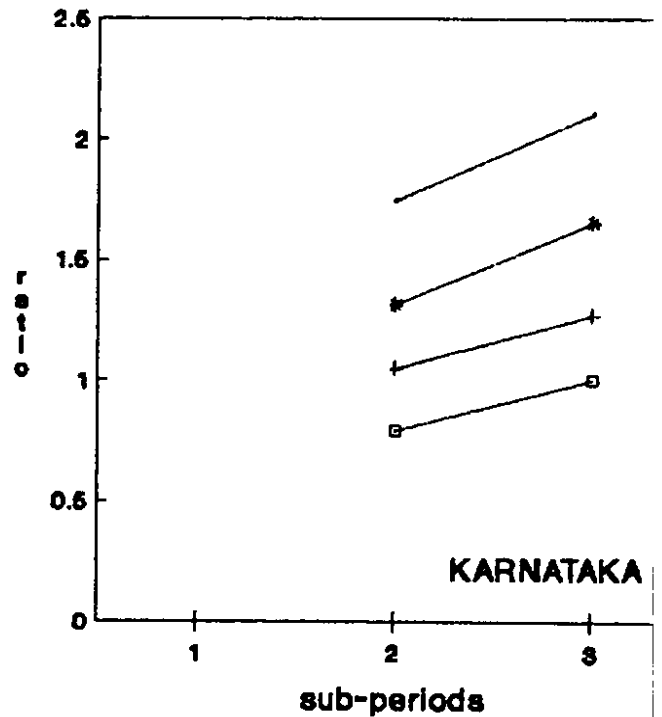
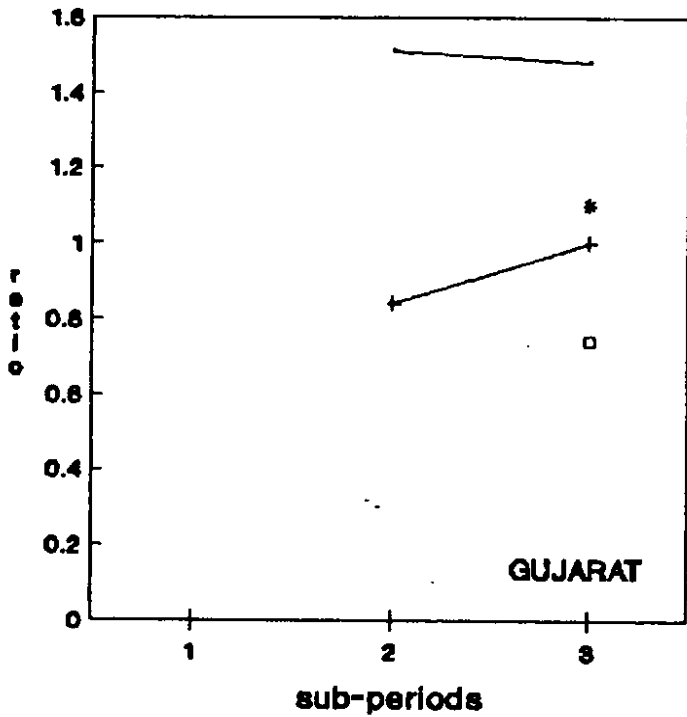
B₂ = Ratio of PP with respect to Cost C₂



— A1 —+ B1 —* A2 —□ B2

— A1 —+ B1 —* A2 —□ B2

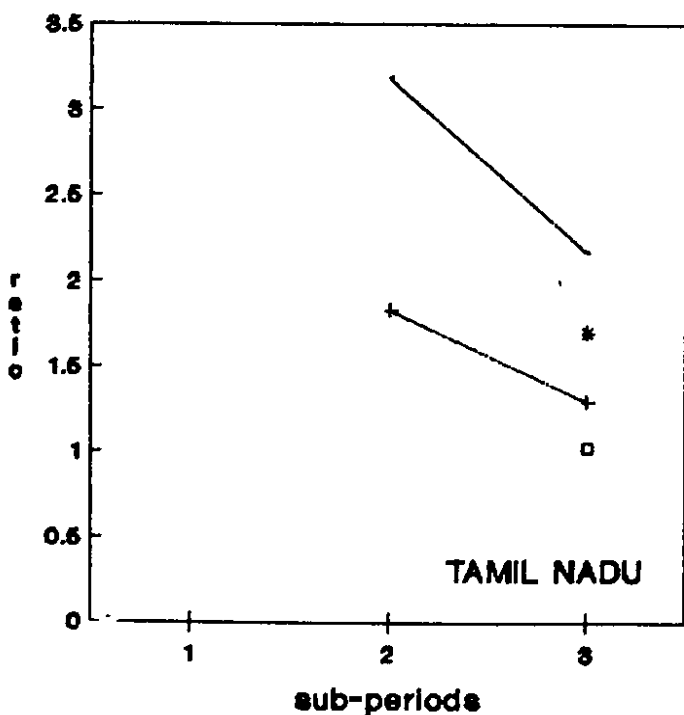
Figure 6 : Ratios of Procurement Price (PP) and Farm Harvest Price (F to Cost of Production of Groundnut



— A1 — B1 —* A2 —□ B2

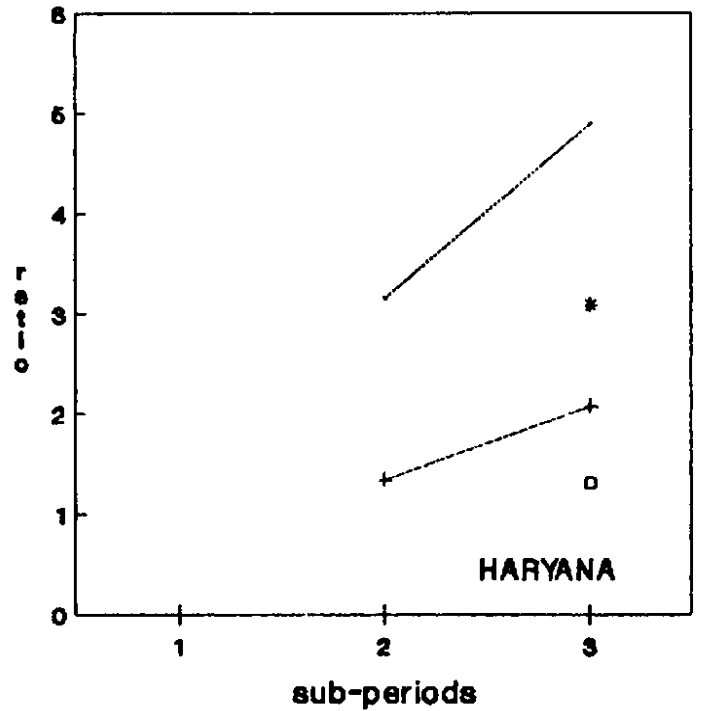
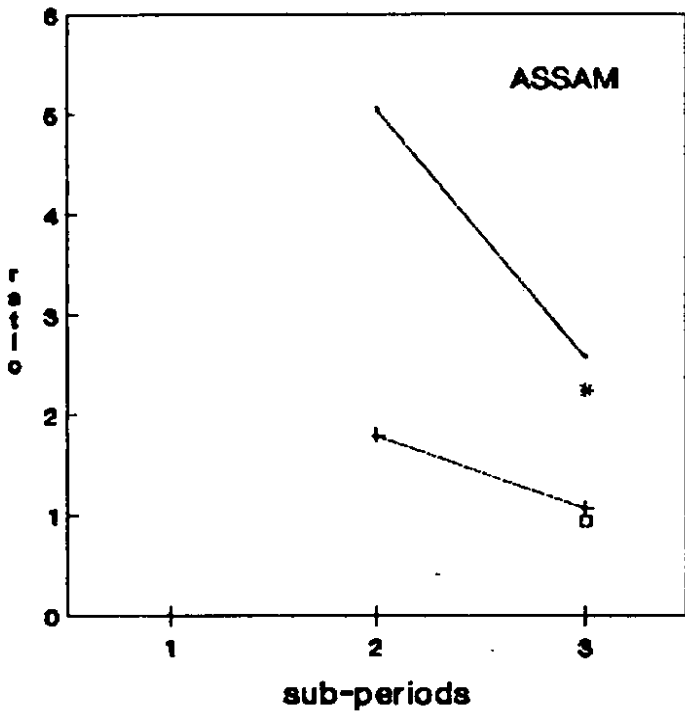
— A1 — B1 —* A2 —□ B2

A₁ = Ratio of FP with respect to Cost A₂
 B₁ = Ratio of FP with respect to Cost C₂
 A₂ = Ratio of PP with respect to Cost A₂
 B₂ = Ratio of PP with respect to Cost C₂



— A1 — B1 —* A2 —□ B2

Figure 7 : Ratios of Procurement Price (PP) and Farm Harvest Price (FP) to Cost of Production of Rapeseed Mustard



— A1 —+ B1 —* A2 —□ B2

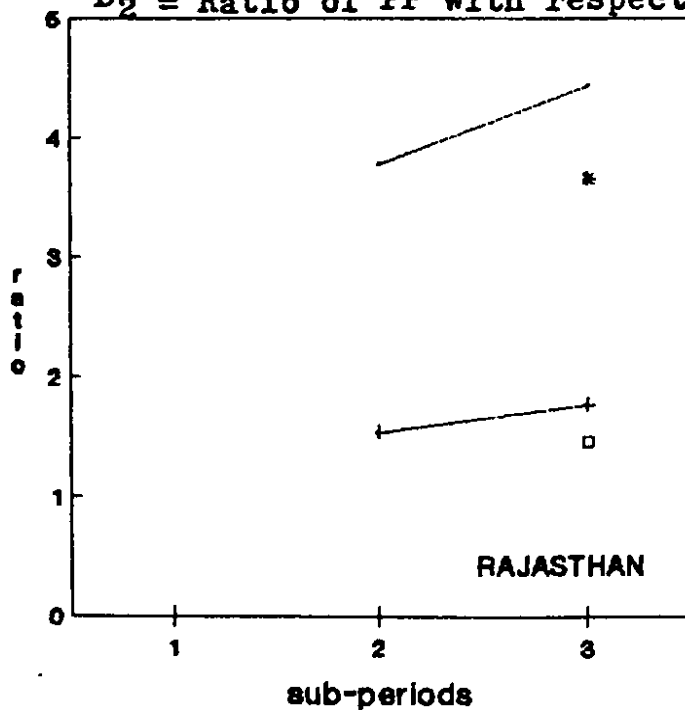
— A1 —+ B1 —* A2 —□ B2

A₁ = Ratio of FP with respect to Cost A₂

B₁ = Ratio of FP with respect to Cost C₂

A₂ = Ratio of PP with respect to Cost A₂

B₂ = Ratio of PP with respect to Cost C₂



— A1 —+ B1 —* A2 —□ B2

CONCLUDING OBSERVATIONS AND EMERGING ISSUES

In this section we bring together all the main findings of the earlier sections and present an overall and a comprehensive picture of agricultural costs and pricing with a view to appreciate the directional and structural changes that may be necessary in domestic production and trade in agricultural commodities in the context of economic liberalization.

Analyses of cost and pricing of agricultural output presented in earlier sections are confined to principal cereal and other crops grown in India and to principal regions growing these crops either in terms of area and/or production of the respective crops. The period chosen for study refers to early seventies to late eighties divided into 3 sub-periods, viz., early seventies, mid-late seventies and mid-late eighties, depending upon the availability of relevant data for different periods, for different crops in different regions. Since the detailed cost of production and price data are not available beyond mid-late eighties, the analysis could not be carried out to the recent period of early nineties.

Cost Analysis

We have seen that in the case of two most important cereals, paddy and wheat, grown in different parts of India, cost increases between seventies and eighties have far outweighed

the corresponding yield increases in all the States, even in the States which are known to have experienced technological change. This has led to a situation of high and increasing cost of production of paddy and wheat in India. The positive outcome of technological change in the case of these two cereal crops appears to be relatively smaller increases in cost of production and lower or same level of absolute cost per unit owing to relatively higher crop yield in the States which are known to have experienced technological change compared to the other States. Cost increases have come mostly from increases in human and animal labour cost as part of operational (variable) cost and from increases in rental value of own land as part of fixed cost. Fertilizer input accounts for only around 15 per cent of the total cost in the States known to have experienced technological change. However, analysis of cost of production at constant price, reveal either a marginally decreasing or a marginally increasing cost over the sub-periods brought about by large yield increase in the States which are known to have experienced technological change, viz., Punjab, Haryana, Karnataka, Andhra Pradesh and Tamil Nadu in the case of paddy and Punjab, Haryana and Uttar Pradesh in the case of wheat.

The cost increases at current prices have been sought to be matched by increases in procurement/support prices of paddy and wheat which are determined on the basis of the average

cost of production and trends in open market prices in the immediate past. Since there exists a positive correlation between support price on the one hand and farm harvest and open market prices on the other, increase effected in support price has led to increases in farm harvest price and open market price. This has led the Indian cereal production to a high cost syndrome. However, the price cost ratios with respect to all the three sets of prices are seen to have had a declining trend specially in the case of paddy between early seventies and mid-late seventies followed by increasing trend between mid-late eighties again specially in the case of the States having experienced technological change. The ratios with respect to procurement and farm harvest prices are seen to have been near unity showing their ineffectiveness as incentive prices. The ratios with respect to variable cost (A2) are seen to have been more favourable. The overall price-cost ratios show deteriorating economic situation in the cereal production in mid-late eighties over mid-late seventies.

Cost increases in the case of gram, an important pulse crop grown in India, have been brought about largely because of a declining and/or stagnant yield in the face of increasing cost of cultivation per hectare between late seventies-early eighties and mid-late eighties. No state seems to have made any technological break-through in gram production. This is borne

out by the analyses of cost of production at constant price. The results of the analyses show considerably rising cost over the sub-periods in the face of declining yield. Human and animal labour cost and cost on account of rental value of own land account for the bulk of the cost increases. These cost increases have been sought to be neutralised by hefty increases in procurement/support prices which has led to large increases in farm gate and open market prices. However, the procurement prices are seen to have remained inoperative, the ratio of procurement price to cost being less than unity in most cases. The ratios with respect to other price are seen to have increased very marginally, if at all, except in the case of Haryana, indicating not an encouraging economic situation in the cultivation of gram in the mid-late eighties.

In the case of cotton, an important cash crop grown in India, Punjab is the only State which shows a marginal increase in cost of production owing mainly to relatively higher and increasing yield level brought about by improved technology. In all other cases large cost increases have been brought about by lagging yield increases against large cost increases per hectare between mid-late seventies and mid-late eighties. Cost increases have been largely on account of human and animal labour on the one hand and rental value of own land on the other. Fertilizer cost accounts for about 10 to 15 per cent of the total cost in various States. Cost analyses at constant price reveal

marginal increase in cost of production in the States having experienced some degree of technological change, owing to large yield increases. Increasing cost at constant prices in the face of declining yield of cotton in Maharashtra shows that technological change has had no impact on cotton cultivation in Maharashtra. Faced with high cost of production, procurement/support prices have been increased substantially over the years. Though procurement prices have remained inoperative, these have led to substantial increases in farm harvest and open market prices. Ratio of procurement prices to cost is seen to have been near unity or less than 1 in most cases. Except in the case of Karnataka and Maharashtra, the ratios of procurement and support prices to cost are seen to have been increasing in mid-late eighties, specially in Punjab. The ratio with respect to the variable cost is seen to be much larger than one depicting a better price-cost relationship. Over all, except in Punjab, the price-cost ratios do not appear to have depicted an encouraging economic situation in mid-late eighties.

The yield increases have been outstripped by increases in cost per hectare in all the States in the case of sugarcane, another important cash crop grown in India, leading to large increases in cost of production. Increase in cost of production has been highest in Maharashtra, known for growing sugarcane under assured irrigation, high fertilizer use and use of better varieties of seeds, owing mainly to stagnant yield level. Cost increases have been brought about largely by increases in cost

on human labour, animal labour, fertilizer-manure and irrigation on the one hand and cost on rental value of own land on the other. In the case of Maharashtra, unlike in Andhra Pradesh and Karnataka, the cost of production even at constant price reveal an increasing trend owing to high but stagnant yield level brought about by early break-through in technology in mid-late seventies, Uttar Pradesh is seen to have been operating at a low level of technology leading to increasing cost at constant price. The cost increases have been sought to be more than countered by hefty increases in the farm gate prices paid by the sugar factories. The procurement prices though increased have largely remained ineffective in the case of sugarcane. In the case of Maharashtra the ratios of procurement and farm-harvest prices to cost of production are seen to have declined though favourable. In the case of all the States prices paid by sugar factories are seen to have been much favourable compared to cost, specially in Maharashtra thereby acting as incentive in mid-late eighties.

As regards groundnut and rapeseed-mustard, two important oilseeds grown in India yield increases except in Tamil Nadu in the case of groundnut and Assam in the case of rapeseed-mustard, have been far outstripped by increases in cost per hectare leading to increases in cost of production. Cost increases have mostly come from increases in human labour and animal labour cost on the one hand and cost on rental value of own land on the other in the case of rapeseed-mustard. In the

case of groundnut, in addition increases in seed cost also contribute significantly to the increase in total cost. Analyses of cost at constant price indicate technological break-through of some degree in the cultivation of groundnut in Gujarat and Karnataka as revealed by declining cost of production. In Tamilnadu on the other hand, yield level though high appears to have reached a plateau, resulting into increased cost even at constant price in mid-late eighties. Similarly, Haryana and Rajasthan show some degree of technological change in the cultivation of rapeseed-mustard as revealed by declining cost at constant price owing to large yield increases in mid-late eighties. There does not seem to be any break-through achieved in the production of rapeseed-mustard in Assam by mid-late eighties as revealed by increasing cost of production at constant price. Procurement prices have mostly remained inoperative and cost increases have largely been sought to be met by very hefty increases in farm gate and open market prices, led by increases in procurement prices specially in the case of groundnut which has given rise to high cost scenario in the case of edible oil crops in India. However, the price-cost ratios with respect to all the three sets of prices are seen to have declined in mid-late eighties and are also seen to have remained barely above unity in the case of groundnut. In the case of rapeseed-mustard, except in the State of Assam, the ratios are seen to have been not only above unity, but, also improving in mid-late eighties.

Inferences and Implications in Domestic Market

It thus appears to be a high cost scenario in the production of important cereals, pulses, oilseeds and other cash crops like sugarcane and cotton in India. This high cost situation in the production of major agricultural crops in India may neither augur well for the domestic economy nor for international trade. First of all it ought to be kept in mind that the procurement/support prices announced are in the nature of marginal cost pricing in the sense that bulk of the output of the crops and of the producers are covered in such a price determination. Hence, it is the cost of production of additional output of the producers (inefficient) at the margin which matters in determining support prices and which turn out to be much larger than the cost of production of the average efficient farmers. Any price determined on this basis is bound to leave the efficient producers with large surplus income (profit) and deprive the domestic consumers of the benefit of lower cost of production brought about through improved technology. Further, the procurement/support prices announced every year also takes into account the trends in the open market prices, a continual off the cuff increase in procurement/support prices fuel the increases in domestic open market prices.

Theoretical concept of technological change connotes outward shift in the production function, ceteris paribus, leading to reduced cost of per unit of output produced. However,

in a dynamic situation, where the full potentials of technological change is not realized, and more importantly, where relative prices of factor inputs also increase due to industry-wise change, the downward shift in the cost functions brought about by upward shift in production function (via technological improvement) is met with an opposite upward shift in cost functions brought about by rising prices of factor inputs. If the opposite force of upward shift turns out to be stronger than the force of downward shift, the cost per unit of output produced will turn out to be higher in the post-technological period. This appears to have happened in the case of India in respect of the important cereal and cash crops considered in this study. This phenomenon is also borne out by an earlier study (Kahlon, Tyagi, 1983).

Unfortunately detailed estimates of cost of production of principal crops for the early nineties are not available for us to comment conclusively on the price-cost relationship in the current period but there is enough indirect evidence to suggest that stagnant and/or low productivity high cost led high domestic prices of principal agricultural commodities continue to dominate the scenario in the agricultural front in India. For instance, it is estimated that open market prices of foodgrains, edible oil and sugar have increased by 30 per cent, 40 per cent and 45 per cent respectively during the period 1990 to 1994 despite increased production of these crops, specially of major cereals,

during this period. This is presumably on account of high cost led production.

Procurement of foodgrains, whatever is offered, at the announced high support price and slowing down of the offtake of cereals under public distribution system has led to a problem of burgeoning stocks in the recent years. The expectation is that the harvest of wheat may approximate around 60 million tonnes in 1995 and the fresh procurement would compound matters. Having announced the minimum support price for the crops, centre is unable not to purchase whatever quantities are offered.

Till the beginning of the 1970s, procurement prices had generally been fixed and announced at the start of the marketing season. They represented the prices at which the State agencies were ready to procure grain from the producers, millers and the market and which were lower than the 'normal' market prices. The quantity to be procured was determined, in theory, by the Government's needs for buffer stocks as well as the quantities needed for disbursement under public distribution system. In recent years, however, the distinction between minimum support (guaranteed) price and procurement price has been sought to be done away with. Actual quantities procured have depended upon the grains offered for sale by the farmers at prices fixed by the Government on the recommendations of the Commissions for Agricultural Costs and Prices, irrespective of the requirements of buffer stock or public distribution system. Scholars have

questioned treating procurement prices, for all practical purposes, as minimum guaranteed price. The case of minimum support price is weakened, if it is used instead as a device to transfer income, i.e., to protect not only the variable costs, but also the fixed costs of cultivation (Vyas, 1994).

Implication in International Market

We now turn to the implication of the high cost led high price syndrome in the domestic agricultural sector for the trade in agricultural commodities. For this, among other things, it is necessary, to begin with, compare domestic prices with world prices. Table 92 presents such a comparison. Limitations of such a comparison in terms of quality differences and on other counts will have to be kept in mind as mentioned in the sources from where these data are reproduced in Table 92. Nevertheless, such a comparison reveals that during later part of eighties except for rice and cotton no clear evidence of domestic price being lower than the world price is noticed. It appears, therefore, that for commodities like wheat, groundnut and rapeseed oil, sugar and also perhaps pulses, Indian prices being higher than the world prices, India could not have competed for these commodities in the international market. Implication of high cost led high domestic prices during mid-late eighties is reflected in India's inability to take advantage of world trade in important agricultural commodities. In the post-liberalization period (1992), however, Indian domestic prices for commodities like, rice, wheat and cotton are seen to be smaller than

the respective world prices indicating a comparative advantage in export of these commodities. Whether this relative advantage will continue to be enjoyed by India will depend upon the relative movement of Indian and world prices. In a recent study the rate of increase in Indian and world prices of major agricultural commodities have been examined (Bhatia, 1994). Table 93 presents the comparative estimates. The estimates of compound rates of growth (per cent per annum) of prices of principal agricultural commodities during 1980-92 show that the world prices during the period 1980-92 have shown a decline in most of the commodities except in a few commodities like cotton, jute, tobacco and some horticultural products in whose case there are some marginal increases. Against this, the wholesale prices of various agricultural commodities in India have increased in the range of 7 to 10.5 per cent per annum during the same period except sugar in which case the increase is relatively less. Even after adjusting the exchange rate through devaluation which has been able to offset the adverse effect of higher increases in domestic prices for export, decline in the world prices of some of the major commodities and continued higher increases in the domestic prices adversely influence the future prospects of agricultural exports (Bhatia, op.cit.,1994). Thus, it is argued that price increases fuelled by indiscriminate periodic rise in administered prices and the high inflation in the Indian economy has considerably reduced the comparative

advantage enjoyed by many crops (Bhalla, 1995).

In this context a note of caution has been sounded in recent studies on international trade and agricultural sector. The studies state that in a situation where Indian domestic prices are considerably divergent from international prices and trade in agricultural commodity is not only small compared to the world trade but also small compared to agricultural output (large compared to world output) currently entering world trade an opening up of India's large agricultural sector to world trade may have an extremely large effects on the nature of the world equilibrium in terms of prices, and subsequently outputs. A larger participation by India in world trade under such a situation is bound to worsen its terms of trade (Sen Abhijit, Nayar Deepak, 1994). Any trade policy reform in India, which seeks to dismantle restrictions on trade, other than tariffs, must take into consideration all the implications of such policy changes.

It may then be argued that any disproportionate increase in cost of producing agricultural commodities in future would add fuel to the already inflationary situation in the country. This would firstly affect the domestic demand and price out the bulk of the low income vulnerable section of the population, specially from the foodgrains sector, thereby increasing the burden of subsidy on the Central Government on account of public distribution system. Secondly, this would also adversely

affect any price advantage India might have enjoyed in the trade of agricultural commodities in the international market. To stamp out these disadvantages in future efforts must be redoubled to boost productivity of the crop to lowering costs and also become globally competitive. There is, therefore, an urgent need for developing state-of-the-art production technology to take advantage of the opportunities opened up for the agricultural producers, both in domestic market and international market by the new economic policies.

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Table 92 : Domestic and World Prices of Principal Agricultural Commodities

	1988	1989	1990	1992
Indian Wholesale Prices (Rs./Quintal)				
Wheat	250.5	240.8	279.8	275.0
Rice	328.2	344.5	362.9	405.0
Groundnut Kernel	638.8	642.9	661.4	-
Sugar	604.5	675.9	671.1	820.0
Cotton	2074.6	2162.9	2148.2	3549.0
Groundnut Oil	2029.1	2202.6	3003.6	3609.6
World Prices (Rs./Quintal)				
Wheat	212.0	293.2	245.4	305.0
Rice	436.7	533.3	544.5	435.0
Cotton	2026.3	2784.7	3267.2	3600.0
Sugar	325.4	469.5	496.4	850.0
Groundnut Kernel	480.0	725.0	971.0	-
Groundnut Oil	864.9	1290.0	1729.1	36330.0

Source : First three columns are from the article entitled "International Trade and Agricultural Sector in India", Deepak Nayyar and Abhijit Sen in G.S. Bhalla (ed.). Economic Liberalization and Indian Agriculture, New Delhi, 1994. The last column is from M.S. Bhati's article on "Agricultural Pricing, Marketing and International Trade Under New Economic Environment", Indian Journal of Agricultural Economics, July-September 1994.

Table 93 : Compound Rates of Growth of Prices of Principal Agricultural Commodities During 1980-82

Commodity	(Per cent per annum)	
	World Prices	Indian Wholesale Prices
Wheat	-1.77	6.91
Maize	-2.11	7.11
Rice	-1.99	7.12
Cotton	5.42	9.46
Jute	0.87	7.94
Soyabean	-1.21	10.90
Groundnut Oil	-1.23	9.98
Sugar	-2.93	5.32

Source : Bhatia, M.S. "Prices, Marketing, Agro-Processing and International Trade", Indian Journal of Agricultural Economics, July-September 1994.

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