

# **AGRO-PROCESSING OF COMMERCIAL CROPS IN WESTERN HARYANA-AN ECONOMIC ANALYSIS**

**BY  
DEEPAK SINGH  
(2004A04M)**

*Thesis submitted to Chaudhary Charan Singh Haryana Agricultural University in  
partial fulfillment of the requirement of the degree of*

**MASTER OF SCIENCE  
IN  
AGRICULTURAL ECONOMICS**



**College of Agriculture  
CCS HARYANA AGRICULTURAL UNIVERSITY  
HISAR-125004 (HARYANA)**

2007

*Dedicated*  
*To*  
*My Grand Mother*  
*&*  
*Respected Parents*

## **CERTIFICATE-I**

This is to certify that This Theses Entitled "**Agro-Processing of Commercial Crops in Western Haryana-An Economic Analysis**" submitted for the degree of Master of Science in the subject of Agricultural Economics of Chaudhary Charan Singh Haryana agricultural University, Hisar is a bonafide research work carried out by Deepak Singh under my supervision and guidance and no part of this thesis has been submitted for any other degree. The assistance and help received during the course of investigation have been fully acknowledged.

**Dr. Dharpal Malik**  
**Major Advisor**

## **CERTIFICATE-2**

This is to certify that this thesis entitled "**Agro-Processing of Commercial Crops in Western Haryana-An Economic Analysis**" submitted by Deepak Singh to Chaudhary Charan Singh Haryana Agricultural University, Hisar in partial fulfillment of the requirement for Master of Science in the subject of Agricultural Economics has been approved by the student's advisory committee after an oral examination on the same.

**MAJOR ADVISOR**

**HEAD OF THE DEPARTMENT**

**DEAN, POST-GRADUATE STUDIES**

## *Acknowledgement*

*Gratitude cannot be seen or expressed; it can only be felt deep in heart and is beyond description. Although thanks are poor expression of debt of gratitude one feels, yet there is no better way to express it.*

*It is my profound privilege to express gratitude to my Major Advisor, Dr. Dharmpal Malik, Scientist in Department of Agricultural Economics, C.C.S. Haryana Agricultural University, Hisar during the period of investigation.*

*I am immensely grateful to Dr. R.K. Grover, Professor, Agricultural Economics, Dr. B.K. Hooda, Scientist, Statistics, Dr. P.S. Sherawat, Scientist, Extension Education, Dr. J.C. Kaushik, Forestry, member of my advisory committee for their valuable suggestions and timely help throughout the course of this study.*

*I also wish to express my deep sense of gratitude to all the faculty members of the Department of Agricultural Economics, and other supporting staff for their timely and judicious support.*

*My special thanks are also due to CCS Haryana Agricultural University for providing all help required for the completion of this study.*

**Place: Hisar**

**January, 2007  
(DEEPAK SINGH)**

# **CONTENTS**

---

<b>CHAPTER</b>	<b>DESCRIPTION</b>	<b>PAGE(S)</b>
I	INTRODUCTION	1-8
II	REVIEW OF LITERATURE	9-47
III	MATERIALS AND METHODS	49-55
IV	RESULTS AND DISCUSSION	56-174
V	SUMMARY AND CONCLUSION	175-183
	LITERATURE CITED	i-xi

---

## **LIST OF TABLES**

<b>Table No.</b>	<b>Description</b>	<b>Page No.</b>
3.1	Production of commercial crops in Haryana	50
3.2	Number of agro-processing industries in Haryana state	51
4.1	Acreage under major crops in Hisar district	57
4.2	Production of major crops in Hisar district	60
4.3	Yield of major crops in Hisar district	62
4.4	Acreage under major crops in Bhiwani district	64
4.5	Production of major crops in Bhiwani district	67
4.6	Yield of major crops in Bhiwani district	69
4.7	Acreage under major crops in Haryana	71
4.8	Production of major crops in Haryana	73
4.9	Yield of major crops in Haryana	75
4.10	Compound growth rates of acreage under major crops in Hisar district	76
4.11	Compound growth rates of production of major crops in Hisar district	78
4.12	Compound growth rates of yield of major crops in Hisar district	80
4.13	Compound growth rates of acreage under major crops in Bhiwani district	82
4.14	Compound growth rates of production of major crops in Bhiwani district	84
4.15	Compounds growth rates of yield of major crops in Bhiwani district	85
4.16	Compound growth rates of acreage under major crops in Haryana	88
4.17	Compound growth rates of production of major crops in Haryana	90

---

<b>Table No.</b>	<b>Description</b>	<b>Page No.</b>
4.18	Compound growth rates of yield of major crops in Haryana	92
4.19	Market arrivals of major crops in Hisar district	94
4.20	Market arrivals of major crops in Bhiwani district	96
4.21	Market arrivals of major crops in Haryana	98
4.22	Compound growth rate of market arrivals of major crops in Hisar district	100
4.23	Compound growth rate of market arrivals of major crops in Bhiwani district	102
4.24	Compound growth rate of market arrivals of major crops in Haryana	104
4.25	Investment incurred for the establishment of cotton processing unit in Hisar district	108
4.26	Fixed cost incurred for the cotton processing unit in Hisar district	109
4.27	Variable cost incurred for the cotton processing unit in Hisar district	111
4.28	Costs and returns of the cotton processing unit in Hisar district	113
4.29	Break-even analysis for the cotton processing unit in Hisar district	115
4.30	Investment incurred for the establishment of rapeseed mustard processing unit in Hisar district	116
4.31	Fixed cost incurred for the rapeseed-mustard processing unit in Hisar district	118
4.32	Variable cost incurred for the rapeseed-mustard processing unit in Hisar district	120
4.33	Costs and returns of the rapeseed-mustard processing unit Hisar district	122
4.34	Break-even analysis for the rapeseed-mustard processing unit in Hisar district	123
4.35	Investments incurred for the establishment of	126

---

<b>Table No.</b>	<b>Description</b>	<b>Page No.</b>
	pulse (chickpea) processing unit in Hisar district	
4.36	Fixed cost incurred for the pulse (chickpea) processing unit in Hisar district	128
4.37	Variable cost incurred for the pulse (chickpea) processing unit in Hisar district	130
4.38	Costs and returns of the pulse (chickpea) processing unit in Hisar district	131
4.39	Break-even analysis for the pulse (chickpea) processing unit in Hisar district	133
4.40	Investment incurred for the establishment of cotton processing unit in bhiwani district	135
4.41	Fixed cost incurred for the cotton processing unit in Bhiwani district	137
4.42	Variable cost incurred for the cotton processing unit in Bhiwani district	138
4.43	Costs and returns of the cotton processing unit in Bhiwani district	140
4.44	Break-even analysis for the cotton processing unit in Bhiwani district	142
4.45	Investment incurred for the establishment of rapeseed-mustard processing unit in Bhiwani district	143
4.46	Fixed expenses incurred for the rapeseed-mustard processing unit in Bhiwani district	147
4.47	Variable expenses incurred for the rapeseed-mustard processing unit in Bhiwani district	148
4.48	Costs and returns of the rapeseed-mustard processing unit in Bhiwani district	150
4.49	Break-even analysis for the rapeseed-mustard processing unit in Bhiwani district	152
4.50	Investments incurred for the establishment of pulse (chickpea) processing unit in Bhiwani district	153
4.51	Fixed cost incurred for the pulse (chickpea)	155

---

<b>Table No.</b>	<b>Description</b>	<b>Page No.</b>
	processing unit in Bhiwani district	
4.52	Variable cost incurred for the pulse (chickpea) processing unit in Bhiwani district	157
4.53	Costs and returns of the pulse (chickpea) processing unit in Bhiwani district	159
4.54	Break-even analysis for the pulse (chickpea) processing unit in Bhiwani district	161
4.55	Capacity utilization of the agro-processing units in Hisar district	162
4.56	Capacity utilization of the agro-processing units in Bhiwani district	164
4.57	Employment pattern in the agro-processing units	166
4.58	Problems encountered by the agro-processing units in Hisar district	169-70
4.59	Problems encountered by the agro-processing units in Bhiwani district	172-73

---

## **CHAPTER-I**

# **Introduction**

Agriculture is the most important economic sector of India. The role of agriculture in the national economy is showing a downward trend. This sector is significant contributor towards national GDP (19.70%) and provides employment (65% of the population). The share of agriculture in national GDP decreased by almost 35 percent in the last five decades from 55.40 percent in 1950-51 to 19.70 percent in 2004-05. The share of agriculture in gross capital formation in the early 90s was 1.90 percent which declined to 1.30 percent in 2004-05.

Heavy dependence on agricultural imports in the early 1960s convinced planners that India's growing population as well as concerns about national independence, security and political stability required self-sufficiency in food grain production. This perception led to a programme of agricultural improvement called the Green Revolution. Moreover, expansion of irrigation facilities, optimal doses of fertilizers, use of plant protection measures and mechanization of farm practices coupled with hybrid/improved varieties, the productivity of food grains particularly cereal crops increased manifold during the post-Green Revolution period (Hemalatha and Reddy, 2003).

The cultivated area has increased from 108 million ha in 1950 to 143 million ha during 2004-05, while the irrigation potential

reached upto 89 million ha over the above said period. The food grain has increased from 51 to 210 million tonnes during the same period showing 311.76 percent increase. The area under major cereal crops i.e. wheat and rice increased from 9.75 and 30.81 million ha to 26.5 and 42.1 million ha giving rise in production from 6.46 and 20.58 million tonnes to 72.11 and 88.28 million tonnes, respectively during the period 1950-2005. The productivity of wheat and rice was just 663 and 668 kg/ha during 1950-51 which increased to 2713 and 2077 kg/ha in 2004-05, respectively.

The area under gram was 7.57 million hectares during 1950-51 decreased to 6.7 million hectares in the year 2004-05 but the production of gram increased from 3.70 to 5.93 million tonnes due to in increased in yield from 482 to 885.07kg/ha during the same period.

India is having largest area under oilseeds which accounts for about 15 percent of the gross cropped area in the country. Area under rapeseed-mustard increased to 4.40 million ha in 2004-05 from 2.07 million ha during 1950-51. The production of rapeseed-mustard increased to 8.38 million tonnes from just 0.76 million tonnes during the above said period. The rise in production was due to increase in area and productivity of rapeseed-mustard from 370 to 1220 kg/ha during the above said period.

The area under cotton cultivation has risen substantially from 5.89 to 8.90 million hectares in the time period 1950-2005 and the production rose from 3.0 to 17.00 million bales. While the average yield per hectare of cotton has increased from 88 to 324 kg.

Processing of farm products offers great scope for conversion of farm produce to consumer commodities and in the process reduces wastage, increases shelf-life resulting in value addition and high income transfer to farmers from different classes of consumers as the processed commodities have wider market. Agro-processing helps in conservation and elimination of avoidable losses and improves quality of agro-produce and also low grade material and by-products by value addition. In India, food processing is at a low level and yet to gain momentum to reach the stage attained in western countries.

Developing countries have to promote value-added processing of primary products as a path to industrialization. The increasing human population, rising real income, changing life-styles conditions, media, advertisements, increasing quality consciousness and rapid urbanization induce disproportionately rapid growth of the demand for higher quality processed and packaged food. The process of value adding to agricultural production and fostering of farm and non-farm linkages in turn, generates higher income and employment for the farm families, besides making agriculture a more effective contributor to industrial growth (Sarkar, 1997).

The Indian climate is favourable for growing any temperate and tropical crops. The fresh and processed products have very good domestic and export markets. Increase in shelf-life and value addition of agro-produce and rural agro-entrepreneurial developments are important. The Indian agriculture and industries will have to play a major role in producing quality agro-produce meeting internationally accepted quality, hygiene and packaging,

reducing post-harvest losses, regulated ripening, precision cleaning, grading, controlled temperature containers, controlled atmospheric and aseptic packaging, cold chain facility, modern material handling equipment and services are some of the issues that need scientific and technical inputs.

The agro-industry provides the crucial farm-industry linkages which helps to accelerate agricultural development by creating backward linkages (supply of credit, input and other production enhancement services) and forward linkages (processing and marketing) adding value to the farmer's produce, generating employment opportunities and increasing the farm's net income. The agro-industry generates new demand on the farm sector for more and different agricultural output which are most suitable for processing (Srivastava, 1989) . The growth in agro-processing industries has a big potential to trigger development in other sectors of economy through multiplier effect. The addition through modern processing industries helps in generating further increase in income and employment from which the farmers would also benefit through better returns (Rao, 1994).

Food processing industry is the modern sector which is growing rapidly in the post 1980's in many developing nations including India. Presently, it is in the process of diversification and internationalization on account of changing consumption patterns initiated by cultural, globalization and technical progress. Particularly, since by the mid-1990's, when food grains stocks started getting into building mountains and the food security concerns, the importance of agro processing has assumed

much higher proportions. In the post-globalization period, the industry has assumed more significance on account of substantial export potential. It also opens up new vistas of employment, increase in rural income, demands on the improvement in the services sectors including marketing, infrastructure and capital investments.

The state of Haryana was deficit in food grains even for its requirement at the time of its inception in 1966 is now second in the country next to Punjab in terms of farm productivity, per capita income and contribution of food grains to the central pool. The phenomenal strides in agricultural production nearly more than 189 per cent increase in food grains from 1966-67 to 2004-05.

The area under gram was 1062 thousand hectares during 1966-67 decreased to 106.63 thousand hectares in 2004-05. Due to decrease in area, the production of gram decreased to 87.80 thousand tonnes even with the increase in productivity of gram from 500 to 823.41 kg/ha. The area under rapeseed-mustard was 198 thousand hectares in year 1966-67 increased to 587.40 thousand hectares in the year 2004-05 giving rise to production from 80 to 816.03 thousand tonnes. The productivity also increased from 404 to 1389.22 kg/ha during the same period (Statistical Abstract of Haryana).

The area under cotton increased to 557.80 thousand hectares in the year 2004-05 from 183 thousand hectares in 1966-67. The cotton production increased substantially i.e. 1077.67 thousand bales in the year 2004-05 as a result of enhanced productivity of

cotton from 267.16 to 328.14 kg/ha during the time period 1966-2005.

Out of total state income during 2004-05, the total net income from agriculture and allied activities constituted 28.20 percent against the national figure of 19.70 percent. The massive creation of infrastructure like irrigation, power transport, market infrastructure, communication, storages and the achievements in other fields by the state are testimony of being one of the most advanced state of country.

However, in recent years, tempo of development of rural economy of the state has slowed down because agricultural production in the state has reached almost a plateau from where a small increase in production requires huge investment. The increase in cropped area in the state is likely to slow down considerably in view of reaching the upper geographical limit to expansion on cropped area both horizontally and vertically. About 71 percent of state population living in the villages and earning its livelihood directly or indirectly from agriculture, therefore, the maintenance of farm incomes at the present level even would be a great challenge.

The establishment of agro-processing industries in rural areas appears to be necessary to sustain or enhance real farm income. The effort in this direction will also generate required employment potential for educated and uneducated rural force to check their migration to urban areas. These industries process agricultural raw material including field and tree crops as well as livestock, poultry, fisheries etc. to create edible or usable forms, easily transportable,

improve storage capacity, stabilize market prices by regular supply, increase shelf-life and extract chemicals for other uses.

At present, it has become important to develop linkages between farm and industry to help agricultural development by the creation of backward and forward linkages, adding value to farmers produce and increasing their net income. This can be achieved by introducing primary processing facilities for on-farm products of cereals, pulses, oilseeds, fruits and vegetables in rural areas. Keeping in view all above facts an attempt has been made to study the status of agro-processing of commercial crops in Haryana state with the following specific objectives:

1. To examine the growth behaviour in area, production and yield of commercial crops.
2. To workout the benefit-cost analysis of processing units for the commercial crops.
3. To identify the constraints in the processing of commercial crops

**Limitation of the study:**

The study has been conducted under following constraints:

1. It has been a student research project with implied limitations of time, money and resources.
2. The study has been conducted in Hisar and Bhiwani districts. Thus, the generalizations of the findings of this study in wider areas have, therefore to be done.

3. The findings are based on the expressed responses of agro-processors from their memory without any record to support their replies in most of the cases.

## **CHAPTER-II**

# **Review of Literature**

Before going ahead with an empirical work, it is salutary to go through some relevant facts already known. Acquaintance with existing knowledge is necessary to find out such findings which are helpful in taking at meritorious policy decisions. In this regard, related works done during past, guides the research aspirants in proceedings with his work. A comprehensive and critical review of past researchers provides a sound basis for scientific investigation on rise or fall in area, production and yield of crops. Though, the circumstances in which the research is conducted may be different but the methodology followed earlier may be of immense help and leads support in the interpretation of the findings. In this chapter, the review of literature pertaining to related studies carried out has been presented under the following three sections:

- 1.1 Growth behaviour in area, production and yield of crops.
- 1.2 Costs, returns and benefit-cost ratio of the agro-processing industries.
- 1.3 Constraints faced by the agro-processing units.

## **2.1 Growth behavior of area, production and yield of crops**

Gangwar *et al* (1983) studied the production and marketing of gram in Haryana state. They computed the linear as well as compound growth rates of area, production and productivity of gram by fitting linear and exponential function for the period 1960-61 to 1979-80. The area under gram decreased in all the important gram growing districts during the period 1970-71 to 1979-80. The compound growth rates showed highest decreased in Gurgaon (-7.17%) and followed by Rohtak (-4.61%) being significant at 5 percent level of probability. The reduction in gram acreage was due to the substitution of gram acreage to other more paying crops such as wheat, sugarcane and barley with the increased availability of irrigation facilities. Decrease in production resulted mainly due to decrease in area.

Chamola and Hasija (1984) analysed the trend in area, production and productivity of guar in major guar producing states of India using compound growth rates and decomposition techniques. The highest growth rate was recorded in production of guar and the least in the case of productivity on all India basis. Among the guar growing states, Haryana achieved the highest growth rates in area and production where as Rajasthan ranked first in case of yield per hectare.

Analysing production and productivity of rice in Eastern India Desai (1984) concluded that the low productivity of rice in Eastern India is an established fact. More than 45 percent of the total area under rice in the country is in Eastern region. Such a large area has lagged behind in productivity enhancement. The slow rate of adoption of high yielding varieties indicates that proper rice technology has not been yet evolved.

Joshi and Agnihotri (1984) studied the millet production in India: problem and prospects using the compound growth rate techniques. It was found that there was decrease in the area under jowar and bajra in almost all the major millet producing states as well as on all India basis. It was further highlighted that if the existing trend continued in coming years, then millet growing regions are expected suffer adversely and the situation can be improved only by devising suitable steps to increase the productivity of millets.

Studying growth in area, production and productivity for oilseeds vis-a-vis cereals and pulses in Himachal Pradesh, Saraswat (1984) using compound growth rate found that acreage under oilseeds decreased at the rate of 0.93 percent per annum while acreage under pulses and cereals increased at the rate of 2.45 and 0.45 percent per annum. The production of oilseeds increased annually at the rate of 0.12 percent due to increase in yield at the rate of 1.04 percent per annum.

Reason behind the decrease in acreage under oilseeds was the lack of support price for oilseed crops while the increase in productivity was due to introduction of high yielding varieties.

Studying the causes of stagnation in production of pulses and oilseeds in Punjab for the period 1961-81, Chatha and Singh (1985) concluded that cereals and cash crops as groups had significantly positive growth rates and pulses group significantly negative growth rate while that of oilseeds though positive but non-significant. Among the variables considered for regression analysis, the productivity and price ratios did not workout to be significant because they are at a level lower than cereals such that slight change in the either does not significantly affect the area under the others crops. The interaction between productivity and price variables came out to be significant only in case of oilseeds. Similarly risk in productivity and price did not significantly affect the area under pulses while in case of oilseeds, the variance in productivity had a significant effect on area. For immediate increase in area for oilseeds, strong price incentives are essential.

Rao and Ray (1985) analysed the stagnation in production of pulses by computing compound growth rate of the time series-data. The pulses were mainly grown in dry and marginal lands, where farmers were usually very poor. The structural disabilities of this class of farmers, however, can be

over come by developing suitable institutional arrangements. Further, to increase the competitiveness of gram and other pulses with wheat and paddy, it would be necessary to develop such new varieties of gram, tur and other pulses which are not only high yielding but also stable and resistant to insect-pests and diseases. Lack of adequate economic infrastructure including regulated markets and storage were major handicaps in the implementation of price policy for pulses. Thus, there is a great need for re-orienting the market structure of pulses, so as to promote vertical integration of production, marketing and processing with a view to improve marketing efficiency and supporting the production programmes.

Identifying areas of good performance of agriculture in Eastern region of India, Singh (1985) concluded that one of the main reasons for poor performance of agriculture in the Eastern region is that new technology of rice could not be widely adopted. In fact, agro-climatic conditions that is most suited for the cultivation of traditional varieties of rice in the region has come in the way of increasing rice production. The factors responsible for their better performance were higher extent of irrigation, higher quality of fertilizers used per hectare, higher extent of adoption of high yielding varieties and better suited agro-climatic conditions for the crop production.

Georga and Mukherjee (1986) studied the growth performance of rice in Kerala for the time period 1960-84 by applying disaggregate analysis method. It was found that area and production of rice were positive for first period (1960-1975), while area and production were negative during the second period (1975-84). But the yield was positive during both time periods. For the overall time period, area, production and yield showed positive growth rates. The fact behind the negative growth rates during second period and that fluctuations remained either stable or at decreased level indicate that the reduction in area was the result of conscious decision made at the farm level in favour of substituting other crops for paddy.

Shad and Bist (1987) studied the growth patterns of area and production of major food grain crops under different plans in Himachal Pradesh. They concluded that during the First Five Year Plan compound growth rate of area of food grains was the highest among all Five Year Plans which was 3.64 percent. The compound growth rate of production of major food grain crops was also highest in the First Five Year Plans. As the compound growth rate for the area under food grains showed positive growth rates in all Five Years Plans, but Third and Fifth Five Year Plan showed the negative compound growth rate for food grain production in the state.

Arora *et al* (1988) examined trends and variability in area, production and productivity of guar in India. The highest levels of guar acreage were 2405.10 (1976-77), 32.72 (1983-84) and 2811.70 (1976-77) thousand hectares in case of Rajasthan, Haryana and the country as a whole, respectively. The lowest levels of acreage reached at 755.20 (1967-68), 37.70 (1966-67) and 990.00 (1968-69) thousand hectares for Rajasthan, Haryana and the country as whole, respectively. Haryana state registered the highest growth rate of production i.e. 9.72 percent per annum. The variability in guar acreage was highest in Haryana state where as variation in the production was observed highest in Rajasthan.

Studying the trends in acreage, output and productivity of major spice crops in India, Khan (1990) found that blackpepper and chillies were lagging far behind in comparison to other spices in area and production. There was not notable development in the area, production and productivity of spice crops except ginger in the country. Bhowmick and Ahmed (1993) studied the behaviour of trend and growth of area, production, productivity and supply response of major oilseed crops in Assam using linear and compound growth rates. From their study, they concluded that the increase in production of oilseeds crops in the state was due to increase in acreage only. Productivity was noted to be more or less stagnant which could be attributed to poor adoption of improved technology.

Acreage under oilseeds crops in Assam is influenced by lagged area, lagged yield, lagged relative yield and some extent yield risk and lagged farm harvest price. Vigorous extension work for spreading improved technology for oilseed production among the farmers should be undertaken.

Singh and Kaur (1993) analysed the growth and instability in oilseeds in India by fitting exponential curve and fitting trend by Cadde-ville index for the time period 1965-1989. The inter-state comparison revealed that the growth rates of groundnut production accelerated for Andhra Pradesh, Karnataka, Orissa and Tamilnadu. Growth rates of rapeseed-mustard production accelerated for Assam, Gujarat, Haryana, Punjab, Rajasthan and West Bengal; growth rates of castor improved for Orissa, Tamilnadu, Madhya Pradesh and Maharashtra. The growth rates of linseed increased for Orissa and Punjab. The growth rates of sesamum accelerated for Assam, J & K, Karnataka Maharashtra and Orissa. However, productivity performance improved in case of groundnut for Bihar, Karnataka, Maharashtra and Rajasthan. The growth rates of rapeseed-mustard improved for Gujarat, Haryana, Orissa, Rajasthan, U.P. and West Bengal, of castor improved for Madhya Pradesh and Maharashtra, the growth rates of linseed improved for J & K, Madhya Pradesh, Maharashtra and Punjab. The growth rates of sesamum improved for Assam, Bihar, J & K, Karnataka, Madhya Pradesh and West Bengal.

They also revealed that the variability in yields declined for groundnut, rapeseed-mustard and increased for linseed, castor, sesamum, and total oilseeds. Further, the analysis of factors affecting variability in yields indicated that it was negatively affected by area under assured irrigation and rainfall.

Sharma and Parihar (1994) examined the trends in acreage and production of apricot in Jammu and Kashmir state. The data for the study was collected from a total sample of 60 farmers comprising 20 farmers from two blocks each in Kargil and two blocks each in Doda and Anantnag districts (Producing fresh apricot). The compound growth rates of production of dried apricot was found to be significantly higher i.e. 4.30 percent per annum than the compound growth rate of production of fresh apricot i.e. 3.30 percent per annum.

Behura *et al* (1995) analysed trends in production acreage and yield of potato in Orissa state during the period 1951-1971. It was found that the production and acreage declined considerably during 1972-82. However, during 1980's and early 1990's, area, production and yield have marginally increased. Cuttack is an important district in terms of acreage and production of potato with highest yield 123.9 kq/ha. Kalahandi district has the lowest acreage and production under potato where as, Phulbani district has the lowest yield (67.3q/ha). The growth rates of area and production of potato

were 3.4 and 1.4 percent per annum in Kalahandi district, 6.6 and 10.77 percent per annum in Balasore district, respectively. Puri had the highest and positive yield growth rate (5 %) of potato followed by kalahandi (4.3 %), Phulbani (4 %), Cuttack (4 %), Balasore (3.9 %), Dhenkanal (3.8 %) and Sundergarh (0.7 %).

Goswami *et al* (1995) studied the growth trend of oilseeds and pulses in India by fitting exponential growth function for time period 1950-1991 in three phases i.e. Phase-I (1950-51 to 1964-65), Phase-II (1966-67 to 1980-81) and Phase-III (1981 to 1990). They concluded that the growth rates of production of total oilseeds were 3.55, 1.66 and 5.0 percent while it was 2.19, -0.53 and 0.97 percent in case of total pulses for the Phase-I, Phase-II and Phase-III, respectively indicating that production of oilseeds was significant during Phase-III. This has led India to a state of self sufficiency in the production of oilseeds. But the low growth rate of production of pulses suggested that there should be special emphasis for increasing area and productivity of the pulse crops.

Mundinami *et al* (1995) analysed the growth performance of oilseeds in Karnataka by applying exponential growth performance and decomposition techniques. The growth in production was achieved mainly due to expansion of acreage in the study area (with an exception of groundnut in Dharwad

and Bijapur districts) and to some extent yield effect in recent years. The improvement in yield levels was observed in areas where irrigation facilities were extended. The potentiality of the viable technology developed for major oilseeds have not yet made a significant impact in increasing oilseeds productivity.

Sholarpurkar *et al* (1995) computed growth rates in area, production and yield of pearl millet in Karnataka for the period 1971-1989. The yield growth rates of pearl millet were positive during the 1970s but stagnant during the 1980s. District level analysis indicated similar trends in pearl millet production in most of the districts. Adoptions of high yielding varieties were at 75 percent. Although more than 90 percent of farmers applied fertilizers less than the recommended dose. About 30 percent of the farmers continued with the broad casting method of sowing.

Atteri and Chand (1997) computed the state wise growth rates of area, production and yield of fruits and vegetables in India for the period 1987-94. The study revealed that growth rates of area and production were positive for vegetables and fruits. But the growth rates of yields for fruits were negative while for vegetables, growth rates were positive between 1991 and 1995.

Borthakur and Krishnamoorthy (1997) studied the sources of growth and instability in the production of rapeseed-mustard in Assam by applying exponential trend

equation. Although, the production of rapeseed-mustard increased over the years, the total production was found to have increased with the increase in area. The yield of rapeseed-mustard had not increased significantly in the state. The average yield level during period-I (1957-1967) and period-II (1967-1991) were 415 kg and 454 kg per hectare, respectively. Moreover, growth in production was accompanied by increased production instability which could be attributed to erratic supply of monsoonal rain, adoption of varieties susceptible to diseases and variation in input supply along with variability in crop areas sown. They emphasized that suitable price, support policy, crop insurance schemes and more assured supply of inputs might be helpful to safeguard the farmers against production instability in rapeseed-mustard.

Dahiya and Ranvir (1997) examined the trends in area and production of fruit crops (apples and other temperate fruits) in the Himachal Pradesh during 1976-94. The fruit production as a whole increased at the rate of 9.35 percent annually during the study period. The apple production recorded the highest growth rate of 5.41 percent which was followed by other temperate fruits with growth rate of 5.07 percent followed by dry fruits i.e. 4.86, citrus fruits 2.92 percent per annum. The least growth rates were in case of subtropical fruits i.e. 2.84 percent per annum.

Shah (1997) studied the underlying growth trends of various fruits and vegetables in Maharashtra state from 1981 to 1994. Production of grapes in the state was growing with much faster than rest of the country with an annual compound growth rate of 25 percent per annum. Production of grapes was growing at 11 percent per annum on all India basis during the same time period. But the production of banana and onion were declining in the state during the same period even when India is in the fore front of export of these two commodities.

Sharma (1997) estimated district wise trend in the production of fruits in Himachal Pradesh for the period 1970-96. The study was based on the secondary data collected from the Directorate of Horticulture, Himachal Pradesh. The study revealed that state achieved a very impressive progress in the production of fruits during the study period. The area and production of fruits increased at a growth rate of 6.28 and 4.43 percent per annum, respectively during the study period. The growth rates of area and production of apple were 3.96 and 5.39 percent, respectively.

For computation of growth in area, production and productivity of pulses in Eastern Uttar Pradesh, Srivastava *et al* (1997) fitted the exponential growth function for the period 1975-2000. The arhar production declined at the compound growth rate of 0.3 percent due to negative growth in productivity. Gram production was found to be declined at the

rate of 5.56 percent per annum due to decline in area. Decline in gram production was more rapid than that of arhar. Total pulse production was also recorded a negative growth at the rate of 0.84 percent annually as results of decline in area of pulses in the study area. No improvement in pulse productivity was observed using the period under study. The decline in total pulse production as well as production of arhar and gram was more in period before 1990 than that after 1990. Further, the study highlighted that there is a need to bring more area under pulse crops as well as improvement in their productivity in order to make the country self sufficient in pulse production.

Vatta and Aggarwal (2000) studied the pattern of growth of major agricultural crops in Punjab by fitting the exponential growth function of area, production and yield for the period 1970-98. The total production of the major agricultural crops in the state increased during 1970-98. The increase in area, production and yield of paddy, wheat, total cereals and total food grains was relatively less during the period 1984-98. The changes in total production of these crops might be attributed to all the three effects i.e. area effect, yield effect and interaction effect. The increase in the area under cotton and pulses slowed down and there were large fluctuation in the yield level during 1984-98 due to high and uncertain incidence of pests attack. The area under sugarcane crop declined during

the period 1970-84 while it increased during 1984-98. The yield of sugarcane declined during the overall period.

Hazra (2001) studied the rice production scenario in India for the time period 1967 to 1997. It was found that the growth rate of rice production was 2.22 percent for the time period 1967 to 1981. It increased to 3.35 percent per annum during the time period 1981 to 1997, but the area increased to just 0.52 percent per annum during the time period 1981 to 1997 as compared to 0.77 percent during the period 1967-81. There has been an appreciable increase in growth of rice productively since 1980 to 1997 which is indicated by the compound growth rate of 2.82 percent per annum as compared to 1.45 percent per annum during the period 1967 to 1981.

Siju and Kambairayu (2001) studied the rice production in Tamilnadu by applying trend and decomposition analysis for the time period 1994-98. It was found that in the pre-Green Revolution period, the growth in production was solely due to increase in area under rice in the state. In the post-Green Revolution period, area showed an insignificant declining trend but the productivity showed a significant positive growth trend. But during the last ten year, there was no significant growth either in productivity or production even though the area has increased marginally.

Ramasamy and Salvaraj (2002) studied the reasons for slow growth of coarse cereals, oilseed and pulses in India from 1960

to 2000. It found that area under coarse cereals declined from 45 to 32 million hectares during the time period 1960-90 witnessing -1.48 percent growth rates. Despite reduction in area, there was a marginal increase in production due to increase in productivity levels. Production increased from 24.74 to 31.03 million tones with an annual growth rate of 0.46 percent per annum during 1970-2000, whereas productivity increased from 547 to 965 Kg per hectare during the same period registering 2.04 percent per annum growth rates. The area under pulses recorded a poor exponential growth function of only 0.03 percent per annum between the time period 1960 and 2000 due to stagnation of area at 23 million hectares with productivity of pulses in almost having around 500 to 600 kg/ ha with an annual growth rate of 0.68 percent during the period 1960-2000 due to cultivation on rained, marginal and rub marginal lands and high susceptibility to insect pests and diseases. Consequently, pulses production, which was 11.05 million tones during 1960 s, increased marginally to 13.60 million tones during 1990s registering a low growth rate or 0.71 percent per annum. The increase in production of different oilseeds during the period 1970-2000 was 1.43, 5.55, 11.55 and 4.14 percent per annum for groundnut, rapeseed-mustard, sunflower and total oilseeds, respectively.

Devraj *et al* (2003) analysed the trends in area, production and productivity of pulses in Bundelkhand region of Uttar Pradesh for the time period 1980 to 2000 by applying coefficient of variation equation and fitting exponential function. The time period was divided into two periods viz. period-I (1980-1990) period-II (1990-2000) and overall period (1980-2000). They found that mean value of area and production increased during the second period and was highest in case of pea i.e. 962.35 and 927.56 percent, respectively. The increase in mean value of productivity of urdbean was highest during the period-II i.e. 33.06 percent among all the pulse crops. Further, the compound growth rates of area and Production of pea (36.13 % and 39.75 %) were the highest during the first period and it reduced to 10.96 and 8.48 percent, respectively during the second period. While the productivity growth rates of pigeonpea (4.30 %) and urdbean (3.28 %) was the highest during the first period and overall period. The compound growth rates of area as well as production in case of chickpea and pigeonpea declined over the study period.

Srivastava *et al* (2003) attempted to analyse the growth in area, production and productivity of pulses in Eastern Uttar Pradesh by fitting exponential function to the district wise data pertaining to the period 1975-2000. It was found that arhar production declined at the compound growth rate of 0.3

percent in the study area due to the negative growth in productivity. Decline in gram production was found to be at the rate of 6.56 percent per annum due to fall in area. Total pulse production was also recorded a negative growth at the rate of 0.84 percent per year as a result of decline in area of pulses in Eastern Uttar Pradesh. The decline in total pulse production as well as production of other arhar and gram was more in the period before 1990 than that of after 1990.

Gupta *et al* (2006) studied the oilseeds scenario in India with special reference to sesame crop for the time period 1971 to 2000 on all India basis by fitting exponential function and decomposition technique. It was found that productivity of sesame increased by 2.46 percent per annum during the entire period. Increase in area was seen in Gujarat and West Bengal where as in Madhya Pradesh and Uttar Pradesh reverse trend was observed. In the period ranging from 1971-2000, in seven states (Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Rajasthan, Uttar Pradesh and West Bengal) the effect of area was estimated to be higher for enhancing the production whereas in rest of the three state i.e. Tamilnadu, Maharashtra and Orissa affect of productivity was recorded.

Tuteja (2006) studied the growth performance and acreage response of pulse crops in India for the time period 1980-2002. It was concluded that the all India pulse production grew at the dismal rate of 0.7 percent per annum

for the period 1980-2002. The growth in area was found almost stagnant where as yield increased at a slow rate of around 0.79 percent. The growth pattern of pulse production varied widely across the major growing states which exceeded 3 percent per year in Maharashtra and Andhra Pradesh. The states of Karnataka, Madhya Pradesh and Tamilnadu also recorded an annual growth rate of 2.0 percent in pulse production. The growth in production occurred due to increase in area and yield of pulses in these three states. But yield was the major contributor in Tamilnadu and Madhya Pradesh.

## **2.2 Costs, returns and benefit-cost ratio of the agro-processing industries**

Singh (1978) studied the role of agro-processing industries in the rural development of India. He is suggested that labour intensive and capital saving as well as power saving agro-processing industries can be located in villages, owned and established by the villagers. The decentralized gur and khandsari industries are cited examples to show how land owing and landless rural population can benefit from agro-processing industries nearer to home.

In Hisar district of Haryana during 1987-88, Srinivas *et al* (1989) studied the economics of three types of existing units i.e. oil mills, expellers and kohlu. The cost of processing per quintal of oilseeds amounted to be Rs. 8.17, Rs. 9.24 and Rs. 11.22 for oil mill, expeller and Kohlu processing units,

respectively. It revealed that with the decrease in plant size, the per quintal cost of processing increased. The fixed cost per quintal of oilseeds increased with the size of plant size, while the variable cost per quintal was inversely related with the size of plant. The returns per quintal of oil were the highest in the case of expellers (Rs. 16.55) followed by oil mills (Rs. 11.05) and Kohlu (Rs. 9.49). Large-size processing units generated more employment for skilled and unskilled workers.

Nagraj *et al* (1989) studied the economics of fruit processing and its impact on employment generation in Karnataka Agro-Fruit Limited during 1987. It was reported that the Agro-Fruits Firm has procured 691.90 tonnes of different varieties of fresh fruits valued at Rs.13.40 lakh with the out turn of 400.62 tonnes of finished product worth Rs. 28.90 lakh. The employment was 30744 man-days during the year, of which 61 percent was accounted for casual labour, 30 percent on permanent labour and 9 percent by contract basis. On an average, the firm employed 66 persons each day for 284 days in a year. The economics of processing revealed that the overhead costs accounted for only 12.25 percent of the total costs. Among the resulting expenses, the cost of fresh fruits, accounted for 48.5 percent of the total cost followed by other material (12.5%), Labour (7%), advertisement (6%) and taxes (5%). The estimation of break-even volume indicated that at

present the firm was operating at around 40 percent of its installed capacity indicating a high degree of under utilization.

Sikka *et al* (1989) studied the economics of potato processing in Nainital district of Uttar Pradesh during the period 1987-88. The data were collected from a unit manufacturing potato chips. It was reported that the technology under consideration involved a fixed cost of Rs. 39730 and could process upto 1500 kg potatoes per day. However, just 480 quintal of potatoes was processed during the entire season. The operational cost of processing this volume of potatoes was Rs. 53850 which included cost of potatoes, labour charges, fuel, chemicals, maintenance and overhead charges etc. The total cost of production of chips was found to be Rs.66299. The sale of chips at Rs. 11 per kg. fetched a gross income of Rs. 85272 for entrepreneurs. After including interest on fixed and working capital (at 12 % per annum) and rental value of land (at Rs.5000 per hectare) gave a net profit of Rs. 2.45 per kg and the profit over total cost of processing was 28.65 percent. This clearly indicates that such types of technology are financially feasible and Government should make out efforts for popularizing such enterprises in potato producing areas. The adoption of technology could be applied at the village level for processing of potato not only augments income of the entrepreneur but it also stabilize price during harvest season.

Talukdar and Singh (1989) examined the relative performance of processors of pine apple with respect to income distribution and pricing efficiency in pine marketing in Manipur state during the period 1986-87. It was found that total production was significantly affected by area and productivity. Factors like total production, area under pine apple, non-market transaction and level of income significantly affected the marketed surplus. The total price spread was mainly affected by the level of margin, level of cost, amount of wastage, number of middle man, quality of product, type of market used by growers and time of produce arrivals in the market. The processors incurred highest cost (Rs. 3040) and earned the highest margin (Rs. 680) per quintal quantity of pineapples.

Veerkar and Barude (1989) studied the economic analysis of mango processing in Ratnagiri district of Maharashtra during the period 1987. Twenty seven mango processing units were selected for the study in which 15 were pulp making, four pickle making, two chutney making and six were slice making. Average capital investment per unit was over Rs. 10 lakhs in pulp making, Rs.2.81 lakhs in pickle making, Rs. 1.60 lakhs in chutney making and Rs. 5.03 lakhs in raw slice making. The working season was 32 days, 110 days, 160 days and 50 days, respectively. Per day employment per unit was 24 persons in pulp making, eight persons in pickle making, 11 persons in

chutney making and 34 persons in raw slice making and most of them were unskilled women. It was found that the cost of processing per quintal of processed product was Rs. 19 per tin of pulp, Rs. 8.87 per quintal of pickle, Rs. 1308 per quintal of chutney and Rs. 257.0 per quintal of raw slices. The net returns were about Rs. 7.0, Rs. 5.66, Rs. 777.0 and Rs. 356.0 for pulp, pickle, Chutney and slices, respectively. The output-input ratio was highest for pickle making (1.64) followed by chutney (1.59), pulp (1.35) and least was for raw slice. Thus, the processing of mango into different products resulted in considerable increase in added value and employment, finally, the business is quite remunerative.

In the Nasik district of Maharashtra Powar *et al* (1990) studied the paddy processing for the *Pohe* and *Murmure* processing units. The per quintal cost of processing of paddy in case of rice mill and huller calculated were Rs. 5.90 and Rs. 4.85, respectively. The processing cost for *Pohe* and *Murmure* making were Rs. 84.21 and Rs. 102.33. The skilled worker employed were highest in *Murmure* making (348 mandays) followed by rice mill (223 mandays), *Pohe* (205 mandays) and huller (196 man days). The employment pattern for unskilled labour showed highest mandays in *Pohe* (615 mandays) followed by *Murmure* (382 man days). The paddy processing industry was found to be labour intensive and strengthening rural economy by providing employment opportunities.

Studying the comparative economics of agro-processing units for rapeseed-mustard in Jodhpur district of Rajasthan, Om and Agarwal (1990) reflected that the processing cost per quintal of rapeseed-mustard was Rs. 20.91, Rs. 18.45 and Rs. 12.76 for six bolt size expeller, nine bolt size expeller and large size oil expeller, respectively. The processing cost per quintal of rapeseed-mustard decreased with the increase in the size of expeller and its crushing capacity. Processors earned a margin of Rs. 19.05, Rs. 21.10 and Rs. 22.19 per quintal of rapeseed-mustard with six bolt, nine bolt and large sized oil expeller, respectively.

Singh and Singh (1990) studied comparative profitability of some important private agro-processing units in Nainital district of Uttar Pradesh during 1989. It was reported that oil processing units were found to be the most profitable processing units in comparison to other selected agro-processing units. The lowest profitable processing units were paddy processing and fruit preservation cum processing units. The processing units were running at 75 to 85 percent of their installed capacity and if they run to their full capacity, their profitability will be increased.

Singh and Vyasulu (1990) examined growth and structure of food processing industries in Punjab for the time period 1966-86 and concluded that growth has taken place in the field of primary processing of agricultural produce which

has recorded growth above the state average in both output and employment. But the secondary processing sector which contributed to higher rate of value added has not grown at a commensurate rate. Aspects of policy to encourage the growth of value adding at secondary sector of processing were identified as a field for further research.

Zeaudeen and Natesh (1991) concluded that groundnut oil processing has been profitable in Karnataka which can be further increased by crushing more quantity. The processing units were operated high above the break-even point of production; even through they were processing very low quantity compared to their installed capacity.

Khatkar (1996) studied status and prospectus for food-processing industry in India. The food industry has attained the annual growth rate of 5.7 percent in 1992-93 as compared to 1.6 percent in 1989-90, yet a vast majority of agricultural produce, was consumed and exported unprocessed. Presently in India, only one percent of the total fruits and vegetables production was processed as against 80 percent in South Africa, 65 percent in USA, 70 percent in Brazil and 83 percent in Malaysia. Indian processed fruits and vegetables export constituted one eighth of total exported fresh produce. The lower level of food industry development index indicated dismal position of food processing industry included and its development status as result of low value of

various indices viz. TII, FEI, GDPI, GDSI and CCI etc. Infrastructural facilities as well as improved processing technology was not lacking in this sector.

Rai *et al* (1996) investigated that there is tremendous scope for agro-processing industries in Haryana state where supply of raw material; processing infrastructure facilities and marketing are not serious problems. The potential of developing agro-processing industries lies wheat and rice milling, feed and concentrate industry, edible oil and cotton processing, sugarcane, fruit and vegetable processing. The rising trend of processed food items will accelerate the development of food/agro-processing industries. These industries will help in development of agriculture by creating backward and forward linkages, generating more employment, adding value to farmer's produce and increasing their net income.

Srinivas *et al* (1996) studied the economics of processing of cashew nuts at different stages in the Karnataka State. They found the processors had to bear the processing cost of Rs. 91.66 per 80 kg of raw nuts. Out of total processing cost, material cost and labour constituted Rs. 55.39 and Rs.44.61, respectively. Among the various labour costs, the major share occupied by shelling operation i.e. Rs. 30.74 which accounted for 24.75 percent, peeling cost with Rs. 21.82 which accounted for 17.56 percent, drying of nuts with Rs. 3.80 which was 3.07

percent, roasting of nuts with Rs. 7.82, drying of shelled karnel Rs. 0.64 and packing charges at Rs. 52.60 which accounted to 42.34 percent of the total processing cost. Recovery rate of 28 percent of kernels was considered to be good one. Out of 80 kg raw material processed, around 22 kg of cashew nut kernels (final product) was obtained.

Kaur and Kaur (2000) studied the Zahura processing plant and concluded that the potential of agro-processing industries could be better harnessed by stimulating the growth of necessary infrastructure to provide supporting services in the context of Punjab economy. Also, the declining growth rate in service sector, unless checked may lead to weakening the inter-sectorial linkages that have sustained the high growth economy of Punjab.

Shergill and Singh (2001) in their book described the growth and performance, linkage effects, problems and expansion plans of agro-processing units in the Punjab. The issues relating to rural agro-processing and participation of rich farmers were also analysed. Industry projections of the availability of surplus agricultural raw materials until 2001 were made. The study showed that the growth of agro-processing industries had not kept pace with the growth of agricultural production projected. The performance of six agro-processing industries has been encouraging. The high performance agricultural industries experienced a relatively

high rate of growth and backward linkage effect was stronger than the forward linkage effect. However agro-processing industries faced problems in regard to the availability of credit and power. It also concluded that the agro-processing industry did not want to expand its operation. A policy package for speeding up the development of agro-processing industries was suggested.

Nain *et al* (2002) studying the role of sugarcane processing industries and the efficiency of processing units in Haryana state. It was concluded that the processing efficiency played a vital role in increasing the net returns due to value addition in sugarcane. The processing efficiency was found higher in the private sugar mill in comparison to co-operative sugar mill as respect of highest fixed costs, overhead expenses and quantity of sugarcane crushed.

Singh (2002) made the comparative study of processing cost of individual and joint entrepreneurship in case of groundnut during the period 1998-99 in Udaipur district. It was found that total fixed cost incurred by individual entrepreneur was Rs. 276000 while that of joint entrepreneurship unit was Rs. 2,94,000. The working cost was found to be Rs. 6,30,454 for the individual unit and for the joint entrepreneurship use it was Rs. 6,16,393. The cost of processing was higher in the joint unit (Rs. 160.96) than individual unit (Rs. 154.83). The capacity utilized by individual entrepreneurship was more

(70.83%) than the joint entrepreneurship (57.31%). It was further noticed that highest arrivals of groundnut were available during the peak season when market prices were low. The recovery was comparatively higher in case of individual ownership units than joint one.

Navadkar and Patole (2004) observed that the major area under fruit crops was noticed in the state of Maharashtra, Andhra Pradesh and Karnataka, which together contributed nearly 35 percent of the national area under fruits. The area under fruit crops has grown by 3.1 million hectares annually from 1991-92 to 2001-02. Simultaneously, there has been substantial improvement in the capacity utilization of fruits and vegetables processing industries during the recent years. However, at present, about half of the installed capacity remains unutilized.

Pant and Pal (2004) examined economic viability and employment generation of agro-processing units for groundnut in Southern Rajasthan. They concluded that processing units utilized about 51 percent of their installed capacity and maximum utilization capacity was in medium units i.e. 62 percent. Of the groundnut pods processed 26.09, 32.58 and 7.04 percent were shells, oil and oil cake, respectively and remaining 4.29 percent went as wastage. The difference in the size of processing units had no influence on recovery of oil, oil cake and shell. In small, medium and large units, fixed and working costs were 7.37 & 92.63 percent, 4.70 & 95.30 percent and 6.43 & 93.57 percent, respectively. In small and

medium units, packaging and labeling of the finished products accounted for maximum of the total working cost while in large units refining of oil constituted maximum followed by packaging and labelling. The processors margin was Rs. 32.34, Rs. 49.35 and Rs. 50.84 in small, medium and large units, respectively. The value added by investment of one rupee was Rs. 1.20, Rs. 1.35 and Rs. 1.23 in different units, respectively. All the three categories of processing units were crushing more quantity of groundnut than their break even quantity. Employment generated in groundnut processing was 464, 1736 and 6931 man days on different categories of processing units. While the employment generated by processing per quintal of groundnut in small, medium and large units were 4.94, 3.76 and 1.83 man days, respectively.

Reddy *et al* (2005) calculated the economics of paddy processing in Prakasam district of Andhra Pradesh. The machinery cost i.e. Rs. 7,58,000 was the major cost item of the total investment where as the cost of raw material shared 81.43 percent of total variable cost. The break-even quantity was calculated to be 14,330 quintal and margin safety was calculated to be 13,764 quintal. So, this indicates that the mill was working at excess capacity utilization.

Meena *et al* (2006) studied the economics of chilli processing in Jodhpur district of Rajasthan. The cost of processing per quintal of chilli was Rs. 180.06, Rs. 167.30 and

Rs. 234.42 for small, medium and large units, respectively. Margin of processors increased with the increase in the size of processing unit. The returns to per rupee investment also increased with the increase in the size of processing unit. All the processing units were operating above the break-even point.

Studying the prospects and problems of agro-processing industries in Bikaner district of Rajasthan, Varghese and Singh (2006) found that the capital investment was relatively more for rasgulla processing units than oil processing units. The employment potential per processing unit was found to be more for woolen yarn production and processing. The employment potential in the category of combined papad-bhugia processing, reasgulla processing, dal processing and oil processing varied between 6 to 7 persons per unit for the units registered under papad and bhugia, the employment potential per unit was 4 to 5 persons only. However, when employment potential per lakh rupees invested is conceived, it is maximum for papad and bhugia processing units which come out to 8-9 person/lakh rupee invested.

### **2.3 Constraints faced by agro-processing units**

Studying constraints faced by the Nizam sugar factory in Amruthanagar, Ali (1989) found that capacity was under utilization as result of lesser production of sugarcane. The reduction in sugarcane was caused due to lack of facilities,

non-remunerative price and more funds invested in management of water for the crop particularly in the summer season.

Bhole *et al* (1989) studied the industrial set up of oil mills in the Buldana, Akola, Amravati and Yavatmol districts of western vidharba region of Maharashtra state. Most of the oil mills were in the urban center causing transportation burden on producers.

Studying the constraints in arhar processing in Narsinghpur district of Madhya Pradesh, Jain (1989) found that the main difficulties of arhar processors were inadequate availability of raw materials, short supply of power leading under utilization of the plant, declining output and inefficiency of machinery, labour and transportation for disposal of processed material. The absence of co-operative arhar processing unit is not healthy sign to safeguard the interest of producers and consumers.

Rao (1989) envisaged the under utilization capacity of edible oil industries in Andhra Pradesh. The under utilization of processing units was scarcity of raw material as result of purchase made by out side traders in the state. To compete with big traders/processors, the small units should procure raw material through interlocking of credit and output markets and adopt co-operative marketing system. The oilseeds production

should be increased with improved production techniques and increase in minimum support price.

Sain (1989) studied the prospects for agro- processing industries in India with special reference to Punjab state during the period 1987-88. He found the constraints in the location of agro industries. The results of the analysis showed that the share of Andhra Pradesh, Bihar, Gujarat and Maharashtra in the production of sugar was more than their share in the production of sugarcane. The share of Uttar Pradesh and Tamilnadu in the cotton mills was more than their share in the production of cotton. The share of wheat roller flour mills in Andhra Pradesh, Assam, Gujarat, Jammu & Kashmir, Karnataka and west Bengal was higher than their share in production of wheat while for Rice mills, Andhra Pradesh Gujarat, Karnataka, Maharashtra, Punjab and Tamilnadu accounted for a higher share in the number as compared to production of paddy. This indicated that some of the states having a lower share in production lagged behind in the development of processing facilities for the connecting farm industry linkages. More sugar mills could be set up in Punjab as the number of mills is proportionately less than production and productivity. Similarly cotton mills should be set up in Gujarat, Rajasthan, Punjab and Haryana. Further in Punjab and Haryana states more flour mills should be set up which constitute the food bowl of India.

Seetharaman and Pichholiya (1989) studied the constraints of soyabean processing units in Madhya Pradesh. The fluctuation in price of oil and oil cake affected the profitability of the processing unit. No product can survive and grow in the long-run, unless its markets are built around the products own strength. They also highlighted that there is a need of integration between farm and industries.

Singh *et al* (1989) studied the guava processing units in Allahabad district of Uttar Pradesh. There were only two guava processing units in that area out of which only one was in running condition with very nominal quantity of guava purchased for making juice and other items. Because buyers of guava juice were particularly in Europe and United States require juice of only yellow and pink varieties which are quite scarce and their cost was high. Unfortunately, area and production of guava had been decreasing since the last two decades probably because of the diversion of its area to field crops and also due to expansion of brick industry. Further, guava production has remained nearly stagnant for the last five years and proved economic for the growers.

Sahu (1990) conducted the study regarding Government policies to develop agro-processing industries in the country and constraints of agro-processing industries. The industries failed to adopt improved techniques of reducing costs and improving productivity and there was lack of co-ordination

between different government efforts and agencies working independently.

Singh and Mann (1990) examined the location of wheat flour mills, rice mills, oil mills and sugarcane mills. Wheat flour mills were mostly concentrated in those states which did not have surplus raw material. Therefore, wheat surplus states were deprived of the benefit of forward linkages. Punjab being major wheat producing state had not good quality of bread making industry. Moreover, volume in rice milling industry was very low due to the lack of modernization of par-boiling process. The existing processing capacity of agro-based industries (paddy, wheat, oilseeds and sugarcane) did not cope with the surplus production of agricultural products.

Mehta *et al* (1994) studied the recent trends, constraints and future challenges of the agro-processing industries. They found constraints in the supply of raw material, processing and marketing, higher tax incidences, planning for agro-climatic regions and further research.

Studying the potential of mango processing in Andhra Pradesh Malliswari (1996) concluded that there was insignificant demand for mango pulp in the domestic market because of high prices and non-perception of processed products as close substitutes of fresh mango. The price of the ultimately product was high because of high packing and promotion charges. Product promotion to increase awareness

among consumers of the nutritive value and the different uses of processed pulp would contribute to higher domestic demand. Also promotion of contract farming would help the processors to get continuous supplies and the farmers are assured buyer at reasonable prices.

Shinde *et al* (1999) studied the fruits and vegetables processing units in the vicinity of Nagpur of Maharashtra state. The present utilization of fruits for processing purpose was quite negligible as result of substantial quantity of production was diverted either for fresh consumption or for exports. However, there is a vast scope to establish new processing units of fruits and vegetables due to availability of raw material in Vidarbha region.

Abhiman (2003) analyzed the economics of paddy processing in Bhandara district in 2002 and it was found that paddy processing units were operating at much higher level than the break-even level during study period despite of inconsistency of electric supply, unavailability of labour. The lack of storage facilities, transport facilities and skilled labour for operating machinery and lower prices of finished products were the some major constraints faced by paddy processors.

Studying the value addition in important fruit crops in Nagpur district of Maharashtra state, Sampetrao (2003) observed the constraint of higher cost of raw-material, packing material, unavailability of labour, seasonality in fruit

production, high incidence of taxes and lack of infrastructure facilities.

Sarkar (1997), studied the growth of agro-industry and its inter- relationship with agriculture in India. It was found that within agricultural sector only plantation and commercially crops gets substantially processed by agro-industry. Within agro-industries oilseed processing, sugarcane processing, raw hide and skin processing industries had strong backward linkages showing their capacity to influence agricultural growth through induced demand. However, relationship between agriculture and agro-industry got weakened by the fact that out of 21 agro-industries, only ten were primary processing and directly affected by changes in the output of agricultural sector. The growth of raw material supply affected growth of agro-industries in positive manner, where as greater concentration of raw material availability influenced the growth of agro-industry in negative fashion.

Swamy (2005) studied the declining trend in khadi and village industries, employment and labour efficiency during the post reforms period in India. Village industries which are based on either resource endowment or demand need to be encouraged. Technical know how should be provided through institutional training to the artisans and small entrepreneurs for introducing modern methods of production and production to diversification. Further, Govt. should take some concentrate

policy measures in the context of liberalization to protect and revive khadi and village industries.

Varghese and Singh (2006) studied the prospects and problems of agro-processing industries in Bikaner district of Rajasthan and found that the production of raw material like pulses, oilseeds, wool etc. was not stable and the availability of raw material for processing was not ensured. The power fluctuations and irregular supply of water were also constraints in the development of agro-processing units in the study area. The government policies should be changed for the smooth development and growth of agro-processing units in the region.

### **CHAPTER-III**

## **Methodology**

There are tremendous scopes of agro-processing industries in Haryana. There are a number of small, medium and large agro-based processing units in the Hisar and Bhiwani districts like wheat milling, rice milling, feed and concentrate industries, oil (edible or non-edible) and oil cake industries, cotton industries and gram processing industries etc.

The study is based on the primary as well as secondary data.

### **3.1 Sampling design**

#### **3.1.1 Selection of districts**

Haryana state is divided in to two agro-climatic zones i.e. eastern and western zones. The western zone of Haryana comprises of districts Hisar, Bhiwani, Sirsa, Fatehabad, Mahendergarh, Rewari and parts of Gurgaon, Rohtak and Jind. The districts Hisar and Bhiwani were purposively selected on the basis of highest production of commercial crops (3.1) and highest number of agro-processing units related to commercial crops i.e. cotton, gram and rapeseed-mustard (Table 3.2). From each selected district 10 agro-processing units for each commercial crop were surveyed. Finally, 60 agro-processors were personally interviewed using well-defined and structured interview schedule to collect the information.

**Table 3.1: Production of Commercial Crops in Haryana**

District	Production (000, Tonnes) T.E. 2004					
	Wheat	Rice	Chickpea	Rapeseed-Mustard	Cotton	S
Ambala	287.00	214.33	-	-	-	
Panchkula	44.33	18.00	-	-	-	
Yamuna Nagar	239.33	161.33	-	1.93	-	
Kurukshetra	471.33	362.00	-	-	-	
Kaithal	747.67	411.33	-	-	-	
Panipat	722.33	473.00	-	-	-	
Sonepat	555.67	131.00	-	5.83	-	
Rohtak	347.67	18.67	2.07	19.50	15.67	
Jhajjar	388.00	22.00	2.67	45.33	3.33	
Faridabad	-	-	-	9.00	-	
Gurgaon	429.00	-	43.00	-	-	
Rewari	195.67	-	-	104.33	-	
Mahendergarh	168.33	-	11.33 (12.91)	113.67 (13.93)	-	
Bhiwani	429.00	-	43.00	208.00	95.00	
Jind	850.33	190.00	-	12.67	79.00	
Hisar	1531.33	247.00	13.33	109.33	500.61	
Sirsa	976.67		11.33	92.00	362.67	

**Table 3.2: Number of agro-processing industries in Haryana: 2004-05**

<b>Sr. No.</b>	<b>District</b>	<b>Oil mill</b>	<b>Dal mill</b>	<b>Cotton ginning mill</b>
1.	Ambala	25	03	-
2.	Bhiwani	31	24	24
3.	Faridabad	28	08	-
4.	Fatehabad	15	01	44
5.	Gurgaon	24	04	-
6.	Hisar	105	33	133
7.	Jhajjar	07	-	-
8.	Jind	27	04	32
9.	Kaithal	01	-	-
10.	Karnal	06	-	-
11.	Kurukshetra	02	-	-
12.	Mohindergarh	24	10	-
13.	Panipat	01	-	-
14.	Panchkula	05	-	-
15.	Rewari	19	01	-
16.	Rohtak	11	04	-
17.	Sirsa	30	07	-
18.	Sonipat	11	-	-
19.	Yamunangar	03	-	-

### **3.1.2 Secondary data**

The secondary data pertaining to area, production and yield of major crops grown in Hisar and Bhiwani districts as well as Haryana state were scanned from various issues of Statistical Abstract of Haryana, Directorate of Economics and Statistics, Govt. of Haryana, Chandigarh for the period 1979-2005. The information with regard to market arrivals of major crops was collected from Haryana State Agricultural Marketing Board, Panchkula for the same period.

### **3.1.3 Primary Data**

Primary data with regard to capital, raw material, machinery equipments, labour, processed products-output, factor-product prices, socio-economic variables and other related parameters were collected from the agro-processing units through a well structured and pre-tested interview schedule.

The information with regards to constraints faced by the processing units was be ascertained through simpler tabular analysis.

## **3.2 Analytical techniques**

### **3.2.1 Growth behavior of commercial crops**

To draw meaningful inferences and to avoid fluctuations from the collected information the conventional statistical tools like percentages, averages, triennium endings were calculated. The data pertaining to area, production, yield and market arrivals of major crops for the period 1979-2004, was divided

into three periods i.e. Period-I (1979-89), Period-II (1990-2004) and Overall Period (1979-2004) to analyse the growth rates, compound growth rates were calculated using exponential model.

$$Y = ab^t$$

$$Y = \frac{\text{Area(ha)} \times \text{production(tonnes)}}{\text{yield(kg/ha)} \times \text{market arrivals (tonnes)}}$$

a = Constant

b = Regression coefficient

t = Time in years

### **3.2.2 Benefit-cost ratio**

The benefit cost ratio was calculated by dividing gross returns i.e. total income from the sale of main product and by products by total costs (total fixed costs + total variable costs) for 2004-05.

$$\text{BCR} =$$

### **3.2.3 Break-even point analysis**

Break-even volume analysis was used to know the minimum level of production required to recover the total fixed capital employed in agro-processing unit. This concept is important in any business as it indicates minimum level of business necessary for operating the enterprise in short run without losses. The formula for calculating break-even quantity used as follows

Where,

Q = Quantity of break-even point

FC = Total annual fixed cost

P = Sale price per unit of raw material

VC = Variable cost per unit

### **3.4 PROCESSING ASPECTS**

#### **Fixed capital**

The items used under fixed capital were the value of land, buildings, machinery and equipments.

#### **Total fixed cost**

The items included under fixed cost were depreciation charges on buildings, machinery and equipments, salaries for regular staff and interest on fixed investment.

#### **Operating cost (Variable cost)**

The operating cost comprised of cost of the raw material and gunny bags, utilities like power, fuel and lubricants, wages for casual labour, repairs and maintenance, interest on operating expenses and taxes.

#### **Depreciation**

The depreciation on building, machines and equipments were calculated by the method of sum of square digit method.

### **Procurement cost**

Procurement cost is a component of variable cost. It includes transportation cost, loading and unloading charges, market fee, commission paid to the commission agents and all other incidental costs incurred in procurement of raw material.

### **Interest**

The interest on operating fixed cost and variable expenses was computed at the rate of 12 percent per annum.

### **Processing cost per quintal of raw material**

Processing per quintal of raw material was calculated by dividing total processing costs by total quantity of the raw material processed.

### **Gross returns**

Gross returns were estimated by taking sum of sale value of main product and by-products.

### **Net returns**

Net returns were computed by subtracting total cost from gross returns.

### **Gross returns per quintal of raw material**

This was calculated by dividing gross returns by total quantity of raw material used.

## **Net returns per quintal of raw material**

This was computed by dividing net returns by total quantity of raw material used.

## **CHAPTER-IV**

# **Results and Discussion**

The results of the study derived from the data collected and analysed by applying different empirical statistical tools have been presented in this chapter under the following heads:

- 1.1 Growth behavior of major crops
- 1.2 Costs and returns of the agro- processing units
- 4.3 Constraint faced by the agro-processing units

### **4.1 Growth behaviour of major crops**

Technology breakthrough, increased use of market inputs, adoption of high yield variety seeds and use of improved production techniques, expansion of irrigation facilities caused manifold increase in acreage under water intensive and less risky crops. With the advent of Green Revolution in Haryana State, the area twisted towards certain crops like paddy and wheat but it resulted into increase in productivity of all crops. The increased production of crops in the state enhanced the market arrivals of agricultural produce.

#### **4.1.1 Area, production and yield of major crops**

##### **4.1.1.1 Hisar District**

###### **4.1.1.1.1 Cropping pattern**

The acreage under different crops in Hisar district is presented for T.E. 1982, T.E. 1992, and T.E. 2004 in table 4.1.



**Table 4.1: Acreage under major crops in Hisar district****(000, hectares)**

Sr. No.	Crops	T.E. 1982	T.E. 1992	T.E. 2004	Percent Increase/ Decrease in 1992 Over 1982	Percent Increase/ Decrease in 2004 Over 1992	Percent Increase/ Decrease in 2004 Over 1982
1	Wheat	159.67 (22.26)	256.13 (31.09)	366.97 (40.83)	60.41	-43.27	129.83
2	Rice	20.43 (2.84)	35.20 (4.27)	86.67 (9.64)	72.29	-146.22	324.22
3	Coarse Cereals	121.50 (16.94)	85.60 (10.39)	88.27 (9.82)	-29.54	3.11	-27.34
4	Total cereals	301.60 (42.05)	376.93 (45.76)	541.91 (60.29)	24.97	43.76	79.68
5	Gram	190.10 (26.50)	114.47 (13.89)	15.03 (1.67)	-39.78	86.86	-92.09
6	Total pulses	194.53 (27.12)	120.90 (14.67)	25.70 (2.86)	-37.85	-78.74	-86.78
7	Total food grains	496.13 (69.17)	497.83 (60.44)	567.61 (63.15)	0.34	14.01	74.35
8	Rapeseed-mu stard	57.40 (8.01)	86.03 (10.44)	76.40 (8.50)	49.87	11.19	33.10
9	Total oil seeds	58.23 (8.13)	90.10 (10.93)	77.60 (8.63)	54.73	13.87	33.26
10	Cotton (Desi)	42.87 (5.98)	15.33 (1.86)	57.90 (6.44)	-64.24	277.69	35.05
11	Cotton (American)	113.47 (15.82)	215.97 (26.22)	186.60 (20.76)	90.33	13.59	64.44
12	Total cotton	156.33 (21.82)	231.30 (28.08)	244.50 (27.21)	47.94	5.70	56.38
13	Sugarcane	6.40 (0.89)	4.40 (0.53)	9.16 (1.02)	-31.25	108.18	43.12
14	Total non-food crops	221.10 (30.83)	325.80 (39.56)	331.27 (36.85)	47.35	1.67	49.82
15	Total cropped area	717.23 (100.00)	823.63 (100.00)	898.88 (100.00)	14.83	9.13	25.32

Note: Coarse cereals includes: bajra, maize, barley, jawar.  
Other pulses: moong, masar, mash, urd  
Other oilseeds: linseed, groundnut, castor, toria and taramira  
Figures in parentheses indicate the percentage of cropped area to the total.  
T.E. indicates Triennium Ending

It is evident from the table that over the years, the cropping pattern in the Hisar District registered a substantial change. Total cropped area in the district increased from 717.23 to 898.88 thousand hectares during 1979-2004. The total cereals accounted for about 42.05 percent of total cropped area in T.E. 1982 increased to 60.29 percent in T.E. 2004 showing an increase of 79.68 percent during 1979-2004. The area under wheat and paddy increased significantly, while area under coarse cereals declined during the study period. The percentage area under gram and total pulses to total cropped area declined from 26.50 and 27.12 percent in 1979-82 to 1.67 and 2.86 percent in 2001-04, respectively registering decline in acreage of 92.09 and 86.78 percent during 1979-2004.

The reduction in acreage under pulses crops was observed as a result of decline in area under gram. However, percentage area under rapeseed-mustard, total oilseeds, cotton (Desi) and cotton (American) increased over the time period. The acreage under non-food crops increased from 30.89 to 36.85 percent during the study period showing an increase of 49.82 percent in the same period. While area under food grains declined from 69.17 to 63.15 percent exhibiting reduction of 6.02 percent in acreage during 1979-2004 as a result of drastic decrease in acreage under pulse crops especially gram and certain amount of decline in area under coarse cereals. The crops like rice, wheat, cotton and rapeseed-mustard gradually replace less remunerative crops like coarse cereals (bajra, maize, jowar and barley) and pulse crops.

The ever rising share of rice, wheat, cotton and rapeseed-mustard may be attributed to major change in production technology of these crops, expansion of irrigation facilities, market infrastructure, institutional arrangements and Govt. Policies (especially minimum support price). The plausible reason for crops regarding declining share in acreage may be low productivity, absence of promising varieties, low market price, difficulty in marketing of product and high risk involved. The increase in area under sugarcane witnessed in the study area due to establishment of sugar mills in Kaithal, Jind and Meham and their purchase centers in producing area of sugarcane.

#### **4.1.1.1.2 Production pattern**

Production pattern of various crops in Hisar District for the period 1979 to 2004 is given in table 4.2. Among the important crops of the district, wheat and rice witnessed the highest relative increase in their production. The production of wheat and rice increased to 1531.33 and 247.00 thousand tonnes in T.E. 2004 from 396.33 and 54.67 thousand tonnes in T.E. 1982, respectively indicating increase in production level of 286.37 and 351.80 percent during 1979-2004. The production of coarse cereals (i.e. jowar, bajra, maize and barley) also showed a considerably increase in their production due to development in farm technology despite decrease in their acreage in the study period. The production of gram and

**Table 4.1: Acreage under major crops in Hisar district****(000, hectares)**

Sr. No.	Crops	T.E. 1982	T.E. 1992	T.E. 2004	Percent Increase/ Decrease in 1992 Over 1982	Percent Increase/ Decrease in 2004 Over 1992	Percent Increase/ Decrease in 2004 Over 1982
1	Wheat	159.67 (22.26)	256.13 (31.09)	366.97 (40.83)	60.41	-43.27	129.83
2	Rice	20.43 (2.84)	35.20 (4.27)	86.67 (9.64)	72.29	-146.22	324.22
3	Coarse Cereals	121.50 (16.94)	85.60 (10.39)	88.27 (9.82)	-29.54	3.11	-27.34
4	Total cereals	301.60 (42.05)	376.93 (45.76)	541.91 (60.29)	24.97	43.76	79.68
5	Gram	190.10 (26.50)	114.47 (13.89)	15.03 (1.67)	-39.78	86.86	-92.09
6	Total pulses	194.53 (27.12)	120.90 (14.67)	25.70 (2.86)	-37.85	-78.74	-86.78
7	Total food grains	496.13 (69.17)	497.83 (60.44)	567.61 (63.15)	0.34	14.01	74.35
8	Rapeseed-mu stard	57.40 (8.01)	86.03 (10.44)	76.40 (8.50)	49.87	11.19	33.10
9	Total oil seeds	58.23 (8.13)	90.10 (10.93)	77.60 (8.63)	54.73	13.87	33.26
10	Cotton (Desi)	42.87 (5.98)	15.33 (1.86)	57.90 (6.44)	-64.24	277.69	35.05
11	Cotton (American)	113.47 (15.82)	215.97 (26.22)	186.60 (20.76)	90.33	13.59	64.44
12	Total cotton	156.33 (21.82)	231.30 (28.08)	244.50 (27.21)	47.94	5.70	56.38
13	Sugarcane	6.40 (0.89)	4.40 (0.53)	9.16 (1.02)	-31.25	108.18	43.12
14	Total non-food crops	221.10 (30.83)	325.80 (39.56)	331.27 (36.85)	47.35	1.67	49.82
15	Total cropped area	717.23 (100.00)	823.63 (100.00)	898.88 (100.00)	14.83	9.13	25.32

Note: Coarse cereals includes: bajra, maize, barley, jawar.  
Other pulses: moong, masar, mash, urd  
Other oilseeds: linseed, groundnut, castor, toria and taramira  
Figures in parentheses indicate the percentage of cropped area to the total.  
T.E. indicates Triennium Ending

total pulses showed a decline of 86.71 and 84.88 percent in T.E. 2004 over T.E. 1982. The reduction in gram and pulses production may be as a result of shift of area from pulses to more remunerative crops like wheat, rice, rapeseed-mustard and cotton. Except shift in area, other factors like insect-pests and uncertain rain were also considered for low production of pulses in the district.

The production of cash crops like rapeseed-mustard, cotton (American), cotton (Desi) and sugarcane exhibited increase over the period due to continuous increase in area as well as use of high yielding, disease resistant varieties and adoption of improved production technology.

Increase in area under the total cereals in 2004 was just 79.68 percent over the year 1982 but increase in production is 263.63 percent in the same time period showing that increase in production was due to increase in area as well as increase in productivity of the cereals crops especially wheat and rice. Increase in the production of coarse cereals occurred as a result of increase in productivity besides the decline in acreage of these crops.

#### **4.1.1.1.3 Yield pattern**

Modern agricultural technologies have played a vital role in increasing the crop productivity. The crop productivity of important crops in Hisar district for the time period 1979-2004 is shown in table 4.3. It is observed from the table that there is a significant increase in productivity of wheat and rice due to increase in area under high yielding varieties, expansion of

**Table 4.3: Yield of major crops in Hisar district****(Kg./hectare)**

Sr. No.	Crops	T.E. 1982	T.E. 1992	T.E. 2004	Percent Increase/ Decrease in 1992 Over 1982	Percent Increase/ Decrease in 2004 Over 1992	Percent Increase/ Decrease in 2004 Over 1982
1	Wheat	2482.18	3736.38	4125.28	50.53	11.68	68.11
2	Rice	2675.97	3693.18	2849.89	38.01	-22.83	6.50
3	Coarse Cereals	633.74	1187.73	1616.44	87.42	35.13	153.25
4	Total cereals	1750.66	3127.90	3340.94	78.67	13.27	102.38
5	Gram	527.77	668.30	840.16	26.63	32.71	68.04
6	Total pulses	538.37	798.76	580.70	48.36	-22.89	14.41
7	Total food grains	1275.21	2536.00	3149.60	98.87	34.49	167.45
8	Rapeseed-mu stard	602.26	1084.85	1450.51	80.13	31.91	137.61
9	Total oil seeds	601.06	1091.34	1440.59	81.57	29.97	135.99
10	Cotton (Desi)	293.44	347.43	266.25	18.40	-0.56	17.74
11	Cotton (American)	400.02	470.71	340.10	17.67	-25.87	-12.77
12	Total cotton	370.82	462.54	323.58	24.74	-24.75	-6.13
13	Sugarcane	2395.31	5681.82	5404.49	137.21	-3.93	127.88

Note: Coarse cereals includes: bajra, maize, barley, jawar.  
 Other pulses : moong, masar, mash, urd  
 Other oilseeds: linseed, groundnut, castor, toria and taramira  
 Cotton production in terms of cotton lint and 000' bales.  
 Sugarcane Production in term of gur.  
 T.E. indicates Triennium Ending

irrigation facilities, use of chemical fertilizers, insecticides, weedicides and mechanization of farming practices. The wheat and rice yield increased upto 4125.28 and 2849.89 kg/ha in T.E. 2004 from 2482.18 and 2675.97 kg/ha in T.E. 1982 showing 68.11 and 6.50 percent increase over T.E. 1982. The other crops like coarse cereals, gram, rapeseed-mustard and sugarcane registered increase in yield in the same period as evolution of high yielding varieties. Per hectare productivity of rapeseed-mustard and sugarcane increase from 602.26 and 2395.31 kg/ha to 1450.51 and 5404.49kg/ha in T.E. 2004, respectively. The cotton yield (both Desi and American) declined to 266.25 and 340.10 kg/ha in T.E. 2004 from 293.44 and 400.02 kg/ha in T.E. 1982 as a result of severe incidence of insect-pests like American bollworm and diseases.

#### **4.1.1.2 Bhiwani District**

##### **4.1.1.2.1 Cropping pattern**

Bhiwani, the largest district of Haryana state, have maximum area under pulses and oilseeds in the state.

The acreage under major crops as well as percentage to the total cropped area in Bhiwani district of Haryana for T.E. 1982, T.E. 1992 and T.E. 2004 is presented in table 4.4. The table clearly shows that there was a significant change in crop acreage during the study period. Total cropped area in the district increased up to 606.07 thousand hectares in T.E. 2004. Wheat the most important cereal crop replaced coarse cereals and pulses during the time period 1979-2004. The total cereals grown accounted for 56.65 percent of total cropped

**Table 4.4: Acreage under major crops in Bhiwani district**

**(000, hectares)**

Sr. No.	Crops	T.E. 1982	T.E. 1992	T.E. 2004	Percent Increase/ Decrease in 1992 Over 1982	Percent Increase/ Decrease in 2004 Over 1992	Percent Increase/ Decrease in 2004 Over 1982
1	Wheat	42.50 (7.99)	62.77 (11.73)	127.13 (21.24)	47.69	102.53	199.12
2	Coarse Cereals	259.47 (48.80)	190.10 (35.52)	190.87 (31.89)	-26.73	0.40	-26.43
3	Total cereals	301.97 (56.65)	252.87 (47.25)	318.00 (53.14)	-16.25	25.75	5.30
4	Gram	168.10 (31.62)	174.53 (32.61)	55.07 (9.20)	3.82	-68.44	-67.23
5	Total pulses	171.37 (32.23)	182.60 (34.12)	65.47 (10.94)	6.55	-64.14	-61.79
6	Total food grains	473.34 (88.89)	435.50 (81.38)	391.17 (64.09)	-7.99	-10.17	-17.35
7	Rapeseed- mustard	30.50 (5.73)	71.30 (13.32)	150.97 (25.23)	133.77	111.73	394.98
8	Total oil seeds	30.80 (5.79)	71.73 (13.40)	151.30 (25.28)	132.88	110.92	391.23
9	Cotton (Desi)	5.13 (0.96)	1.87 (0.34)	12.67 (2.11)	-63.54	577.54	146.97
10	Cotton (American)	9.00 (1.69)	26.03 (4.86)	50.93 (8.51)	189.22	95.65	465.88
11	Total cotton	14.13 (2.65)	27.90 (5.21)	63.60 (10.63)	97.45	127.95	350.10
12	Total non food crops	59.08 (11.11)	99.93 (18.62)	214.90 (35.91)	69.14	115.05	263.74
13	Total cropped area	532.42 (100.00)	535.43 (100.00)	606.07 (100.00)	0.56	13.19	13.83

Note: Coarse cereals includes: bajra, maize, barley, jawar.  
Other pulses : moong, masar, mash, urd  
Other oilseeds: linseed, taramira, groundnut, castor, toria and taramira  
Figure in parentheses indicate the percentage of cropped area to the total.  
T.E. indicates Triennium Ending

area in the district declined to 53.14 percent reporting increase of 5.30 percent in T.E. 2004 over T.E. 1982. The increase in area under total cereals was reported due to increase in area under wheat crop replacing pulse crops.

The percentage area under gram and total pulses to total cropped area declined from 31.62 and 32.23 in T.E. 1982 to just 9.20 and 10.94 percent in T.E 2004 showing a decrease of 67.23 and 61.79 percent in T.E. 2004 over T.E. 1982, respectively. However, percentage area under rapeseed-mustard, total oilseeds, cotton (American) and cotton (Desi) increased both in absolute as well as in relative terms during the study period. Acreage under non-food crops increased from 11.11 to 35.91 percent during the same period registering an increase of 263.74 percent in T.E. 2004 over T.E. 1982. While area under food grains declined from 88.89 to 64.09 percent as a result of drastic decrease in acreage under pulse crops, especially gram and certain amount of decline in area under coarse cereals (jowar, bajra, barley and maize).

The crops like wheat, rapeseed-mustard and cotton gradually replaced less remunerative crops like coarse cereals and pulse crops. The area also shifted towards paddy crop in low lying areas and water-logged area i.e. catchment areas of canals. The ever rising share of wheat, cotton and rapeseed-mustard may be attributed to major change in production technology of these crops, expansion of irrigation facilities, efficient use of irrigation water through adoption of micro-irrigation system (sprinkler irrigation system), market infrastructure, institutional arrangement and government policies (especially minimum support price). The main reason for crops regarding declining share in acreage may be low

productivity and risk involved. The increase in area under rapeseed-mustard and cotton witnessed in the study area due to establishment of processing units in the district.

#### **4.1.1.2.2 Production pattern**

Production pattern of major crops in Bhiwani district for the period 1979 to 2004 is presented in table 4.5. It is evident from the table that production of cereals achieved the manifold increase during the study period. The production of total cereals registered increase of more than four times in T.E. 2004 comparing production in T.E. 1982 showing an increase of 314.12 percent in T.E. 2004 over T.E. 1982. Wheat being major cereal crop in the district occupied a significant share of total cereals production showing five times increase i.e. 86.67 to 429.00 thousand tonnes during the period 1979-2004. The percentage increase in wheat production was recorded 395.98 percent in 2004 over 1982 due to adoption of high yield varieties seeds increased availability of irrigation water, fertilizers, insecticides and pesticides.

Gram crop was cultivated on maximum acreage in rainfed region of Bhiwani district. The production of gram increased upto 127.03 thousand tonnes in T.E. 1992 and then declined to just 43.00 thousand tonnes in T.E. 2004. The same pattern also followed in case of total pulse production. The decline in production of gram as well as total pulses was recorded due to low productivity and decline in acreage as a

**Table 4.5: Production of major crops in Bhiwani district**

(000,tonnes)							
Sr. No.	Crops	T.E. 1982	T.E. 1992	T.E. 2004	Percent Increase/ Decrease	Percent Increase/ Decrease	Percent Increase/ Decrease

					<b>in 1992 Over 1982</b>	<b>in 2004 Over 1992</b>	<b>in 2004 Over 1982</b>
1	Wheat	86.67 (2.48)	203.33 (3.24)	429.00 (4.64)	134.60	110.98	395.98
2	Coarse Cereals	69.00 (10.49)	116.33 (16.53)	215.67 (24.04)	68.59	85.39	212.56
3	Total cereals	155.67 (2.94)	319.66 (3.54)	644.67 (5.20)	105.34	101.67	314.12
4	Gram	50.33 (14.01)	127.03 (36.99)	43.00 (48.97)	152.39	-66.14	14.56
5	Total pulses	52.50 (13.16)	161.90 (34.91)	46.47 (37.08)	208.38	-71.29	-11.48
6	Total food grains	208.17 (3.79)	481.56 (4.81)	691.14 (5.50)	131.33	43.52	232.00
7	Rapeseed-mustard	15.43 (12.03)	83.00 (15.18)	208.00 (25.49)	437.91	150.60	1248.02
8	Total oil seeds	15.57 (11.00)	83.27 (13.43)	208.03 (24.99)	434.81	149.82	1236.09
9	Cotton (Desi) *	4.67 (2.79)	2.67 (2.22)	15.33 (5.64)	-42.82	474.15	228.26
10	Cotton (American) *	16.67 (3.54)	55.00 (4.98)	79.67 (9.89)	229.93	44.85	377.92
11	Total cotton *	21.34 (3.34)	57.67 (4.71)	95.00 (8.82)	170.24	64.73	345.17

Note: Figures in parentheses indicate the percentage of production to total respective crop production at state level.  
Cotton production in terms of cotton lint and 000' bales.  
T.E. indicates Triennium Ending

result of drought condition. The production of food grains increased up to 691.14 thousand tonnes despite reduction in production of pulse crops. This may be on account of manifold increase in wheat production.

The production of rapeseed-mustard, total oilseeds and cotton (American) exhibited continuous increase over the time period showing 1248.02, 1236.09 and 377.92 percent increase in T.E.

2004 over T.E. 1982. However, production of cotton (Desi) decreased up to 2.67 thousand bales in T.E. 1992 but again increased up to 15.33 thousand bales in T.E. 2004. The decline in production of cotton (Desi) was due to severe drought condition.

#### 4.1.1.2.3 Yield pattern

The yield of major crops in Bhiwani district is depicted in table 4.6 for the period 1979-2004. It is observed from the table that increased use of chemical fertilizers, availability of irrigation facilities and effective pesticides and insecticides has increased the productivity of crops in the study area. The yield of wheat and gram were 2039.29 and 299.41 kg/ha in T.E. 1982 which increased upto 3374.50 and 780.82 kg/ha during T.E. 2004 showing an increase of 65.47 and 160.79 percent, respectively in T.E. 2004 over T.E. 1982. The yield of rapeseed-mustard increased upto 1377.76 kg/ha in T.E. 2004 recording an increase of 177.34 percent in T.E. 2004 over T.E. 1982. The yield of cotton increased upto 351.39 in T.E. 1992 and then decreased upto 253.93 kg/ha in the T.E. 2004. The reduction in yield of cotton crop after 1992 was reported as result of severe incidence of American Bollworm and Leaf curl disease in the region.

**Table 4.6: Yield of major crops in Bhiwani district**

(Kg./hectare)

Sr. No.	Crops	T.E. 1982	T.E. 1992	T.E. 2004	Percent Increase/Decrease in 1992 Over 1982	Percent Increase/Decrease in 2004 Over 1992	Percent Increase/Decrease in 2004 Over 1982
1	Wheat	2039.29	3239.29	3374.50	58.84	4.17	65.47
2	Coarse Cereals	265.93	611.94	1129.93	130.12	84.65	324.90
3	Total cereals	516.88	1264.13	2027.26	144.57	60.37	292.21

4	Gram	299.41	727.84	780.82	143.10	7.28	160.79
5	Total pulses	306.35	886.64	709.79	189.42	-19.95	131.69
6	Total food grains	439.55	1105.76	1766.85	151.57	59.79	301.97
7	Rapeseed-mustard	505.90	1164.10	1377.76	130.10	18.35	177.34
8	Total oil seeds	505.52	1160.88	1374.95	129.64	18.44	171.99
9	Cotton (Desi)	154.76	242.73	205.69	56.84	-15.26	32.91
10	C o t t o n (American)	314.88	359.20	265.93	14.08	-25.97	-15.54
11	Total cotton	256.74	351.39	253.93	36.87	-27.74	-1.10

---

Note: Coarse cereals includes: bajra, maize, barley, jawar.  
Other pulses : moong, masar, mash, urd  
Other oilseeds: linseed, groundnut, castor, toria and taramira  
Cotton production in terms of cotton lint and 000' bales.  
T.E. indicates Triennium Ending

### **4.1.1.3 Haryana state**

Haryana state has witnessed a tremendous growth in agriculture production since after the bifurcation from Punjab. It was deficit in food grains even for its requirement at the time of its inception in 1966. Now, it is second in the country next to Punjab in terms of farm productivity, per capita income and contribution of food grains to the central pool.

#### **4.1.1.3.1 Cropping Pattern**

The acreage under different crops in Haryana state for the time period 1979-2004 is presented in table 4.7. From the table, it is evident that over the years, the cropping pattern in the state registered a substantial change. The total cereals accounted for about 62.72 percent of total cropped area in 1979-82 inclined to 65.16 percent during 1989-92 and then increased to 72.34 percent in 2002-04 revealing 25.57 percent increase in acreage in T.E.2004 over T.E.1982. The area under wheat and paddy increased significantly, while area under coarse cereals (jowar, bajra, maize and barley) declined during 1979-2004.

The percentage area under gram and total pulses to total cropped area declined from 16.51 and 17.90 percent in 1979-82 to 1.96 and 3.19 percent in 2001-04, respectively showing reduction in acreage in T.E. 2004 over T.E.1982. However, area under rapeseed-mustard, cotton (American), cotton (Desi) and sugarcane increased both in absolute as well as in relative terms over the period. The Haryana agriculture twisted towards high value crops like rice, wheat and rapeseed-mustard gradually replaced relatively less remunerative crops

**Table 4.7: Acreage under major crops in Haryana state**

(000, hectares)

Sr. No.	Crops	T.E. 1982	T.E. 1992	T.E. 2004	Percent Increase/ Decrease in 1992 Over 1982	Percent Increase/ Decrease in 2004 Over 1992	Percent Increase/ Decrease in 2004 Over 1982
1	Wheat	1505.90 (32.22)	1835.60 (36.25)	2294.00 (42.32)	21.89	24.97	52.33
2	Rice	499.30 (10.68)	639.33 (12.63)	982.80 (18.13)	28.04	53.72	96.83
3	Coarse Cereals	1160.23 (24.82)	811.77 (16.03)	698.30 (12.88)	-30.03	-13.97	-39.81
4	Total cereals	3165.43 (62.72)	3286.70 (64.91)	3975.10 (72.34)	3.83	20.94	25.57
5	Gram	772.10 (16.51)	487.53 (9.63)	106.63 (1.96)	-36.85	-78.12	-86.18
6	Total pulses	836.70 (17.90)	578.37 (11.42)	173.17 (3.19)	-30.87	-70.05	-79.30
7	Total food grains	4002.13 (82.62)	3865.07 (76.33)	4148.27 (75.54)	-3.42	7.32	3.65
8	Rapeseed-m ustard	211.00 (4.51)	496.00 (9.80)	587.40 (10.83)	135.07	18.42	178.39
9	Total oil seeds	222.23 (4.75)	563.70 (11.13)	597.57 (11.02)	153.65	6.00	168.89
10	Cotton (Desi)	107.13 (2.29)	65.53 (1.29)	148.57 (2.74)	-38.83	126.72	38.68
11	C o t t o n (American)	212.60 (4.54)	419.73 (8.19)	409.23 (7.55)	97.42	-2.50	92.48
12	Total cotton	319.73 (6.84)	485.26 (9.58)	557.80 (10.29)	51.77	14.94	74.45
13	Sugarcane	129.67 (2.77)	149.30 (2.57)	170.10 (3.11)	15.14	13.93	31.17
14	Total non food crops	671.63 (14.38)	1178.63 (23.28)	1325.47 (24.46)	75.48	12.45	97.35
15	Total cropped area	4673.76 (100.00)	5063.30 (100.00)	5473.74 (100.00)	7.91	8.11	17.11

Note: Coarse cereals includes: bajra, maize, barley, jawar.  
 Other pulses : moong, masar, mash, urd  
 Other oilseeds: linseed, taramira, groundnut, castor, toria and taramira  
 Figure in parentheses indicate the percentage of cropped area to the total.  
 T.E. indicates Triennium Ending

like bajra, gram, maize, barley etc. The increasing share of wheat, rice, rapeseed-mustard and cotton may be due to introduction of high yielding varieties, expanded irrigation facilities, minimum support price and establishment of agro-processing units. The main reason behind the declining acreage of gram is uncertainty in rains, low productive varieties, diseases and insect-pests etc.

#### **4.1.1.3.2 Production Pattern**

Production pattern of major crops in Haryana for T.E. 1982, T.E. 1992 and T.E. 2004 is presented in table 4.8. Except gram and total pulses all the crops showed a significant increase in the production over the time period. Among the important crops, wheat and paddy witnessed the highest relative increase in their production. Wheat and paddy showed an increase of 164.91 and 131.60 percent in T.E. 2004 over T.E.1982 which increased to all time record of 9246.33 and 2665.00 thousand tonnes during T.E. 2004 showing 3 and 2.5 times increase, respectively. While coarse cereals (barley jowar, maize, bajra) did not reveal so much increase due to reduction in acreage. Gram being important rainfed pulse crop showed a decline in production during the study period due to decline in acreage and productivity as a result of untimely rain. The commercial crop i.e. rapeseed-mustard, cotton (American), cotton (Desi) and sugarcane exhibited increase in their production level registering an increase of 535.88,71.05, 68.82 and 94.34 percent in T.E. 2004 over T.E. 1982, respectively.

**Table 4.8: Production of major crops in Haryana state**

(000,tonnes)							
<b>Sr. No.</b>	<b>Crops</b>	<b>T.E. 1982</b>	<b>T.E. 1992</b>	<b>T.E. 2004</b>	<b>Percent Increase/</b>	<b>Percent Increase/</b>	<b>Percent Increase/</b>

					<b>Decrease in 1992 Over 1982</b>	<b>Decrease in 2004 Over 1992</b>	<b>Decrease in 2004 Over 1982</b>
1	Wheat	3490.33	6279.67	9246.33	79.91	47.24	164.91
2	Rice	1150.67	1795.67	2665.00	56.05	48.41	131.60
3	Coarse Cereals	658.00	705.33	897.00	7.19	27.17	36.32
4	Total cereals	5299.00	8780.97	12808.33	65.70	45.86	141.71
5	Gram	359.33	343.40	87.80	-4.43	-74.43	-75.56
6	Total pulses	398.93	463.73	125.30	16.24	-72.97	-68.59
7	Total food grains	5697.93	9244.70	12933.63	62.26	39.90	127.02
8	Rapeseed-must ard	128.33	546.67	816.03	325.98	49.27	535.88
9	Total oil seeds	137.70	620.20	832.60	350.39	34.24	504.64
10	Cotton (Desi) *	167.33	120.33	272.00	-28.08	126.04	62.55
11	C o t t o n (American) *	471.00	1105.27	805.67	134.66	-27.16	71.05
12	Total cotton *	638.33	1225.60	1077.67	92.00	-12.07	68.82
13	Sugarcane**	482.33	700.33	973.37	45.19	33.84	94.34

Note: Coarse cereals includes: bajra, maize, barley, jawar.  
Other pulses : moong, masar, mash, urd  
Other oilseeds: linseed, groundnut and castor  
Cotton production in terms of cotton lint and 000' bales.  
Sugarcane production in terms of gur.  
T.E. indicates Triennium Ending

#### **4.1.1.3.3 Yield Pattern**

The yield pattern of major crops in Haryana state is depicted in table 4.9. The wheat productivity registered a substantial increase due to increase in area under high yielding varieties and evolution of promising varieties. The wheat yield per hectare was 2317.77 kg/ha in T.E. 1982 increased to 4030.66 kg/ha in T.E. 2004 showing more than 1.5 times increase. The yield of paddy did not increase significantly due to continuous growing of the crop in the same region i.e. Eastern part of Haryana as well as increase in area under basmati crop of low productivity. The coarse cereals and gram also registered increase during the same period as evolution of high yielding varieties and adoption of package of farm practices.

The per hectare yield of rapeseed-mustard and sugarcane increased from 608.20 and 3719.67 kg/ha to 1389.22 and 5722.34 kg/ha during the period 1979-2004, showing 128.42 and 53.84 percent increase in T.E. 2004 over T.E. 1982, respectively. The cotton yield (both Desi and American) was 339.48 kg/ha in T.E. 1982 declined to 328.44 kg/ha in T.E. 2004 as a result of severe incidence of insect-pests and disease especially American bollworm.

#### **4.1.2 Growth rates of area, production and yield of major crops**

##### **4.1.2.1 Hisar district**

##### **4.1.2.1.1 Compound growth rates of acreage**

The compound growth rates of area under different crops in Hisar district is presented in table 4.10, for three periods viz. period-I (1979-1989), period-II (1990-2004) and overall period (1979-2004). The area under rice and wheat increased

**Table 4.9: Yield of major crops in Haryana state****(Kgs./hectare)**

Sr. No.	Crops	T.E. 1982	T.E. 1992	T.E. 2004	Percent Increase/Decrease in 1992 Over 1982	Percent Increase/Decrease in 2004 Over 1992	Percent Increase/Decrease in 2004 Over 1982
1	Wheat	2317.77	3421.04	4030.66	47.60	17.82	73.90
2	Rice	2304.57	2808.67	2711.64	21.87	-3.45	17.66
3	Coarse Cereals	567.13	868.88	1284.55	53.21	47.84	126.50
4	Total cereals	1674.02	2671.58	3222.14	59.59	20.61	92.48
5	Gram	465.39	704.37	823.41	51.35	16.90	76.93
6	Total pulses	476.79	801.79	723.57	68.16	-9.76	51.76
7	Total food grains	1423.49	2391.78	3117.84	68.02	30.36	119.03
8	Rapeseed-mustard	608.20	1102.16	1389.22	81.22	26.05	128.42
9	Total oil seeds	619.63	1100.23	1393.31	77.56	26.64	124.86
10	Cotton (Desi)	265.53	312.16	311.23	17.56	-0.30	17.21
11	Cotton (American)	376.62	447.66	334.69	18.86	-25.24	-11.13
12	Total cotton	339.48	429.36	328.44	26.51	-23.51	-3.23
13	Sugarcane	3719.67	4690.76	5722.34	26.11	21.99	53.84

Note: Coarse cereals includes: bajra, maize, barley, jawar.  
 Other pulses : moong, masar, mash, urd  
 Other oilseeds: linseed, groundnut, castor, toria and taramira  
 Cotton production in terms of cotton lint and 000' bales.  
 Sugarcane production in terms of gur.  
 T.E. indicates Triennium Ending

**Table 4.10: Compound growth rates of acreage under major crops in Hisar district**

(Per cent)

Sr. No.	Crops	Period-I	Period-II	Overall Period
1	Wheat	4.88	3.12	3.68
2	Rice	4.77	9.08	7.61
3	Coarse Cereals	-2.76	0.55	-1.57
4	Total Cereals	2.27	3.16	2.77
5	Gram	-15.66	-18.5	-9.46
6	Total Pulses	-7.79	-14.85	-8.04
7	Total food grains	0.55	1.04	-1.02
8	Rapeseed Mustard	6.30	-2.16	1.75
9	Total oilseeds	6.32	-2.34	1.71
10	Cotton (Desi)	-11.98	13.56	3.73
11	Cotton (American)	6.34	-2.09	1.94
12	Total cotton	2.86	0.13	2.25
13	Sugarcane	4.65	6.24	1.33

Note: Period-I indicates 1979 to 1989

Period-II indicates 1990 to 2004

Overall period indicates 1979 to 2004

in period-I due to increase in total cropped area as well as a result of shift of area from coarse cereals and pulses. This trend was halted during the period-II and overall period to some extent indicating marginal increase in area under wheat and rice. However, area under rapeseed–mustard and cotton increased substantially in the period-I. In the overall period, growth rate of acreage under rice, wheat, rapeseed-mustard, cotton (Desi) and sugarcane exhibited positive sign.

#### **4.1.2.1.2 Compound growth rates of production**

Table 4.11 indicates the compound growth rates of production of major crops in Hisar district for three periods. The wheat and rice production exhibited positive sign of growth rate in all the three periods due to increase in acreage under high yielding varieties and increased productivity of these crops. The coarse cereals production recorded increase annually at the rate of 0.61 and 2.98 percent during period-I and overall period because of cultivation of high breed varieties of crops especially bajra crop.

The production of gram and pulses decreased at the rate of 18.1 & 15.56 percent and 8.13 & 6.47 percent in second and overall periods, respectively except period-I. The decline in production of pulses may be attributed to erratic rainfall, absence of promising of varieties, reduction in acreage under pulse crops and large cultivation on rainfed areas.

In the period-I, the production of commercial crops i.e. rapeseed -mustard, cotton (American) and sugarcane increased annually at the rate of 13.66, 5.12 and 6.22 percent,

**Table 4.11: Compound growth rates of production of major crops  
in Hisar district**

(Per cent)

<b>Sr. No.</b>	<b>Crops</b>	<b>Period-I</b>	<b>Period-II</b>	<b>Overall Period</b>
1	Wheat	9.24	4.14	6.31
2	Rice	6.40	6.30	6.74
3	Coarse Cereals	0.61	2.62	2.98
4	Total cereals	8.09	4.28	6.13
5	Gram	-5.50	-18.1	-8.13
6	Total pulses	-4.99	-15.56	-6.47
7	Total food grains	6.73	3.65	5.42
8	Rapeseed Mustard	13.66	-0.36	5.07
9	Total oilseeds	13.55	-0.60	5.02
10	Cotton (Desi)	-10.34	3.68	2.58
11	Cotton (American)	5.12	-13.70	0.81
12	Total cotton	0.29	-1.56	3.00
13	Sugarcane	6.22	5.68	5.30

Note: Period-I indicates 1979 to 1989

Period-II indicates 1990 to 2004

Overall period indicates 1979 to 2004

respectively. The increase in production may be attributed to increase in area as a result of expansion of irrigation facilities. This trend continued in period-II and in overall period. The cotton (Desi) exhibited negative growth rate in period-I and increased at the rate of 2.58 percent per annum in overall period.

Sugarcane is not important crop in Hisar district. It was grown on small area. In period-II and overall period sugarcane production increased sharply at the compound growth rate of 5.68 and 6.30 percent, respectively. The increase in sugarcane production was attained due to increase in crop acreage and enhanced productivity in both periods.

#### **4.1.2.1.3 Compound growth rates of yield**

The yield growth rates of the various crops in the Hisar District of Haryana for three periods separately are presented in table 4.12. It is evident from the table that compound growth rates of yield of wheat and coarse cereals was positive during all the three periods, where as yield of rice declined during the period-II and overall period due to shortfall of irrigation water and large acreage under basmati rice.

Gram yield showed negligible increase during period-II. While yield of total pulses decreased during the period-II maintaining positive during period-I and overall period. This may be attributed due to erratic rainfall and large cultivated area under rainfed condition. The rapeseed-mustard also showed moderate increase in yield in all the three periods. The decline in yield of cotton (Desi) as well as cotton (American)

**Table 4.12: Compound growth rates of yield of major crops in Hisar district**

(Per cent)

Sr. No.	Crops	Period-I	Period-II	Overall Period
1	Wheat	4.68	0.60	2.32
2	Rice	0.64	-4.93	-1.58
3	Coarse Cereals	3.47	3.10	4.55
4	Total Cereals	6.10	0.28	2.71
5	Gram	11.94	0.45	1.07
6	Total Pulses	4.90	-0.34	1.01
7	Total food grains	7.94	1.46	3.69
8	Rapeseed Mustard	6.27	1.85	3.10
9	Total oilseeds	6.21	1.75	3.08
10	Cotton (Desi)	0.99	-2.58	-1.15
11	Cotton (American)	-0.46	-2.32	-0.16
12	Total cotton	0.32	-1.71	-0.49
13	Sugarcane	4.65	-0.19	3.35

Note: Period-I indicates 1979 to 1989

Period-II indicates 1990 to 2004

Overall period indicates 1979 to 2004

was obtained due to severe incidence of insect-pests (especially American bollworm) and leaf curl disease.

The yield of sugarcane exhibited positive growth rate in all periods due to cultivation of improved irrigation facilities, high yielding and high sugar content varieties.

#### **4.1.2.2 Bhiwani district**

##### **4.1.2.2.1 Compound growth rates of acreage**

The compound growth rate in area of major crops in Bhiwani district is presented in table 4.13 separately for the three periods viz. period-I (1979-89), period-II (1990-2004) and overall period (1979-2004). The growth rates of acreage under major crops showed a moderate increase. The compound growth rate of wheat acreage registered increase in all periods due to continuous increase in area under this crop as result of less risk involved and expanded irrigation facilities. The food grains exhibited negative growth rate in all three periods. This may be observed due to shift in area from coarse cereals and pulses was not offset by increase in wheat acreage.

The area under wheat, gram, other pulses (mong, masoor, urd etc.), rapeseed-mustard, cotton (Desi) and Cotton (American) increased in period-I (1979-1989) due to increase in the total cropped area as well as shift in area from coarse cereals, increased irrigation facilities due to special programme of agriculture department, Govt. of Haryana for pulse crops. But during the period-II, area from gram and coarse cereals shifted towards wheat,

rapeseed-mustard and cotton showing negative growth rate of acreage under gram and positive

**Table 4.13: Compound growth rate of area under major crops in Bhiwani district**

**(Per cent)**

<b>Sr. No.</b>	<b>Crops</b>	<b>Period-I</b>	<b>Period-II</b>	<b>Overall Period</b>
1	Wheat	4.71	6.83	4.86
2	Coarse Cereals	-1.95	1.16	-1.12
3	Total Cereals	-0.80	2.95	0.41
4	Gram	0.68	-9.09	-3.50
5	Total Pulses	0.92	-7.98	-2.96
6	Total food grains	-0.18	-0.17	-0.48
7	Rapeseed Mustard	12.10	6.08	11.52
8	Total oilseeds	15.73	6.06	7.04
9	Cotton (Desi)	11.9	5.21	5.18
10	Cotton (American)	8.98	12.62	7.04
11	Total cotton	8.13	7.05	6.58

Note: Period-I indicates 1979 to 1989  
 Period-II indicates 1990 to 2004  
 Overall period indicates 1979 to 2004

growth rates of rapeseed-mustard and cotton acreage. The positive growth rate of area under commercial crops indicated the healthy sign for enhancing the farm income.

The establishment of cotton and oil mills in the study area caused higher positive growth rates of area under rapeseed-mustard and cotton.

#### **4.1.2.2.2 Compound growth rates of production**

The table 4.14 indicates the compound growth rates of production of major crops in Bhiwani district for three periods. The production of wheat, coarse cereals and total cereals increased annually at the rate of 9.26, 4.18 and 8.88 percent during the period-I. The continuous increase in production was noticed in period-II and over all period. The gram and total pulses production showed a positive growth trend in period-I, while these crops revealed a sharp decline during period-II and overall period. The decline in production of gram and total pulses was occurred as these crops cultivated in rainfed area.

The production of food grains showed positive growth rate in all three periods. This may be attained as decline in production of pulses was less in comparison to increase in the production level of cereals.

The rapeseed-mustard and cotton (American) registered increase in the production at the rate of 23.85 and 9.65 percent per annum in period-I, respectively. This may be attributed due to composite effect of acreage increase and enhanced productivity. The

continuous increase in production of above said crops was recorded in period-II and overall

**Table 4.14: Compound growth rate of production of major crops in Bhiwani district**

(Per cent)

Sr. No.	Crops	Period I	Period II	Overall Period
1	Wheat	9.26	7.19	7.68
2	Coarse Cereals	4.18	6.49	4.84
3	Total cereals	8.88	6.90	6.45
4	Gram	8.73	-11.15	-0.28
5	Total pulses	8.23	-10.97	-0.52
6	Total food grains	9.39	4.25	5.62
7	Rapeseed Mustard	23.85	6.86	16.12
8	Total oilseeds	23.43	6.84	15.99
9	Cotton (Desi)	2.13	3.91	7.06
10	Cotton (American)	9.65	1.69	11.04
11	Total cotton	6.89	5.06	7.17

Note: Period-I indicates 1979 to 1989

Period-II indicates 1990 to 2004

Overall period indicates 1979 to 2004

period as a result of more acreage under high yield varieties and use of recommended doses of modern inputs.

#### **4.1.2.2.3 Compound growth rates of yield**

The compound growth rate of yield of major crops in Bhiwani district is presented in table 4.15. It is evident from the table that yield of wheat and coarse cereals increased sharply in period-I and overall period due to adoption of high yielding varieties and modern farming technologies. The growth rates of yield of wheat, coarse cereals (jowar, bajra, barley etc.) and total cereals were positive in all three periods. The yield of wheat increased at the rate of 4.31 percent per annum during period-I. But it increased with 2.67 percent per annum during the overall period due to evolution of high yielding varieties, use of recommend package of practices and availability of irrigation water. The yield of gram as well as total pulses increased in all the periods except in period-II. The decline in yield of pulse crops in period-II may be attributed due to erratic rainfall as these crops were largely cultivated in rainfed area. The rapeseed-mustard registered high growth rate of yield during period-I and moderate growth during period-II and overall period.

The decline in yield of cotton (Desi) was observed in period-I and period-II as non-availability of irrigation water and absence of promising varieties. The yield of cotton (American) showed positive growth rate of 0.89 and 0.94 percent in period-I and overall period, respectively. In period-II, the yield of

**Table 4.15: Compound growth rate of yield of major crops in Bhiwani district**

**(Per cent)**

<b>Sr. No.</b>	<b>Crops</b>	<b>Period-I</b>	<b>Period-II</b>	<b>Overall Period</b>
1	Wheat	4.31	0.33	2.67
2	Coarse Cereals	6.26	4.23	5.57
3	Total Cereals	9.75	3.84	6.02
4	Gram	7.59	-1.03	3.93
5	Total Pulses	7.24	-3.23	3.58
6	Total food grains	9.60	4.43	6.13
7	Rapeseed Mustard	10.19	0.72	4.08
8	Total oilseeds	10.12	0.74	4.09
9	Cotton (Desi)	-3.79	-1.95	0.30
10	Cotton (American)	0.89	-1.44	0.94
11	Total cotton	-1.15	-2.59	0.56

Note: Period-I indicates 1979 to 1989  
 Period-II indicates 1990 to 2004  
 Overall period indicates 1979 to 2004

cotton (American) registered negative growth rate because of severe attack of insect pests and diseases.

#### **4.1.2.3 Haryana state**

##### **4.1.2.3.1 Compound growth rates of acreage**

The compound growth rates of area for major crops in Haryana state are given in table 4.16 for three periods i.e. period-I (1979-89) period-II (1990-2004) and overall period (1979-2004). It is evident from the table that in period-I, area under wheat, rice, rapeseed-mustard, cotton (American) and sugarcane recorded significant increase of 2.20, 1.73, 9.46, 6.24 and 0.22 percent per annum, respectively. While acreage under coarse cereals, gram and cotton (Desi) declined in period-I due to diversion of area towards more remunerative crops and expansion of irrigation facilities in the state.

In the period-II and overall period, the area under wheat and rice witnessed significant increase at the rate of 1.97 & 4.04 percent and 1.79 & 3.66 percent annually, respectively. The crops like coarse cereals and total pulses showed decline in acreage in all periods. The total cereals acreage registered increase in period-II and overall period as result of substantial increase in area under wheat and rice. The growth rate of food grains exhibited negative sign in period-I. This may be attributed to be due to decline area in pulses and coarse cereals is not offset by increase in wheat and rice acreage. The area from cotton (American) shifted towards cotton (Desi) due to less irrigation requirement, higher prices and low incidence of insect-pests. The decline in cotton (American) acreage was

**Table 4.16: Compound growth rate of area of major crops in Haryana state**

**(Per cent)**

<b>Sr. No.</b>	<b>Crops</b>	<b>Period I</b>	<b>Period II</b>	<b>Overall Period</b>
1	Wheat	2.20	1.97	1.79
2	Rice	1.73	4.04	3.66
3	Coarse Cereals	-2.99	-0.73	-2.00
4	Total cereals	0.44	1.80	1.15
5	Gram	-6.20	-12.58	-7.73
6	Total pulses	-4.29	-10.21	-6.38
7	Total food grains	-0.29	0.80	0.35
8	Rapeseed Mustard	9.46	0.55	5.13
9	Total oilseeds	9.03	-0.26	5.02
10	Cotton (Desi)	-6.13	8.46	2.76
11	Cotton (American)	6.24	-0.92	3.05
12	Total cotton	2.98	0.92	2.93
13	Sugarcane	0.22	2.64	1.14

Note: Period-I indicates 1979 to 1989

Period-II indicates 1990 to 2004

Overall period indicates 1979 to 2004

due to severe incidence of insect-pests (American Bollworm) and diseases in the period-II.

In the overall period, area under rapeseed-mustard and cotton has sharply increased at the rate of 5.13 and 2.93 percent per annum, respectively. The increase in rapeseed-mustard acreage was noticed in overall period. Area from gram crop diverted to more remunerative crops in Southern Haryana with the introduction of sprinkler irrigation system. The growth rate of the area under cotton crop in overall period witnessed positive sign as result of evolution of disease and pest resistant varieties. Sugarcane also indicated positive sign in acreage due to higher minimum support price and establishment of sugar processing units in the state.

#### **4.1.2.3.2 Compound growth rates of production**

Table 4.17 indicates the compound growth rates of production of major crops in Haryana state for period (1979-1989), period-II (1990-2004) and overall period (1979-2004). Wheat and rice production exhibited positive and significant increase per annum in all three periods. This may be due to composite effect of acreage increase and enhanced productivity of these crops. The production of coarse cereals (i.e. jowar, bajra, maize, and barley) registered decline at the rate of 0.84 percent per annum in first period as a result of decline in area under these cereals. But this trend changed in second and overall period as result of evolution of high yielding varieties and coarse cereals production increased at rate of 2.53 and 1.67 percent per annum.

**Table 4.17: Compound growth rate of production of major crops in Haryana state**

(Per cent)

<b>Sr. No.</b>	<b>Crops</b>	<b>Period-I</b>	<b>Period-II</b>	<b>Overall Period</b>
1	Wheat	6.34	3.44	4.49
2	Rice	2.80	3.54	4.18
3	Coarse Cereals	-0.84	2.53	1.67
4	Total Cereals	5.97	3.40	4.16
5	Gram	-0.44	-12.49	-5.65
6	Total Pulses	-0.07	-11.64	-4.79
7	Total food grains	5.43	3.05	4.06
8	Rapeseed-mustard	13.41	2.21	8.78
9	Total oilseeds	15.01	1.57	7.64
10	Cotton (Desi)	-5.18	8.10	3.76
11	Cotton (American)	4.35	-2.84	2.34
12	Total cotton	2.09	-1.13	1.36
13	Sugarcane	3.94	2.90	2.95

Note: Period-I indicates 1979 to 1989

Period-II indicates 1990 to 2004

Overall period indicates 1979 to 2004

The continuous decline in area under gram and total pulses caused reduction in production annually at the rate of 12.49 & 11.64 percent and 5.65 & 4.79 percent in second and overall periods, respectively. In first period, the production of rapeseed-mustard, cotton (American) and sugarcane increased at the rate of 13.41, 4.35 and 3.94 percent per annum, respectively. The increase may be recorded due to increase in area as a result of expansion in irrigation facilities and higher market prices. In overall period, production of all commercial crops was significantly positive.

#### **4.1.2.3.3 Compound growth rates of yield**

The compound growth rates of yield of major crops in Haryana state are presented in table 4.18. From the table, it could be noticed that yield in case of total cereals registered significant increase at the rate of 4.54, 1.52 and 2.96 percent per annum in period-I, period-II and overall period, respectively. Coarse cereals recorded positive and significant growth rates of crop yield in all periods due to introduction of high yielding varieties and adoption of improved production technology. The wheat yield witnessed more increase in period-I as diversion of area from traditional varieties to high yielding dwarf varieties and optimum use of chemical fertilizers and it was continuous in period-II and overall period. The yield of rice crop also exhibited positive sign in all periods except period-II.

Gram yield as well as total pulses yield declined annually at the rate of 0.11 and 1.62 per cent in period-II, respectively.

**Table 4.18: Compound growth rate of yield of major crops in Haryana state**

(Per cent)

<b>Sr. No.</b>	<b>Crops</b>	<b>Period I</b>	<b>Period II</b>	<b>Overall Period</b>
----------------	--------------	-----------------	------------------	-----------------------

---

1	Wheat	4.05	1.47	2.64
2	Rice	1.05	-0.35	0.56
3	Coarse Cereals	2.26	3.07	3.62
4	Total cereals	4.54	1.52	2.96
5	Gram	3.77	-0.11	1.97
6	Total pulses	4.04	-1.62	2.01
7	Total food grains	5.73	2.23	3.69
8	Rapeseed-mustard	7.96	1.66	3.48
9	Total oilseeds	7.50	1.84	3.58
10	Cotton (Desi)	0.78	-1.94	0.73
11	Cotton (American)	-1.12	-0.22	-0.33
12	Total cotton	-0.37	-2.04	-2.36
13	Sugarcane	3.78	0.70	1.88

---

Note: Period-I indicates 1979 to 1989

Period-II indicates 1990 to 2004

Overall period indicates 1979 to 2004

The decline in yield of pulse crops may be obtained as untimely rain and maximum acreage in rainfed area of the state.

The commercial crops i.e. rapeseed-mustard and sugarcane registered higher yield growth rates during the period-I, moderate during period-II and overall period. The yield of cotton (Desi) showed low growth rates during the period-I and overall period where as it declined in period-II because of severe incidence insect pest and diseases during 1990-2004. The cotton (American) registered negative growth rates of yield during all the three periods due to severe incidence of insect-pests (especially American bollworm and leaf viral disease). The compound growth rate of yield of sugarcane was positive in all periods due to adoption of recommended package of practices.

#### **4.1.3.1 Market arrivals of agricultural produce**

##### **4.1.3.1.1 Market arrivals pattern in Hisar district**

The market arrivals of major agricultural produce of major crops in Hisar district for T.E. 1982, T.E. 1992, and T.E. 2004 is presented in table 4.19. Wheat and rice increased from 152.14 and 88.11 thousand tonnes to 858.47 and 443.79 thousand tonnes from T.E. 1982 to T.E.2004, respectively indicating 464.26 and 403.67 percent increase in T.E. 2004 over T.E. 1982. The arrivals of bajra increased 291.42 percent in 2004 over T.E. 1982. While the market arrivals of coarse cereals and other pulses in the district remained almost same. But the market arrivals of gram decreased from 50.80 to 5.67

**Table 4.19: Market arrivals of major crops in Hisar district**  
(000,tonnes)

Sr. No.	Particulars	T.E. 1982	T.E. 1992	T.E. 2004	Percent Increase/ Decrease in 1992 Over 1982	Percent Increase/ Decrease in 2004 Over 1992	Percent Increase/ Decrease in 2004 Over 1982
1	Wheat	152.14	377.42	858.47	148.07	127.46	464.26
2	Paddy	88.11	204.69	443.79	132.31	116.81	403.67
3	Bajra	4.08	1.65	15.97	-59.55	867.88	291.42
4	Maize	0.19	0.43	0.51	126.31	18.60	168.43
5	Barley	2.64	5.09	3.54	92.80	-30.45	34.09
6	Gram	50.80	11.95	5.67	-76.47	-52.55	-88.83
7	Other pulses	0.96	1.15	0.98	19.79	-14.78	2.08
8	Oilseeds	33.76	36.55	39.94	8.26	9.27	18.30
9	Gurkhandsari**	4.71	1.61	0.20	-65.81	-87.58	-95.75
10	Cotton(Desi)*	29.83	14.40	19.56	-51.72	35.83	-34.42
11	C o t t o n (American)*	105.43	281.95	89.33	167.42	-68.32	-15.27

Note: Market arrivals of Cotton (Desi) and Cotton (American) in terms of 000'bales  
Gurkhandsari in terms of gur.  
T.E. indicates Triennium Ending

thousand tonnes in the study period due to sharply decline in production of gram.

The market arrivals of cotton (American) and cotton (Desi) decreased because of low productivity as a result of insect-pests and diseases. The marketed surplus in case of oilseeds registered increase to some extent due to increased productivity of these crops. The market arrivals of gur-khandsari declined over the period as a result of establishment of modern sugar mills and purchasing centers of nearby mills in the study area during the period.

#### **4.1.3.1.2 Market arrivals pattern in Bhiwani district**

The market arrivals pattern of agricultural produce of major crops in Bhiwani district is shown in table 4.20 for separately for T.E., 1982, T.E. 1992 and T.E. 2004. It is observed that market arrivals for major cereals i.e. wheat and bajra increased from 8.03 and 1.05 thousand tonnes to 78.05 and 6.67 thousand tonnes from T.E. 1982 to T.E. 2004 revealing 871.98 and 535.24 percent increase in T.E. 2004 over T.E. 1982, respectively. This was due to increase in production of these crops in the Bhiwani district. The market arrivals of barley increased in T.E. 1992, but it decreased in T.E. 2004 due to reduction in area this crop.

The arrivals of gram decreased over the time period showing 81.77 percent decrease from T.E. 1982 to T.E. 2004. The decline in market arrivals of gram was attributed to low production of gram, lack of required minimum support price,

**Table 4.20: Market arrivals of major crops in Bhiwani district****(000,tonnes)**

Sr. No.	Particulars	T.E. 1982	T.E. 1992	T.E. 2004	Percent Increase/ Decrease in 1992 Over 1982	Percent Increase/ Decrease in 2004 Over 1992	Percent Increase/ Decrease in 2004 Over 1982
1	Wheat	8.03	3.41	78.05	-57.53	2188.86	871.98
2	Bajra	1.05	0.38	6.67	-63.80	1655.26	535.23
3	Maize	0.06	0.02	0.01	-66.66	-50.00	-83.33
4	Barley	3.98	6.44	3.75	61.80	-47.77	-5.77
5	Gram	11.96	5.65	2.18	-52.75	-61.42	-81.77
6	Other pulses	0.08	0.28	0.08	250.00	-71.43	0.00
7	Oilseeds	5.75	15.48	19.14	169.21	366.00	232.86
8	Cotton (Desi) *	2.98	1.75	1.20	-41.27	-31.43	59.73
9	Cotton (American) *	0.08	13.29	9.40	16512.50	-29.27	11650.00

Note: Market arrivals of Cotton (Desi) and Cotton (American) in terms of 000'bales  
T.E. indicates Triennium Ending

due to reduction in production as result of rainfed crop, low productivity and shift in area towards rapeseed-mustard.

The market arrivals of oilseeds (sarson, toria and taramira) and cotton (American) increased to 232.87 and 11650.00 percent in T.E. 2004 over T.E. 1982. The market arrivals of cotton (American) increased sharply upto T.E. 1992 as composit effect of increase in area and productivity. But market arrivals of cotton (American) decreased in T.E. 2004 due to reduction in production.

#### **4.1.3.1.3 Market arrivals pattern in Haryana state**

The market arrivals pattern of agriculture produce in Haryana state is shown separately for T.E. 1982, T.E. 1992 and T.E. 2004 in table 4.21. The wheat and paddy arrivals increased from 1324.13 and 1605.07 thousand tonnes in T.E. 1982 to 5391.90 and 3684.86 thousand tonnes in T.E. 2004, respectively. The market arrivals of wheat and paddy showed 307.20 and 129.58 percent increase in T.E. 2004 over T.E. 1982, respectively. The increase in wheat and paddy arrivals was obtained due to rise in production and maximum purchase of produce by Govt. agencies for maintaining buffer stock. The arrivals of bajra and maize were 238.80 and 38.32 percent increase in T.E. 2004 over T.E. 1982. The market arrivals in succeeding triennium ending 1992 and 2004 decreased as a result of reduction in production. The market arrivals of gram declined from 128.40 thousand tonnes in T.E. 1982 to 11.11 thousand tonnes in the study period due to heavy fall in area under gram cultivation and production while market arrivals of

**Table 4.21: Market arrivals of major crops in Haryana state****(000,tonnes)**

<b>Sr. No.</b>	<b>Particulars</b>	<b>T.E. 1982</b>	<b>T.E. 1992</b>	<b>T.E. 2004</b>	<b>Percent Increase/Decrease in 1992 Over 1982</b>	<b>Percent Increase/Decrease in 2004 Over 1992</b>	<b>Percent Increase/Decrease in 2004 Over 1982</b>
1	Wheat	1324.13	2533.06	5391.90	91.29	112.86	307.20
2	Paddy	1605.07	2971.91	3684.86	85.15	23.99	129.57
3	Bajra	44.72	21.60	151.51	-51.69	601.44	238.79
4	Maize	6.81	18.81	9.42	176.21	-49.92	38.32
5	Barley	76.29	61.41	38.57	-19.50	-37.19	-49.44
6	Gram	128.40	37.79	11.11	-70.56	-70.60	-91.34
7	Other pulses	10.12	19.83	12.16	95.94	-38.68	20.15
8	Oilseeds	125.17	148.65	169.00	18.75	13.69	35.01
9	Gurkhandsari	40.18	33.65	5.70	-16.25	-83.06	-85.81
10	Cotton (Desi) *	68.43	51.00	59.06	-25.47	15.80	-13.69
11	Cotton (American) *	190.29	610.98	217.18	221.07	-64.45	14.13

Note: Market arrivals of Cotton (Desi) and Cotton (American) in terms of 000'bales  
 Gurkhandsari in terms of gur.  
 T.E. indicates Triennium Ending

other pulses (moong, masor, urd) did not exhibited significant increase under the study period.

The market arrivals of oilseeds (sarson, toria, taramira) and cotton (American) showed slightly increase in T.E. 2004 over T.E. 1982. While during T.E. 1992 cotton (American) increased 157.32 percent over T.E. 1982 due to increase in production of cotton (American). But the market arrivals of cotton (Desi) decreased as result of decline in area under cotton (Desi). The market arrivals of gurkhandsar decreased sharply due to establishment of modern sugar mills and increase in minimum support price decided by state government.

#### **4.1.3.2 Compound growth rates of market arrivals of agricultural produce**

##### **4.1.3.1.1 Hisar District**

The compound growth rates of market arrivals of major crops in Hisar district of Haryana for three periods viz period-1 (1979-89) period -II (1990-2004) and overall period (1979-2004) is depicted in table 4.22. It is evident from the table that market arrivals of wheat and paddy increased during all the three periods. The market arrivals of wheat and paddy increased at the rate of 7.65 and 7.58 percent, respectively. Increase in wheat and paddy market arrivals was due to heavy purchase by the government and semi-government agencies. In period-I, market arrivals of bajra decreased due to fall in its production, but it increased during period-II and overall period at the rate of 21.59 and 4.56 percent per annum, respectively.

**Table 4.22: Compound growth rate of market arrivals of major crops in Hisar district**

**(Per cent)**

<b>Sr. No.</b>	<b>Crops</b>	<b>Period I</b>	<b>Period II</b>	<b>Overall Period</b>
1	Wheat	12.22	6.07	7.65
2	Paddy	3.03	6.43	7.58
3	Bajra	-7.88	21.59	4.56
4	Maize	15.06	5.45	0.90
5	Barley	5.67	0.19	7.72
6	Gram	-14.83	-6.44	-8.58
7	Other pulses	4.97	-2.63	-4.45
8	Oilseeds	10.04	-3.05	-0.53
9	Gurkhandsari	-14.89	-13.72	-14.64
10	Cotton (Desi)	-4.81	0.71	1.64
11	Cotton (American)	12.55	-12.10	-3.58

Note: Period-I indicates 1979 to 1989

Period-II indicates 1990 to 2004

Overall period indicates 1979 to 2004

Gram and other pulses exhibited negative growth rates during period-II and overall period due to fall in production of these crops as a result of shift of area from pulses towards wheat and paddy. The market arrivals of oilseeds and cotton (American) remained negative in period-II and overall period as a result of lesser purchase of these crops by the government and semi-government agencies. Market arrivals of cotton (Desi) decreased during the period-I at the rate of 4.81 percent per annum while it increased in period-II and overall period due to increase in productivity.

#### **4.1.3.1.2 Bhiwani District**

The compound growth rates of market arrivals of major crops in Bhiwani district are presented in table 4.23. The wheat market arrivals decreased during period-I due to fall in purchase of wheat by the government agencies while it increased significantly during period-II and overall period due to heavy purchase of wheat by the government agencies. The market arrivals of bajra exhibited positive sign during period-I, period-II and overall period. Maize and barley market arrivals growth rates remained negative for overall period due to fall in their production.

The market arrivals of gram and other pulses (moong and masor) increased at the rate of 5.63 and 15.58 percent per annum due to increase in production of these crops during the first period. While it decreased sharply during period-II and overall period because of reduction in production. The arrivals of cotton (Desi) recorded negative sign of growth rate in

**Table 4.23: Compound growth rate of market arrivals of major crops in Bhiwani district**

**(Per cent)**

---

<b>Sr. No.</b>	<b>Crops</b>	<b>Period I</b>	<b>Period II</b>	<b>Overall Period</b>
1	Wheat	-9.93	32.47	10.85
2	Bajra	3.76	24.21	3.78
3	Maize	23.41	0.24	-6.97
4	Barley	9.08	1.61	2.12
5	Gram	5.63	6.49	-5.47
6	Other pulses	15.58	-7.65	-2.83
7	Oilseeds	21.79	-3.89	3.16
8	Gurkhandsari	-9.27	-8.73	-10.82
9	Cotton (Desi)	-8.90	2.28	3.12

---

Note: Period-I indicates 1979 to 1989

Period-II indicates 1990 to 2004

Overall period indicates 1979 to 2004

period-I as the year 1987-88 was drought year and diversion of area towards cotton (American) in the study area. The marketed surplus in case of cotton (American) was directly purchased by the processing units.

#### **4.1.3.1.3 Haryana state**

Table 4.24 indicates compound growth rates of market arrivals of different agricultural commodities separately for the three periods in Haryana state. It is clear from the table that arrivals of wheat and paddy increased annually at the rate of 8.39 and 2.55 percent in the state during the period-I. Both crops registered increase in period-II and overall period. Bajra showed a negative growth rate in period-I. But the growth rate of arrivals of bajra was positive during the over all period. The growth rates of maize, barley, pluses and oilseeds exhibited negative sign in period-II and overall period as a result of reduction in production due to shift of area towards wheat and paddy.

The market arrivals of cotton (American) and cotton (Desi) also registered decline in market arrivals in period-II and overall period. The negative growth rate of market arrivals of gurkhandsar was noticed as farmers preferred to sell his produce to sugar mill due to higher prices and changes in the taste of consumer. The market arrivals of gram and pulses showed positive sign of growth rate in period-I but the trend was reversed in period-II and overall period. The market arrivals of oilseeds also decreased at the growth rate of 2.84 and 0.83 percent in period-II and overall period, respectively as a result of diversion of area towards other remunerative or profitable crops.

**Table 4.24: Compound growth rate of market arrivals of major crops in Haryana state**

**(Per cent)**

<b>Sr. No.</b>	<b>Crops</b>	<b>Period I</b>	<b>Period II</b>	<b>Overall Period</b>
1	Wheat	8.39	6.25	5.90
2	Paddy	2.55	2.29	3.92
3	Bajra	-3.64	20.13	5.73
4	Maize	4.59	-3.17	-0.02
5	Barley	3.46	-1.18	-0.82
6	Gram	-9.86	-9.42	-9.87
7	Other pulses	8.71	-3.16	-1.18
8	Oilseeds	10.44	-3.84	-0.83
9	Gurkhandsari	-8.79	-13.04	-9.43
10	Cotton (Desi)	-4.21	-0.45	1.16
11	Cotton (American)	13.49	-10.76	-1.93

Note: Period-I indicates 1979 to 1989

Period-II indicates 1990 to 2004

Overall period indicates 1979 to 2004

## **1.2**

## **Costs and returns of various agro-processing units in Haryana**

### **4.2.1 Cotton processing unit in Haryana**

Cotton by far the most important fibre crop is grown commercially in about 111 countries in the world. The world area under cotton is 30.05 million hectares with production 53.73 million tonnes of seed cotton. In many countries, cotton is a major cash crop forming the basis for textile industry and a source of foreign exchange. The important and leading cotton growing countries of the world are Pakistan, India, Uzbekistan, China, USA, Argentina, Brazil and Turkey. Cotton crop is primarily cultivated for fibre in tropical and sub-tropical regions in the world. India maintains its position as the 3<sup>rd</sup> largest cotton consumption and emerged as 2<sup>nd</sup> important consumer of cotton next to China. India holds the largest cotton area and shares 25.51 percent of world cotton acreage and 10.38 percent of world production. In the world cotton scenario, India ranks first in acreage, third in production after China and USA but the yield is half of the world average as 64 percent area of cotton is rainfed.

Cotton is an important commercial crop of India and is grown in three agro-climatic zones. The cotton growing areas of India falls in states Maharashtra, Andhra Pradesh, Gujarat, Punjab, Haryana, Karnataka and Madhya Pradesh.

Cotton lint is utilized for preparing thread, yarns, medical cotton, mixing with synthetic fiber. The yarn in turn used for manufacturing textile of various types. The cotton seed contains 19 to 22 percent oil in the seed and 31 to 34 percent in the kernel

dependency upon the species. The crude oil is used for soap making, lubrication and for lightening in villages in the remote areas. It also meets the demand of edible vegetable oil in the country. Cotton seed is rich source of essential fatty acids and amino acids which help to build the proteins needed for a well balanced diet. The cotton seed cake or meal containing 50 percent protein is important cattle feed and cotton linters are used in making high grade writing paper, rayon, photographic paper and X-ray films, explosives, shatter proof glasses. It is also used for production of furfural chemical and particle boards and mushroom cultivation. The cotton stalk or stocks are utilized for the manufacture of particle boards, pulp and paper, hard boards, corrugated boards and boxes. Cotton hulls (bears lint and linter) are used as roughage in livestock ration. Cotton leaves are also used in the green stage as cattle feed

Hisar and Bhiwani districts were selected amongst the cotton growing areas of Haryana state. The acreage under cotton crop (Desi & American) is highest in both selected districts in comparison to other cotton growing districts. The area under cotton crop is 228.80 thousand hectares with average productivity 472 kg/ha in Hisar district while the cotton acreage in Bhiwani district is 6190 thousand hectares with crop yield of 332kg/ha during 2004-05. The total numbers of agro-processing units were 177 and 24 in Hisar and Bhiwani Districts, respectively. Therefore, it is essential to calculate costs, returns and benefit-cost ratio of processing units of cotton crop to measure the economic viability of the units.

#### **4.2.1.1 Costs and returns of cotton processing unit in Hisar district**

##### **4.2.1.1.1 Investment incurred for establishment of cotton processing unit**

The total fixed investment and investment per quintal of raw material incurred on the establishment of cotton processing unit in Hisar district is presented in table 4.25. The total amount incurred for the establishment of cotton processing unit worked out was Rs. 39.87 lakhs. The investment made on the purchase of land, construction of building and purchase of machines & equipments accounted for about 4.56, 28.47 and 66.97 percent, respectively. Among different items of fixed investment incurred, investment on machines constituted the highest share followed by expenses on construction of building.

The investment per quintal of cotton raw material processed was calculated Rs. 122.47. The investment made per quintal of raw material, the items-wise expenditure followed the same pattern as in case of total investment for the establishment of cotton processing unit. The expenses incurred on machines may be attributed due to installation of modern technology. While the expenses on building was higher due to increase in prices of construction material (like bricks, cement etc.) and higher charges of labour.

##### **1.21.1.2 Fixed cost of cotton processing unit**

It is evident from the table 4.26 that the total fixed cost of cotton processing unit and fixed cost per quintal of raw

**Table 4.25: Investment incurred for establishment of cotton processing unit in Hisar district**

**(Rs.)**

<b>Sr. No.</b>	<b>Particulars</b>	<b>Total Amount</b>	<b>Per quintal of raw material processed</b>
1	Investment on land	181850.00 (4.56)	5.59
2	Investment on building	1135000.00 (28.47)	34.86
3 (i)	Investment on machines	1585000.00 (39.75)	48.68
(ii)	Investment on electric motors	435000.00 (10.91)	13.36
(iii)	Investment on generator	611000.00 (15.32)	18.77
4	Investment on equipments	39300.00 (0.99)	1.21
<b>Total investment</b>		<b>3987150.00</b> <b>(100.00)</b>	<b>122.47</b>

Note: Figures in parentheses indicate the percent to total investment

**Table 4.26: Fixed cost of cotton processing unit in Hisar district  
(Rs.)**

<b>Sr. No.</b>	<b>Particulars</b>	<b>Total Amount</b>	<b>Per quintal of raw material processed</b>
1	Rental value of land	18185.00 (1.82)	0.56
2	Depreciation on building	74982.19 (7.49)	2.30
3 (i)	Depreciation on machines	68787.37 (6.88)	2.11
(ii)	Depreciation on electric motors	41048.95 (4.10)	1.26
(iii)	Depreciation on generator	111209.49 (11.12)	3.42
4	Depreciation on equipments	5580.08 (0.56)	0.17
5	Salaries of regular staff	202200.00 (20.21)	6.21
6	Interest on fixed investment *	478458.00 (47.82)	14.69
<b>Total fixed cost</b>		<b>1000451.09</b> <b>(100.00)</b>	<b>30.72</b>

Note: Figures in parentheses indicate the percent to total fixed cost

\*@ of 12% per annum

material in Hisar district was Rs. 10.00 lakhs and Rs. 30.72, respectively. The major items of the fixed cost were interest on fixed investment, salaries of regular staff, depreciation on machines and building, and rental value of land. The interest on fixed investment accounted highest share i.e. 47.82 percent of total fixed cost followed by salary of regular employees. The fixed cost per quintal of raw material exhibited the same pattern. The highest share of interest on fixed investment in fixed cost may be account of large investment made on purchase of machine. The salary of regular employees both in case of total fixed cost and fixed cost per quintal of raw material processed was higher as enhancement of salary because of increase in public sector and salary of government department employees.

#### **4.2.1.1.3 Variable expenses incurred in cotton processing unit**

The variable expenses of cotton processing unit in Hisar district in depicted in table 4.27. The total variable expenses of cotton processing unit were Rs. 7.21 crores. Among different inputs used, the expenses incurred on the purchase of raw material was highest i.e. 85.59 percent of total variable expenses. The other expenses like wages of casual labour, electricity/fuel charges, packaging & miscellaneous charges, oil & greasing charges, repair and maintenance cost constituted 1.17, 0.90, 1.08, 0.35 and 0.05 percent of total variable expenses, respectively. The expenses calculated per quintal of raw material processed were Rs. 2214.57. The cost of raw material per quintal was Rs. 1895.00 including various market

**Table 4.27: Variable cost of cotton processing unit in Hisar district**

		(Rs.)	
Sr. No.	Particulars	Total Amount	Per quintal of raw material processed
1	Cost of raw material	61701200.00 (85.59)	1895.00
2	Electricity charges/fuel charges	651200.00 (0.90)	20.00
3	Oil and greasing charges	264500.00 (0.35)	8.12
4	Repair and maintenance charges	32800.00 (0.05)	1.01
5	Packaging and miscellaneous charges	775414.00 (1.08)	23.81
6	Salaries of skilled labour	117450.00 (0.16)	3.61
7	Wages of casual labour	842400.00 (1.17)	25.87
8	Interest on variable cost *	7726195.68 (10.70)	237.15
<b>Total variable cost</b>		<b>72111159.68</b> <b>(100.00)</b>	<b>2214.57</b>

Note: Figures in parentheses indicates the percent to total variable cost  
\* @ of 12% per annum for six month

**Table 4.28: Costs and returns of cotton processing unit in Hisar district**

			(Rs.)
Sr. No.	Particulars	Total Amount	Per quintal of raw material processed
1	Total fixed cost*	1000451.09 (1.37)	30.72
2	Total variable cost*	72111159.68 (98.63)	2214.57
3	Total cost (Fixed cost +Variable cost)	73111610.77 (100.00)	2245.29
4	Processing cost	-	350.44
5	Income from the sale of main product (cotton lint)**	51282000.00 (66.67)	1575.00
6	Income from the sale of by product (cotton seed)**	25641000.00 (33.33)	787.50
7	Gross returns	76923000.00 (100.00)	2362.50
8	Net returns	3811389.23	117.41
<b>Benefit-cost ratio</b>		<b>1.05</b>	-

Note: \*Figures in parentheses indicate the percentage to total cost

\*\* Figures in parentheses indicate percentage to total gross returns

expenses (loading and unloading charges, market fee, commission) incurred on the purchase of raw material by processors. The other constituents of variable expenses incurred per quintal of raw material exhibited the same pattern.

The cost of raw material was higher as a result of increase in minimum support price, higher marketing cost, taxes and higher transportation charges. The wages of casual labour was also higher because of increase in minimum daily wages by the state Govt. The electricity and packaging charges also shared a significant amount of total variables expenses due to higher cost per unit of electricity supply and higher cost of packing material, respectively.

#### **4.2.1.1.4 Costs and returns of cotton processing unit**

The processing cost of cotton was Rs. 7.31 crores out of which 98.63 and 1.37 percent were incurred as variable and fixed cost, respectively (Table 4.28). The gross returns received from the sale of main product (cotton lint) and by-product (cotton seed) was Rs. 5.13 crores and Rs. 2.56 crores, respectively. The income from the sale of main product shared about 66.67 percent of total returns. The gross returns per unit of processing cost from the cotton processing unit were Rs. 2362.50.

The total cost per quintal of raw material processed worked out was Rs. 2245.29 out of which variable cost constituted the maximum share. The processing cost per quintal of raw material was calculated Rs. 350.44. The total income from the sale of per quintal of raw material processed was estimated Rs. 117.41. The benefit-cost ratio calculated

was 1.05 indicating the economic viability of the processing unit in the study area.

From the results, it was concluded that there was heavy investment on construction of building, purchase of land, machinery and equipments. However, there was large amount need to be invested for the purchase of raw material. The costs and returns analysis revealed the value of B-C. ratio more than one showed that investment made in cotton processing units in the study area is economically variable.

#### **4.2.1.1.5 Break-even analysis of cotton processing unit**

Break-even point indicates the minimum level of quantity of raw material that has to be processed so as to continue in business without incurring losses. The break-even analysis revealed the performance of agro-processing unit.

Table 4.29 shows that the break-even point for the cotton processing unit is 6769.69 quintals per year which is 5.38 percent of total installed capacity while the percentage of break-even volume to capacity utilization is 20.79 percent.

#### **4.2.1.2 Costs and returns of cotton processing unit in Bhiwani district**

##### **4.2.1.2.1 Investment incurred for the establishment of cotton processing unit**

The total fixed investment and investment per quintal of raw material incurred on the establishment of cotton processing unit in Bhiwani district is presented in table 4.30. The investment made on the purchase of land, construction of building, purchase of machines and equipments accounted for about 8.20, 63.29 and 1.61 percent of total investment,

**Table 4.29: Break-even analysis of cotton processing unit in Hisar district**

<b>Sr. No.</b>	<b>Particulars</b>	<b>Amount (Rs.)</b>
1	Income from sale of per quintal of cotton products (cotton lint + cotton seed)	2362.50
2	Cost of raw material (per quintal)	1895.00
3	Total fixed cost	1000451.09
4	Total variable cost (per quintal)	2214.72
5	Break-even volume (quintals)	6769.88
6	Capacity utilization	32560.00
7	Installed capacity	125750.00
8	Percentage of break-even volume to capacity utilization	20.79
9	Percentage of break-even volume to installed capacity	5.38

**Table 4.30: Investment incurred for establishment of cotton processing unit Bhiwani district**

**(Rs.)**

<b>Sr. No.</b>	<b>Particulars</b>	<b>Total Amount</b>	<b>Per quintal of raw material processed</b>
1	Investment on land	333355.00 (8.20)	10.85
2	Investment on building	1093085.00 (26.90)	35.57
3 (i)	Investment on machines	1167520.00 (28.73)	37.99
(ii)	Investment on electric motors	237030.00 (5.83)	7.71
(iii)	Investment on generator	1167520.00 (28.73)	37.99
4	Investment on equipments	64610.00 (1.61)	2.10
<b>Total investment</b>		<b>4063120.00</b> <b>(100.00)</b>	<b>132.21</b>

Note: Figures in parentheses indicate the percent to total investment

respectively. The total amount incurred for the establishment of cotton processing unit worked out was Rs. 40.63 lakhs. Among different items of fixed investment incurred, investment on machines constituted the highest share followed by investment on construction of the building.

The investment per quintal of cotton raw material processed was calculated was to be Rs. 132.21. Out of total investment per quintal of raw material, the item-wise cost followed the same pattern as in case of total investment of cotton processing unit. The expenses incurred on machines may be attributed due to installation of modern technology while the expenses on construction of building were higher due to increase in the prices of construction material (like iron, bricks, cement etc.) and higher labour charges.

#### **4.2.1.2.2 Fixed cost of cotton processing unit**

It is evident from the table 4.31 that the total fixed cost of cotton processing unit and fixed cost per quintal of raw material in Bhiwani district was Rs. 9.79 lakhs and Rs. 31.84, respectively. The major items of the fixed cost were interest on fixed investment, salaries of regular staff, depreciation of machines, equipments, building and rental value of land. The investment on fixed investment accounted higher share i.e. 49.79 of total fixed cost followed by salary of regular staff. Fixed cost per quintal of raw material exhibited the same pattern. The highest share of interest on fixed cost may be attributed due to large investment made on purchase of machines embodied with latest technology. The rise in price of construction material (i.e. iron, cement, bricks etc.) and higher labour charges increased the cost of construction of building.

**Table 4.31: Fixed cost of cotton processing unit in Bhiwani district**

			(Rs.)
Sr. No.	Particulars	Total Amount	Per quintal of raw material processed
1	Rental value of land	33335.50 (3.40)	1.08
2	Depreciation on building	67766.21 (6.92)	2.20
3 (i)	Depreciation on machines	53512.48 (5.47)	1.74
(ii)	Depreciation on electric motors	24108.22 (2.46)	0.78
(iii)	Depreciation on generator	116815.15 (11.93)	3.80
4	Depreciation on equipments	8259.75 (0.85)	0.27
5	Salaries of regular staff	187800.00 (19.18)	6.11
6	Interest on fixed investment*	487574.40 (49.79)	15.86
<b>Total fixed cost</b>		<b>979171.72</b> <b>(100.00)</b>	<b>31.84</b>

Note: Figures in parentheses indicate the percent to total fixed cost

\* @ of 12% per annum

#### **4.2.1.2.3 Variable expenses incurred of cotton processing unit**

The variable expenses of cotton processing unit in Bhiwani district is depicted in table 4.32. The total variable expenses of cotton processing unit were Rs. 6.76 crores. Among different inputs used, the expenses incurred on the purchase of raw material was highest i.e. 86.13 percent of total variable expenses. The other expenses like wages of casual labour, electricity/fuel charges, packaging & miscellaneous charges, oil & greasing charges and repair & maintenance cost constituted 1.09, .89, 0.80, 0.15 and 0.05 percent of total variable expenses, respectively.

The variable expenses calculated per quintal of raw material processed were Rs. 2200.25. The cost of raw material per quintal was Rs. 1895.00 including various market expenses incurred on the purchase of raw material. The other constituents of variables expenses incurred per quintal of raw material followed the similar trend. The cost of raw material was higher as a result of increase in minimum support price, higher marketing cost, taxes and higher transportation charges. The wages of casual labour was also higher because of increase in minimum daily wages by the state Govt. The electricity charges and packaging charges also accounted a significant amount of total variable expenses due to higher cost per unit of electricity supply and higher cost of packing material, respectively.

#### **4.2.1.2.4 Costs and returns of cotton processing unit**

The processing cost of cotton was Rs. 6.86 crores out of which 98.57 and 1.43 percent were incurred as variable and

**Table 4.32: Variable cost of cotton processing unit in Bhiwani district**

(Rs.)

<b>Sr. No.</b>	<b>Particulars</b>	<b>Total Amount</b>	<b>Per quintal of raw material processed</b>
1	Cost of raw material	58240740.50 (86.13)	1895.00
3	Electricity charges/fuel charges	605100.00 (0.89)	19.69
4	Oil and greasing charges	104300.00 (0.15)	3.39
5	Repair and maintenance charges	28460.00 (0.05)	0.93
6	Packaging and miscellaneous charges	541992.33 (0.80)	17.64
7	Salaries of skilled labour	121500.00 (0.18)	3.95
8	Wages of casual labour	735000.00 (1.09)	23.91
9	Interest on variable cost *	7245251.14 (10.71)	235.74
<b>Total variable cost</b>		<b>67622343.97</b> <b>(100.00)</b>	<b>2200.25</b>

Note: Figures in parentheses indicates the percent to total variable cost

\* @ of 12% per annum for six month

fixed cost, respectively (table 4.33). The gross returns recovered from the sale of main product (cotton lint) and by-product (cotton seed) was Rs. 4.84 crores and Rs. 2.42 crores. The income from the sale of main product shared about 66.67 percent of the total gross returns. The gross return per quintal of raw material processed from the cotton processing unit was Rs. 2362.50.

The total cost per quintal of raw material processed worked out was Rs. 2232.09 out of which variable cost constituted the maximum proportion. The processing cost per quintal of raw material was calculated Rs. 337.11. The total income from the sale of per quintal of raw material processed was estimated 1575.00 while net returns were obtained Rs. 130.41. The benefit-cost ratio calculated was Rs. 1.05 showing the economic viability of the processing unit.

From the results, it was concluded that there was heavy investment on construction of building, purchase of land, machinery and equipments. However, there was large amount invested for the purchase of raw material. The costs and returns analysis revealed the value of B-C ratio more than one. Finally, the value of B-C ratio shows that investment made in cotton processing units in the study area is economically variable.

#### **4.2.1.2.5 Break-even analysis of cotton processing unit**

Table 4.34 gives the break-even analysis for the cotton processing units in Bhiwani district. It is evident from table that break-even volume of cotton of the raw material was 6034.96 quintals which was 19.64 percent of the capacity utilization and 5.00 percent of the installed capacity of the plant.

**Table 4.33: Costs and returns of cotton processing unit in Bhiwani district**

		<b>(Rs.)</b>	
<b>Sr. No.</b>	<b>Particulars</b>	<b>Total Amount</b>	<b>Per quintal of raw material processed</b>
1	Total fixed cost*	979171.72 (1.43)	31.84
2	Total variable cost*	67622343.97 (98.57)	2200.25
3	Total cost (Fixed cost + Variable cost)	68601515.68 (100.00)	2232.09
4	Processing cost	-	337.11
5	Income from the sale of main product (cotton lint)**	48405892.50 (66.67)	1575.00
6	Income from the sale of by product (cotton seed)**	24202946.25 (33.33)	787.50
7	Gross returns	72608838.75 (100.00)	2362.50
8	Net returns	4007323.07	130.41
<b>Benefit-cost ratio</b>		<b>1.06</b>	<b>-</b>

Note: \*Figures in parentheses indicate the percentage to total cost

\*\* Figures in parentheses indicate percentage to total gross returns

**Table 4.34: Break-even analysis of cotton processing unit in Bhiwani district**

<b>Sr. No.</b>	<b>Particulars</b>	<b>Amount (Rs.)</b>
1	Income from sale of per quintal of cotton products (cotton lint + cotton seed)	2362.50
2	Cost of raw material (per quintal)	1895.00
3	Total fixed cost	979171.72
4	Total variable cost (per quintal)	2200.25
5	Break-even volume (quintals)	6034.96
6	Capacity utilization	30734.00
7	Installed capacity	120760.00
8	Percentage of break-even volume to capacity utilization	19.64
9	Percentage of break-even volume to installed capacity	5.00

#### **4.2.2 Rapeseed-mustard processing units**

Rapeseed-mustard is one of the major oilseed crops of world. The important rapeseed-mustard growing countries of world are China, India, Canada, Pakistan, Poland, Bangladesh, France, Germany and U.K. India attained second position both in terms of acreage and production next to China accounting for 22.61 percent of the world total area and 15.19 percent of total world production, respectively (2002-03). During the year 2002-03, rapeseed and mustard in India occupied 4.52 million hectares with an annual production of 3.92 million tonnes.

In India, rapeseed-mustard is considered major rabi oilseed crop. Its cultivation is mainly confined to Uttar Pradesh, Rajasthan, Haryana, Madhya Pradesh, West Bengal, Gujarat and Assam. Among different states, Uttar Pradesh alone produced about 33.65 percent of total rapeseed-mustard production in the country.

The oil content of rapeseed-mustard varies from 37 to 49 percent. The seed and oil are used as condiment in the preparation of pickles and for flavoring carries and vegetables. The oil is also utilized for human consumption mainly in Uttar Pradesh, Bihar and Eastern states of India in cooking and frying purposes. It is also used in the preparation of oils and medicines, soap making, in mixture with mineral oils for lubrication. Rapeseed oil is also used in the manufacture of greases. The leaves of young plants used as green vegetables are rich source of sulphur and minerals contributing in human diet. The oilcake is used as a cattle feed and manure, while green stems and leaves are good source of green fodder for cattle. In the tanning industry, mustard oil is used for softening

leather.

#### **4.2.2.1 Costs and returns of rapeseed-mustard processing unit in Hisar district**

Hisar and Bhiwani districts were selected amongst the rapeseed-mustard growing district of Haryana state. The acreage under rapeseed-mustard is 81.80 thousand hectares with average productivity 1517.00kg/ha in Hisar district while the rapeseed-mustard acreage in Bhiwani district is 177.50 thousand hectares with average productivity 155.70 kg/ha which is highest among all the districts during 2004-05. The total numbers of rapeseed-mustard processing units were in operation 120 and 31 in Hisar and Bhiwani districts, respectively.

##### **4.2.2.1.1 Investment incurred for the establishment of rapeseed-mustard processing unit**

The total fixed investment and investment per quintal of raw material incurred on the establishment of rapeseed-mustard processing unit in Hisar district is presented in table 4.35. The total amount incurred for the establishment of rapeseed-mustard processing unit worked out to be Rs. 17.92 lakhs. The investment made on the purchase of land, construction of building, purchase of machines and equipments, accounted for about 9.37, 21.18 and 40.84 percent of total investment, respectively. Among different items of fixed investment incurred, expenditure on machines constituted the highest share followed by investment on construction on building.

**Table 4.35: Investment incurred for establishment of rapeseed-mustard processing unit in Hisar district**

(Rs.)

<b>Sr. No.</b>	<b>Particulars</b>	<b>Total Amount</b>	<b>Per quintal of raw material processed</b>
1	Investment on land	167970.00 (9.37)	6.64
2	Investment on Building	379500.00 (21.18)	15.00
3 (i)	Investment on machines	730230.00 (40.75)	28.87
(ii)	Investment on electric motors	229820.00 (12.82)	9.08
(iii)	Investment on generator	283000.00 (15.79)	11.19
4	Investment on equipments	1473.00 (0.09)	0.06
<b>Total investment</b>		<b>1791993.00</b> <b>(100.00)</b>	<b>70.84</b>

Note: Figures in parentheses indicate the percent to total investment

The investment per quintal of rapeseed-mustard raw material processed was calculated as Rs. 70.84. Out of total investment calculated per quintal of raw material, the item wise cost followed the same pattern as in case of total investment made for the establishment of rapeseed-mustard processing unit. The expenses incurred on machines may be on the account of installation of modern machines while, the expenses on construction of building was higher due to increase in prices of construction material (like iron, bricks, cement, etc) and higher labour charges.

#### **4.2.2.1.2 Fixed cost of rapeseed-mustard processing unit**

It is evident from the table 4.36 that the total fixed cost of rapeseed-mustard processing unit in Hisar district was Rs. 5.36 lakhs and Rs. 21.19 fixed cost per quintal of raw material. The major items of the fixed cost were interest on fixed investment, salary of regular staff depreciation on machines, depreciation on building and rental value of land.

The interest on fixed investment accounted highest share i.e. 40.11 percent of total fixed cost followed by salaries of regular staff. The fixed cost per quintal of raw material exhibited the same pattern for interest on fixed investment and. The salary of regular staff both in case of total fixed cost and fixed cost per quintal of raw material processed was higher as enhancement of salary of public sector and Govt. department employees. The higher share of interest on fixed investment in fixed cost may be due to large investment on purchase of machines.

**Table 4.36: Fixed cost of rapeseed-mustard processing unit in Hisar district**

(Rs.)

Sr. No.	Particulars	Total Amount	Per quintal of raw material processed
1	Rental value of land	16797.00 (3.13)	0.66
2	Depreciation on building	20898.98 (3.90)	0.83
3 (i)	Depreciation on machines	36181.79 (6.75)	1.43
(ii)	Depreciation on electric motors	25804.17 (4.81)	1.02
(iii)	Depreciation on generator	43072.82 (8.03)	1.70
4	Depreciation on equipments	194.11 (0.04)	0.01
5	Salaries of regular staff	178200.00 (33.23)	7.04
6	Interest on fixed investment*	215039.16 (40.11)	8.50
<b>Total fixed cost</b>		<b>536188.03</b> <b>(100.00)</b>	<b>21.19</b>

Note: Figures in parentheses indicate the percent to total fixed cost

\* @ of 12% per annum

#### **4.2.2.1.3 Variable expenses incurred of rapeseed-mustard processing unit**

The variable expenses of rapeseed-mustard processing unit in Hisar district is depicted in table 4.37. The total variable expenses of rapeseed-mustard processing unit were Rs. 4.98 crores. Among different inputs used, the expenses incurred on the purchase of raw material was highest i.e. 86.59 percent of total expenses. The other expenses like wages of casual labour, electricity/fuel charges, packaging & miscellaneous charges, oil & greasing charges and repair & maintenance cost constituted 0.49, 0.66, 1.31, 0.09 and 0.03 percent of total variable expenses, respectively.

The variable expenses calculated per quintal of raw material processed were Rs. 1968.99. The cost of raw material per quintal was Rs. 1705.00 including various market expenses incurred on purchase of raw material. The other constituents of variable expenses incurred per quintal of raw material followed the similar trend. The cost of raw material was higher as a result of increase in minimum support price, higher marketing cost, taxes and higher transportation charges. The wages of casual labour was also higher because of increase in minimum daily wages by state Govt. The electricity charges and packaging charges also shared a significant amount of total variable expenses due to higher cost per unit of electricity supply and higher cost of packing material, respectively.

#### **4.2.2.1.4 Costs and returns of rapeseed-mustard processing unit**

The processing of cotton was Rs. 5.03 crores out of which 98.93 and 1.07 percent were shared by variable and fixed

**Table 4.37: Variable cost of rapeseed-mustard processing unit in Hisar district**

		(Rs.)	
Sr. No.	Particulars	Total Amount	Per quintal of raw material processed
1	Cost of raw material	43131726.00 (86.59)	1705.00
2	Electricity charges/fuel charges	329000.00 (0.66)	13.01
3	Oil and greasing charges	45300.00 (0.09)	1.79
4	Repair and maintenance charges	11320.00 (0.03)	0.45
5	Packaging and miscellaneous charges	650057.09 (1.31)	25.70
6	Wages of skilled labour	40500.00 (0.12)	2.40
7	Wages of casual labour	244800.00 (0.49)	9.68
8	Interest on variable cost*	5336754.37 (10.71)	210.96
<b>Total variable cost</b>		<b>49789457.46</b> <b>(100.00)</b>	<b>1968.99</b>

Note: Figures in parentheses indicates the percent to total variable cost

\* @ of 12% per annum for six month

**Table 4.38: Costs and returns of rapeseed-mustard processing unit in Hisar district**

			(Rs.)
Sr.No.	Particulars	Total Amount	Per quintal of raw material processed
1	Total fixed cost*	536188.04 (1.07)	21.19
2	Total variable cost*	49787027.46 (98.93)	1968.99
3	Total cost (Fixed cost + Variable cost)	50323215.50 (100.00)	1990.18
4	Processing cost	-	285.18
5	Income from the sale of main product (oil) **	39615415.20 (72.15)	1556.00
6	Income from the sale of by-product (mustard cake)**	15292157.40 (27.85)	604.50
7	Gross returns	54907572.60 (100.00)	2160.50
8	Net returns	458435.10	170.32
<b>Benefit-cost ratio</b>		<b>1.09</b>	-

Note: \*Figures in parentheses indicate the percentage to total cost

\*\* Figures in parentheses indicate percentage to total gross returns

costs, respectively (Table 4.38).The gross returns received from the sale of main product (mustard oil) and by-product (oil cake) was Rs. 3.96 crores and Rs. 1.53 crores, respectively. The income from the sale of main product accounted for about 72.15 percent the total gross returns. The gross returns from the processing unit of rapeseed-mustard worked out were Rs. 5.49 crores. The net returns per quintal of processing cost from rapeseed-mustard processing were Rs. 170.32.

The total cost per quintal of raw material processed worked out was Rs. 1990.18 out of which variable constituted the maximum share. The processing cost per quintal of raw material was calculated as Rs. 285.18. The total income from the sale of per quintal of raw material processed estimated was 2160.50 while net returns obtained Rs. 170.32. The benefit-cost ratio calculated was 1.09 indicating the economic viability of the rapeseed-mustard processing unit in the study area.

From the results, it was concluded that there was heavy investment on construction of building, purchase of land, machinery and equipments. However, there was large amount invested for the purchase of raw material. The costs and returns analysis revealed the value of B-C ratio more than unity showing that investment made in rapeseed-mustard processing unit in the study area is economically viable.

#### **4.2.2.1.5 Break-even analysis of rapeseed-mustard processing unit**

The break-even point for the rapeseed-mustard processing units in Hisar district is presented in table 4.39.

**Table 4.39: Break-even analysis of rapeseed-mustard processing unit in Hisar district**

<b>Sr. No.</b>	<b>Particulars</b>	<b>Amount (Rs.)</b>
1	Income from sale of per quintal of rapeseed-mustard products (mustard oil + mustard cake)	2160.50
2	Cost of raw material (per quintal)	1705.00
3	Total fixed cost	536188.04
4	Total variable cost (per quintal)	1968.99
5	Break-even volume (quintals)	2799.79
6	Capacity utilization	40935.00
7	Installed capacity	55210.00
8	Percentage of break-even volume to capacity utilization	6.84
9	Percentage of break-even volume to installed capacity	5.07

The break-even analysis reveals that about 2799.79 quintals of rapeseed-mustard raw material was processed in the processing unit to equalize the benefit with the processing cost. The quantity of raw material processed accounted for 6.84 percent of total plant capacity utilization while it shared 5.07 percent of total plant installed capacity. Therefore, the processing units of rapeseed-mustard were operating at the much higher level than the break-even point.

#### **4.2.2.2 Cost and returns of rapeseed-mustard processing unit in Bhiwani district**

##### **4.2.2.2.1 Investment incurred for the establishment of rapeseed-mustard processing unit**

The total fixed investment and investment per quintal of raw material incurred on the establishment of rapeseed-mustard processing unit in Bhiwani district is presented in table 4.40. The investment made on the purchase of land, construction of building, purchase of machines and equipments accounted for about 25.80, 37.85 and 0.10 percent of total investment, respectively. The total amount incurred for the establishment of rapeseed-mustard processing unit worked out to be Rs. 23.71 lakhs. Among different items of fixed investment incurred, investment on building constituted the highest share followed by investment on land.

The investment per quintal of rapeseed-mustard raw material processed was Rs. 57.91. Out of investment per quintal of raw material, the item wise cost followed the same pattern as in case of total investment for the establishment of

**Table 4.40: Investment incurred for establishment of rapeseed-mustard processing unit in Bhiwani district**

**(Rs.)**

<b>Sr. No.</b>	<b>Particulars</b>	<b>Total Amount</b>	<b>Per quintal of raw material processed</b>
1	Investment on land	611710.00 (25.80)	14.94
2	Investment on building	897510.00 (37.85)	21.92
3 (i)	Investment on machines	408100.00 (17.21)	9.97
(ii)	Investment on electric motors	43500.00 (1.83)	1.06
(iii)	Investment on generator	408100.00 (17.21)	9.97
4	Investment on equipments	2065.00 (0.10)	0.05
<b>Total investment</b>		<b>2370985.00</b> <b>(100.00)</b>	<b>57.91</b>

Note: Figures in parentheses indicate the percent to total investment

rapeseed-mustard processing unit. The expenses incurred on building may be attributed due to increase in prices of construction material (like bricks, cement, iron etc.) and higher labour charges. While expenses on purchase land are higher due to increase in land price.

**4.2.2.2.2 Fixed cost of rapeseed-mustard processing unit** It is evident from the table 4.41 that the total fixed cost and fixed cost per quintal of raw material processed were Rs. 6.31 lakhs and Rs. 15.42. The major items of the fixed cost were interest on fixed investment salaries of regular staff and depreciation on generator. The interest on fixed investment constituted highest share i.e. 45.08 percent of total fixed cost followed by salaries of regular staff. The fixed cost per quintal of raw material exhibited the same pattern for interest on fixed investment, salaries of regular staff, depreciation on generator and building and rental value of land.

**4.2.2.2.3 Variable expenses of rapeseed-mustard processing unit**

The variable expenses of rapeseed-mustard processing unit in Bhiwani district is depicted in table 4.42. The total variable expenses of rapeseed-mustard processing unit was Rs. 8.06 crores. Among different inputs used, the expenses incurred on the purchase of raw material was highest i.e. 86.96 percent of total expenses. The other expenses like wages of casual labour, electricity/fuel charges, packaging & miscellaneous charges, oil & greasing charges and repair & maintenance cost constituted 0.06, 0.83, 1.31, 0.08 and 0.03 percent of total expenses, respectively.

**Table 4.41: Fixed cost of rapeseed-mustard processing unit in Bhiwani district**

(Rs.)

<b>Sr. No.</b>	<b>Particulars</b>	<b>Total Amount</b>	<b>Per quintal of raw material processed</b>
1	Rental value of land	61171.00 (9.69)	1.49
2	Depreciation on building	47920.21 (7.59)	1.17
3 (i)	Depreciation on machines	24451.24 (3.87)	0.60
(ii)	Depreciation on electric motors	5731.49 (0.91)	0.14
(iii)	Depreciation on generator	87082.63 (13.80)	2.13
4	Depreciation on equipments	225.99 (0.05)	0.01
5	Salaries of regular staff	120000.00 (19.01)	2.93
6	Interest on fixed investment*	284518.20 (45.08)	6.95
<b>Total fixed cost</b>		<b>631100.76</b> <b>(100.00)</b>	<b>15.42</b>

Note: Figures in parentheses indicate the percent to total fixed cost

\* @ of 12% per annum

**Table 4.42: Variable cost of rapeseed-mustard processing unit in Bhiwani district**

(Rs.)

<b>Sr. No.</b>	<b>Particulars</b>	<b>Total Amount</b>	<b>Per quintal of raw material processed</b>
1	Cost of raw material	69824865.00 (86.96)	1705.00
2	Electricity charges/fuel charges	669600.00 (0.83)	16.35
3	Oil and greasing charges	63280.00 (0.08)	1.55
4	Repair and maintenance charges	21295.00 (0.03)	0.52
5	Packaging and miscellaneous charges	1052361.05 (1.31)	25.70
6	Wages of skilled labour	64800.00 (0.02)	1.58
7	Wages of casual labour	304200.00 (0.06)	7.43
8	Interest on variable cost*	8640048.13 (10.71)	210.97
<b>Total variable cost</b>		<b>80640449.18</b> <b>(100.00)</b>	<b>1969.10</b>

Note: Figures in parentheses indicates the percent to total variable cost

\* @ of 12% per annum for six month

The variable expenses calculated per quintal of raw material processed were Rs. 1969.10. The cost of raw material per quintal was Rs. 1705.00 including various market expenses incurred on purchase of raw material. The other constituents of variable expenses incurred per quintal of raw material followed the similar pattern.

The cost of raw material was higher as a result of increase in minimum support price, addition of marketing cost, taxes involved and higher transportation charges. The wages of casual labour was also higher because of increase in minimum daily wages by state Govt. The electricity and packaging charges also shared a significant amount of total variable expenses due to higher cost per unit of electricity supply and high cost of packing material, respectively.

#### **4.2.2.2.4 Costs and returns of rapeseed-mustard processing unit**

The processing cost of rapeseed-mustard was Rs. 8.13 crores out of which 99.22 and 0.98 percent were incurred as variable and fixed costs, respectively (Table 4.43). The gross returns received from the sale of main product (mustard oil) were Rs. 6.41 crores and by-product (mustard oilcake) were Rs. 2.48 crores. The income from the sale of main-product shared about 72.15 percent of the total gross returns. The net returns from rapeseed-mustard processing unit was Rs. 7.62 lakhs.

The total cost per quintal of raw material processed worked out was Rs. 1984.52 out of which variable cost

**Table 4.43: Costs and returns of rapeseed-mustard processing unit in Bhiwani district**

			(Rs.)
Sr. No.	Particulars	Total Amount	Per quintal of raw material processed
1	Total fixed cost*	631100.76 (0.78)	15.42
2	Total variable cost*	80640449.18 (99.22)	1969.10
3	Total cost (Fixed cost + Variable cost)	81271549.94 (100.00)	1984.52
4	Processing cost	-	279.51
5	Income from the sale of main product (oil) **	64132398.00 (72.15)	1556.00
6	Income from the sale of by-product (mustard cake)**	24756088.50 (27.85)	604.50
7	Gross returns	88888486.50 (100.00)	2160.50
8	Net returns	7616936.56	175.98
<b>Benefit-cost ratio</b>		<b>1.09</b>	-

Note: \*Figures in parentheses indicate the percentage to total cost

\*\* Figures in parentheses indicate percentage to total gross returns

constituted the maximum share. The processing cost per quintal of raw material calculated was Rs. 279.51. The total income from the sale of per quintal of material processed estimated was Rs. 2160.50. The net returns per quintal of raw material processed calculated were Rs. 175.98. The benefit-cost ratio calculated was 1.09 indicating the economic viability of the processing unit.

From the results, it was concluded that there was heavy investment on construction of building, purchase of land, machinery and equipments. However, there was large amount need to be invested for the purchase of raw material. The cost and return analysis revealed the value of B-C ratio more than one shows that investment made in rapeseed-mustard processing unit in the study area is economically viable.

#### **4.2.2.2.5 Break-even analysis of rapeseed-mustard processing unit**

Table 4.44 indicates that the break-even volume for the rapeseed-mustard processing unit in Bhiwani district calculated was 3586.21 quintals accounting for 8.76 percent of capacity utilization and 6.50 percent of installed capacity of the processing plant. The processing unit of rapeseed-mustard in the study area was running at higher level than the Break-even point.

**Table 4.44: Break-even analysis of rapeseed-mustard processing unit in Bhiwani district**

<b>Sr. No.</b>	<b>Particulars</b>	<b>Amount (Rs.)</b>
1	Income from sale of per quintal of rapeseed-mustard products (mustard oil + mustard cake)	2160.50
2	Cost of raw material (per quintal)	1705.00
3	Total fixed cost	631100.76
4	Total variable cost (per quintal)	1984.52
5	Break-even volume (quintals)	3586.21
6	Capacity utilization	40935.00
7	Installed capacity	55210.00
8	Percentage of break-even volume to capacity utilization	8.76
9	Percentage of break-even volume to installed capacity	6.50

### **4.2.3 Pulse (gram) processing unit in Haryana**

Chickpea is one of the important pulse crops of the world cultivated over an area of 9.89 million hectares with a production of about 7.80 million tonnes of grain (2002). The important chickpea growing countries are India, Pakistan, Bangladesh, Myanmar, Turkey, Mexico, Ethiopia and Iran constituting 93.79 and 92.49 percent of total area and production of chickpea in the world, respectively.

India ranked first in the world in respect of production (70.08%) as well as acreage (64.84%). The area under cultivation of this crop in India was 5.67 million hectares with a production of 4.13 million tonnes during the year 2002-03. Chickpea constituted about 28.28 percent of area under pulses and contributed about 37.07 percent of total pulse production in India (2002-03). The growth rate in production of pulses is not matched with increase in cereals. The major chickpea producing areas are situated in Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra, Andhra Pradesh, Karnataka and Haryana. Presently, there is shortage of pulses in the country as availability of pulses per capita is very low.

Hisar and Bhiwani district were selected amongst chickpea growing areas of Haryana state. The acreage under chickpea is highest in both selected districts. The area under chickpea is 19.10 thousand hectares with productivity of 939.60 kg/ha in Hisar district, while chickpea acreage in Bhiwani district is 57.50 thousand hectares which is maximum among all the districts of Haryana state with average yield of 758kg/ha during the year 2004-05. The total

numbers of pulse (dal)-processing units were 34 and 24 in Hisar and Bhiwani districts, respectively.

#### **4.2.3.1 Costs and returns of pulse (gram) processing units in Hisar district**

##### **4.2.3.1.1 Investment incurred for establishment of pulse (gram) processing unit in Hisar district**

The total investment and investment per quintal of raw material incurred on the establishment of pulse (gram) processing unit in Hisar district is presented in table 4.45. The investment made on the purchase of land, construction of building, purchase of machines and equipments accounted for about 30.56, 38.39, 3.69 and 0.07 percent of total investment, respectively. The total amount incurred for the establishment of pulse (gram) processing unit worked out was Rs. 9.15 lakhs. Among different items of investment incurred, the investment on construction of building constituted the highest share followed by investment on purchase of land.

The investment per quintal of raw material processed was calculated Rs. 53.01. Out of total investment calculated per quintal of raw material, the items wise cost followed the same pattern as in case of total investment for establishment of pulse (gram) processing unit. The machines and equipments used in the pulse (gram) processing unit are cheaper with respect to machinery and equipments used in other agro-processing units in the study area.

**Table 4.45: Investment incurred for establishment of pulse (gram) processing unit in Hisar district**

			(Rs.)
Sr. No.	Particulars	Total Amount	Per quintal of raw material processed
1	Investment on land	279770.00 (30.56)	16.20
2	Investment on building	351500.00 (38.39)	20.35
3 (i)	Investment on machines	33800.00 (3.69)	1.96
(ii)	Investment on electric motors	7260.00 (0.79)	0.42
(iii)	Investment on generator	242500.00 (26.49)	14.04
4	Investment on equipments	665.00 (0.08)	0.04
<b>Total investment</b>		<b>915495.00</b> <b>(100.00)</b>	<b>53.01</b>

Note: Figures in parentheses indicate the percent to total investment

#### **4.2.3.1.2 Fixed cost of pulse (gram) processing unit**

Fixed cost incurred in pulse (gram) processing unit and fixed cost per quintal of raw material in Hisar district was Rs. 3.85 lakhs and Rs. 22.33, respectively (Table 4.46). The major items of fixed cost were salary of regular staff, interest on fixed investment, depreciation of generator and rental value of land. The salary of regular employees accounted for highest share i.e. 44.22 percent of the total fixed cost followed by the interest on fixed investment. The fixed cost per quintal of raw material exhibited the same pattern for salary of regular employees, interest on fixed investment, depreciation on generator and building. The highest share of salary of regular staff may be on the account of enhancement in the salary.

#### **4.2.3.1.3 Variable expenses incurred of pulse (gram) processing unit**

The variable expenses of pulse (gram) processing unit in Hisar district is depicted in table 4.47. The total variable expenses of processing unit were Rs. 3.35 crores. Among different inputs used, the expenses incurred on the purchase of raw material was highest i.e. 87.39 percent of total expenses. The other expenses like wages of casual labour, electricity/fuel charges, packaging & miscellaneous charges, oil & greasing charges and repair & maintenance cost constituted 0.51, 0.35, 0.77 and 0.02 percent of total variable expenses, respectively.

The variable expenses calculated per quintal of raw material processed were Rs. 1939.48. The cost of raw

#### **Table 4.46: Fixed cost of gram processing unit in Hisar district**

		(Rs.)	
Sr. No.	Particulars	Total Amount	Per quintal of raw material processed
1	Rental value of land	27977.00 (7.26)	1.62
2	Depreciation on building	35150.00 (9.12)	2.04
3 (i)	Depreciation on machines	1833.91 (0.48)	0.11
(ii)	Depreciation on electric motors	824.35 (0.21)	0.05
(iii)	Depreciation on generator	39203.94 (10.17)	2.27
4	Depreciation on equipments	110.70 (0.03)	0.01
5	Salaries of regular staff	170400.00 (44.22)	9.87
6	Interest on fixed investment*	109859.40 (28.51)	6.36
<b>Total fixed cost</b>		<b>38539.30</b> <b>(100.00)</b>	<b>22.33</b>

Note: Figures in parentheses indicate the percent to total fixed cost

\* @ of 12% per annum

**Table 4.47: Variable cost of gram processing unit in Hisar district**

		(Rs.)	
<b>Sr. No.</b>	<b>Particulars</b>	<b>Total Amount</b>	<b>Per quintal of raw material processed</b>
1	Cost of raw material	29273497.50 (87.39)	1695.00
2	Electricity charges/fuel charges	116100.00 (0.35)	6.72
3	Oil and greasing charges	23900.00 (0.07)	1.38
4	Repair and maintenance charges	3623.00 (0.02)	0.21
5	Packaging and miscellaneous charges	259057.50 (0.77)	15.00
6	Wages of skilled labour	40500.00 (0.18)	3.52
7	Wages of casual labour	170100.00 (0.51)	9.85
8	Interest on variable cost*	3588843.36 (10.71)	207.80
<b>Total variable cost</b>		<b>33475621.36</b> <b>(100.00)</b>	<b>1939.48</b>

Note: Figures in parentheses indicates the percent to total variable cost

\* @ of 12% per annum for six months

material per quintal was Rs. 1695.00 including market expenses incurred on the purchase of raw material. The other constituents of variable expenses incurred per quintal of raw material followed the similar pattern.

The cost of raw material was higher as a result of higher prices due to reduction in production, higher marketing cost, taxes and higher transportation charges. The wages of casual labour was also higher because of increase in minimum daily wages by state Govt. The electricity charges and packaging charges also shared a significant amount of total variable expenses due to higher cost per unit of electricity and higher cost of packing material, respectively.

#### **4.2.3.1.4 Costs and returns of pulse (gram) processing unit**

The processing cost of pulse (gram) was Rs. 3.39 crores out of which 98.86 and 1.14 percent were variable cost and fixed cost, respectively (Table 4.48). The gross returns received from the sale of main product (dal) and by-product (churi, chhilka and chani) were 91.23 and 8.77 percent of total gross returns, respectively. The net returns of pulses processing unit was Rs. 15.58 lakhs.

The total cost per quintal of raw material processed worked out was Rs. 1961.79 out of which variable cost constituted the maximum share. The processing cost per quintal of raw material calculated was Rs. 266.80. The total income from the sale of per quintal of processed material calculated was 2052.00 while net returns obtained 90.21.

**Table 4.48: Costs and returns of gram processing unit in Hisar district**

		(Rs.)	
Sr. No.	Particulars	Total Amount	Per quintal of

			<b>raw material processed</b>
1	Total fixed cost *	385359.29 (1.14)	22.31
2	Total variable cost*	33495871.36 (98.86)	1939.48
3	Total cost (Fixed cost + Variable cost)	33881230.65 (100.00)	1961.79
4	Processing cost	-	266.80
(A)	Income from the sale of main product		
(i)	Income from the sale of Dal**	32330376.00 (91.23)	1872.00
(B)	Income from the sale of by-product		
(i)	Income from the sale of Churi**	1347099.00 (3.80)	78.00
(ii)	Income from the sale of Chhilka**	1398910.50 (3.95)	81.00
(iii)	Income from the sale of Chani**	362680.50 (1.02)	21.00
	Total income from the sale of by products	3108690.00 (8.77)	180.00
5	Gross returns	35439066.00 (100)	2052.00
6	Net returns	157835.35	90.21
<b>Benefit-cost ratio</b>		<b>1.05</b>	<b>-</b>

Note: \*Figures in parentheses indicate the percentage to total cost

\*\* Figures in parentheses indicate percentage to total gross returns

The benefit-cost ratio calculated was 1.05 indicating the economic viability of the processing unit. The results conclude that there was heavy investment on construction of building, purchase of

land, machinery and equipments. However, there was large amount invested for the purchase of raw material. The costs and returns analysis revealed the value of B-C ratio more than one indicates that investment made in pulse (gram) processing in the study area is economically viable.

#### **4.2.3.1.5 Break-even analysis of pulse (gram) processing unit**

Table 4.49 indicates that the break-even quantity of pulse (gram) processing unit is 4271.80 quintals. The quantity of raw material processed at break-even point is 10.44 percent of the capacity utilization and 7.74 percent of the installed capacity of the processing plant. The processing unit of chickpea was in operation at higher level than Break-even point.

#### **4.2.3.2 Costs and returns of pulse (gram) processing unit in Bhiwani district**

##### **1.21.1.1 Investment incurred for the establishment of pulse (gram) processing unit**

The total fixed investment and investment per quintal of raw material processed incurred of pulse (gram) processing unit in Bhiwani district is presented in table 4.50. The investment made on the purchase of land, construction of building, purchase of machines and equipments accounted for about 27.29, 51.84, 20.71 and 0.16 percent of total

**Table 4.49: Break-even analysis of pulse (gram) processing unit in Hisar district**

<b>Sr. No.</b>	<b>Particulars</b>	<b>Amount (Rs.)</b>
----------------	--------------------	---------------------

---

1	Income from sale of per quintal of pulse (gram) products (dal + churi+chilka+chani)	2052.00
2	Cost of raw material (per quintal)	1695.00
3	Total fixed cost	385359.29
4	Total variable cost (per quintal)	1961.79
5	Break-even volume (quintals)	4271.80
6	Capacity utilization	40935.00
7	Installed capacity	55210.00
8	Percentage of break-even volume to capacity utilization	10.44
9	Percentage of break-even volume to installed capacity	7.74

---

**Table 4.50: Investment incurred for establishment of pulse (gram) processing unit in Bhiwani district**

(Rs.)

<b>Sr. No.</b>	<b>Particulars</b>	<b>Total Amount</b>	<b>Investment ( per quintal of raw material processed)</b>
1	Investment on land	100858.00 (27.29)	8.03
2	Investment on building	191600.00 (51.84)	15.25
3 (i)	Investment on machines	31400.00 (8.49)	2.50
(ii)	Investment on electric motors	13800.00 (3.73)	1.10
(iii)	Investment on generator	31400.00 (8.49)	2.50
4	Investment on equipments	575.00 (0.16)	0.05
<b>Total investment</b>		<b>369633.00</b> <b>(100.00)</b>	<b>29.43</b>

Note: Figures in parentheses indicate the percent to total investment

investment, respectively. The total amount incurred of pulse (gram) processing unit worked out was Rs. 3.69 lakhs. Among different items of fixed investment incurred, investment on building constituted the highest share followed by investment on land.

The investment per quintal of pulse (gram) material processed was calculated was Rs. 29.43. Out of total investment calculated per quintal of raw material, the item wise cost followed the same pattern as in case of total investment for the establishment of pulse (gram) processing unit. The expenses incurred on construction of building may be higher due to rise in price of construction material (bricks, iron, cement etc.) and higher labour charges.

#### **4.2.3.2.2 Fixed cost of pulse (gram) processing unit**

It is evident from the table 4.51 that fixed cost of pulse (gram) processing unit and fixed cost per quintal of raw material in Bhiwani district was Rs. 1.98 lakhs and Rs. 18.36, respectively. The major items of the fixed cost were salaries of regular staff, interest on fixed investment depreciation on generator, depreciation on building and rental value of land. The salaries of regular staff accounted highest share i.e. 39.91 percent of total fixed cost followed by interest on fixed investment.

The fixed cost per quintal of raw material exhibited the same pattern for salaries of regular staff, interest on fixed investment, depreciation on generator and building. The highest share salaries of regular staff may be accounted due to

**Table 4.51: Fixed cost of gram processing unit in Bhiwani district**

**(Rs.)**

<b>Sr. No.</b>	<b>Particulars</b>	<b>Total Amount</b>	<b>Fixed cost (per quintal of raw material processed)</b>
1	Rental value of land	10085.80 (5.08)	0.80
2	Depreciation on building	19160.00 (9.66)	1.52
3 (i)	Depreciation on machines	1527.12 (0.77)	0.12
(ii)	Depreciation on electric motors	1876.10 (0.95)	0.15
(iii)	Depreciation on generator	42125.20 (21.23)	3.35
4	Depreciation on equipments	76.01 (0.04)	0.01
5	Salaries of regular staff	79200.00 (39.91)	6.30
6	Interest on fixed investment*	44355.96 (22.36)	6.11
<b>Total fixed cost</b>		<b>198406.19</b> <b>(100.00)</b>	<b>18.36</b>

Note: Figures in parentheses indicate the percent to total fixed cost

\* @ of 12% per annum

rise in salaries of employees by the state Govt. the high percentage of interest on fixed investment in fixed cost may be due to large investment made on purchase of modern machinery.

#### **4.2.3.2.3 Variable expenses incurred of pulse (gram) processing unit**

The variable expenses of pulse (gram) processing unit in Bhiwani district is depicted in table 4.52. The total variable expenses of pulse (gram) processing unit were Rs. 2.44 crores. Among different inputs used, the expenses incurred on the purchase of raw material was highest i.e. 87.59 percent of total variable expenses. The other expenses like wages of casual labour, electricity/fuel charges, packaging & miscellaneous charges, oil & greasing charges and repair & maintenance cost constituted 0.08, 0.35, 1.14, 0.08 and 0.03 percent of total expenses, respectively.

The variable expenses calculated per quintal of raw material processed were Rs. 1942.42. The cost of raw material per quintal was Rs. 1690.00 including various market expenses incurred on the purchase of raw material. The other constituent of variable expenses incurred per quintal of raw material followed the similar trend.

The cost of raw material was higher as a result of increase in minimum support price, addition of marketing cost, taxes involved and higher transportation charges. The wages of casual labour was also higher because of increase in minimum daily wages. The electricity charges and packaging

**Table 4.52: Variable cost of gram processing unit in Bhiwani district**

			(Rs.)
Sr. No.	Particulars	Total Amount	Variable cost (per quintal of raw material processed)
1	Cost of raw material	21234850.00 (87.59)	1690.00
2	Electricity charges/fuel charges	86000.00 (0.35)	6.84
3	Oil and greasing charges	19500.00 (0.08)	1.55
4	Repair and maintenance charges	2242.50 (0.03)	0.18
5	Packaging and miscellaneous charges	276430.00 (1.14)	22.00
6	Wages of skilled labour	52650.00 (0.02)	4.19
7	Wages of casual labour	119880.00 (0.08)	9.54
8	Interest on variable cost*	2614986.30 (10.71)	208.12
<b>Total variable cost</b>		<b>24406538.80</b> <b>(100.00)</b>	<b>1942.42</b>

Note: Figures in parentheses indicates the percent to total variable cost

\* @ of 12% per annum for six month

charges also shared a significant amount of total variable expenses due to higher cost per unit of electricity supply and higher cost of packing material, respectively.

#### **4.2.3.2.4 Costs and returns of pulse (gram) processing unit**

The processing cost of pulse (gram) was Rs. 2.46 crores out of which 99.19 and 0.81 percent were incurred as variable cost and fixed cost, respectively (Table 4.53). The gross returns received from the sale of main product (dal) and by-products (churi, chhilka and chani) were Rs. 2.35 crores and Rs. 22.61 lakhs. The income from the sale of main product shared about 91.23 percent to the total gross returns. The net return from the pulse (gram) processing unit was Rs. 11.78 lakhs.

The total cost per quintal of raw material processed worked out was Rs. 1960.78 out of which variable cost constituted the maximum share. The processing cost per quintal of raw material calculated was Rs. 268.21. The total income from the sale of per quintal of material processed estimated was Rs. 2052.00 while net returns obtained were Rs. 91.22. The benefit-cost ratio calculated was 1.06 indicating the economic viability of the processing unit.

The results reveal that there was heavy investment on construction of building, purchase of land, machinery and equipments. However, there was large amount invested for the purchase of raw material. The cost and return analysis revealed the value of B-C ratio more than one shows that investment made in pulse processing unit in the study area is economically viable.

**Table 4.53: Costs and returns of the pulse (gram) processing unit in Bhiwani district**

**(Rs.)**

<b>Sr. No.</b>	<b>Particulars</b>	<b>Total Amount</b>	<b>Cost and returns (per quintal of raw material processed)</b>
1	Total fixed cost *	198406.19 (0.81)	18.36
2	Total variable cost*	24406538.80 (99.19)	1942.42
3	Total cost (Fixed cost + Variable cost)	24604944.99 (100.00)	1960.78
4	Processing cost	-	268.21
(A)	Income from the sale of main product		
(i)	Income from the sale of Dal**	23521680.00 (91.23)	1872.00
(B)	Income from the sale of by-product		
(i)	Income from the sale of Churi**	980070.00 (3.80)	78.00
(ii)	Income from the sale of Chhilka**	1017765.00 (3.95)	81.00
(iii)	Income from the sale of Chani**	263865.00 (1.02)	21.00
	Total income from the sale of by product	2261700 (8.77)	180.00
5	Gross returns	25783380.00	2052.00
6	Net returns	1178435.01	91.22
	<b>Benefit-cost ratio</b>	<b>1.06</b>	

Note: \*Figures in parentheses indicate the percentage to total cost

\*\* Figures in parentheses indicate percentage to total gross returns

#### **4.2.3.2.5 Break-even analysis of pulse (gram) processing unit**

The break-even analysis of pulse (gram) processing unit is presented in table 4.54. It is evident from table that the break-even volume for the pulse (gram) processing unit is 2175.03 quintals. The break-even point of chickpea processing unit was 17.32 percent of capacity utilization and 4.66 percent of installed capacity of processing plant. The processing unit of pulse processing unit was in operation at higher than the break-even point.

#### **4.2.4 Capacity utilization of agro-processing units**

##### **4.2.4.1 Capacity utilization of the agro-processing units in Hisar District**

The total capacity utilization of the cotton, rapeseed-mustard and pulse (gram) processing unit is given in table 4.55. It is clear from the table that in case of cotton processing units, about 26 percent of the installed capacity is utilized. The reason may be that the processing units were in operation for five to six months in the whole year because of non-availability of raw material in the study area. Similarly, pulse (gram) processing units were running six to seven months in the whole year. The processing units were in operation for half period of the year because of reduction in pulses production, more number of processing units installed and commodity specific processing unit.

The installed capacity of rapeseed-mustard worked out was 37.18 thousand quintals. The rapeseed-mustard

**Table 4.54: Break-even analysis of pulse (gram) processing unit in Bhiwani district**

---

<b>Sr. No.</b>	<b>Particulars</b>	<b>Amount (Rs.)</b>
1	Income from sale of per quintal of pulse (gram) products (dal + churi+chilka+chani)	2052.00
2	Cost of raw material (per quintal)	1690.00
3	Total fixed cost	198406.19
4	Total variable cost (per quintal)	1960.78
5	Break-even volume (quintals)	2175.03
6	Capacity utilization	12560.00
7	Installed capacity	46720.00
8	Percentage of break-even volume to capacity utilization	17.32
9	Percentage of break-even volume to installed capacity	4.66

---

**Table 4.55: Capacity utilization of agro-processing units in Hisar district**

<b>Sr. No.</b>	<b>Processing unit</b>	<b>Installed capacity (000, qtl.)</b>	<b>Capacity utilization (000, qtl.)</b>
1.	Cotton	125.75	32.56 (25.89)
2.	Pulse (Chickpea)	50.37	17.27 (34.29)
3.	Rapeseed-mustard	37.18	25.30 (68.05)

Note: Figures in parentheses indicate the utilization percentage to installed capacity

processing unit in the study area constituted about 68.05 percent of installed capacity. The higher capacity utilization of processing units was the availability of raw material as a result of increased production of rapeseed-mustard and increased demand of mustard oil.

#### **4.2.4.2 Capacity utilization of the agro-processing units in Bhiwani district**

The capacity utilization of agro-processing units is presented in table 4.56. The installed capacity of agro-processing units was calculated to be 120.76, 46.72 and 55.21 thousand quintals of cotton, pulse and rapeseed-mustard processing unit, respectively. The rapeseed-mustard processing unit, constituted maximum share i.e. 74.17 percent of total installed capacity. This may be attributed due to availability of raw material because of increased production of rapeseed-mustard. The raw material of rapeseed-mustard can be easily stored and demand of mustard oil through out the year. Cotton and gram processing units were in operation just five to six months in a year. The availability of raw material of cotton and gram was not in adequate quantity as required in the processing units. The processing units of cotton and gram could not be utilized for the processing of other agricultural products. So, there is need of modernization of existing processing units so that these processing units can be utilized for the processing of other agricultural products in the lean period.

**Table 4.56: Capacity utilization of agro-processing units in Bhiwani district**

<b>Sr. No.</b>	<b>Processing unit</b>	<b>Installed capacity (000, qtl.)</b>	<b>Capacity utilization (000, qtl.)</b>
1.	Cotton	120.76	30.73 (25.48)
2.	Pulse (Chickpea)	46.72	12.56 (26.88)
3.	Rapeseed-mustard	55.21	40.94 (74.17)

Note: Figures in parentheses indicate the utilization percentage to installed capacity

### **4.2.3 The employment pattern of agro-processing units**

The employment pattern in Hisar and Bhiwani district during the year 2006 is given in table 4.57. It is evident from the table that cotton processing unit provided the highest number of mandays (10443) employment followed by rapeseed-mustard processing units (5567 mandays) and the pulse (gram) processing units (3150 mandays) in Hisar district.

In case of cotton processing unit in Hisar district, people got employment about 305, 708 and 8460 mandays as management, skilled labour and casual labour, respectively.

The rapeseed-mustard processing unit has an employment of 5567 mandays. The manager got employment for 365 mandays and accountant got employment for 730 mandays. The electrician and helper were employed for 472 mandays while casual labour employed for 4200 mandays.

The pulse (gram) processing unit had total employment of 3030 mandays. The manager and the accountant employed for 365 and 365 mandays. The electrician and helper got employment for 220 and 220 mandays. The casual labour employed for about 1980 mandays in the whole processing year 2006 for various processing operations in the unit.

In Bhiwani district, cotton processing unit provided employment of 9723 mandays. The manager and the accountants got employment of 365 and 730 mandays.. The electrician and helpers employed for 236 and 472 mandays, respectively. The casual labours got employment of 8100 mandays in the processing unit.

**Table 4.57: Employment Pattern of agro-processing unit**

**(Man Days)**

Sr. No.	Employ status	District					
		Hisar			Bhiwani		
		Cotton	Rapeseed-M ustard	Pulse (Chickpea)	Cotton	Rapeseed- Mustard	Pulse (Chickpea)
<b>1.</b>	<b>Management</b>	<b>1095 (10.49)</b>	<b>1095 (18.99)</b>	<b>730 (23.18)</b>	<b>1095 (11.06)</b>	<b>1095 (16.42)</b>	<b>730 (30.28)</b>
	(a) Manager	365 (3.50)	365 (6.33)	365 (11.59)	365 (3.69)	365 (5.47)	365 (15.14)
	(b) Accountant	730 (6.99)	730 (12.66)	365 (11.59)	730 (7.37)	730 (10.95)	365 (15.14)
<b>2.</b>	<b>Skilled Labour</b>	<b>708 (6.78)</b>	<b>472 (8.18)</b>	<b>440 (13.96)</b>	<b>708 (7.15)</b>	<b>472 (7.08)</b>	<b>420 (17.42)</b>
	(a) Electrician	236 (2.26)	236 (4.09)	220 (6.98)	236 (2.38)	236 (3.54)	<b>210 (8.71)</b>
	(b) Helper	472 (4.52)	236 (4.09)	220 (6.98)	472 (4.77)	236 (3.54)	<b>210 (8.71)</b>
<b>3.</b>	<b>Causal labour</b>	<b>8640 (82.73)</b>	<b>4200 (72.83)</b>	<b>1980 (62.86)</b>	<b>8100 (81.79)</b>	<b>5100 (76.50)</b>	<b>1260 (52.30)</b>
	<b>Total</b>	<b>10443</b>	<b>5767</b>	<b>3150</b>	<b>9903</b>	<b>6667</b>	<b>2410</b>

		<b>(100.00)</b>	<b>(100.00)</b>	<b>(100.00)</b>	<b>(100.00)</b>	<b>(100.00)</b>	<b>(100.00)</b>
--	--	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------

The rapeseed-mustard processing unit provided employment of 6667 mandays in the year 2004-05. The manager and accountant got employment for 365 and 730 mandays, respectively. The electrician and helper employed for 236 and 236 mandays, respectively. The casual labours got employment of 5100 mandays for performing various operations in the processing unit.

The pulse processing units created 2410 mandays employment in the year 2004-05. The manager and the accountant got employed for 365 and 365 mandays. The electrician and helper employed for 236 and 236 mandays, respectively. The casual labour got engaged for 1260 mandays in the processing unit.

The results reveal that casual labour employment constituted the highest share of total mandays employment for all processing units. This may be related directly to the quantum of raw material processed. The casual labour engaged in the agro-processing units for various operations, cleaning, loading, unloading, bagging of furnished products and by-products, etc. The skilled labour got employment in the processing units to limited extent because they were employed for specific job/operation particularly for machines and equipments. The persons employed in the processing units as manager and accountants less in number as they maintained the transactions carried during the year.

#### **4.3 Constraints faced by agro-processing units**

Hisar and Bhiwani districts are the major producers of cotton, rapeseed-mustard and gram (chickpea). Therefore cotton, rapeseed-mustard and gram processing is the old tradition in the area. A number of constraints come in the way of processing of agricultural produce. It is observed that modernization of processing units with the required quality assurance and scientific support is a mislink in most of these units. The crop production is mostly seasonal in nature and there is need of village agro-industries to be set up to absorb underemployed rural work force. The agro-processing units in rural area not only enhance the farm income but also generate employment opportunities. The processing units in the study area also faced a number of problems on installation of plant, processing, marketing and financial frontiers. Efforts have been made to identify the various constraints being faced by agro-processors.

#### **4.3.1 Problem encountered by agro-processing units in Hisar district**

Problems encountered by the agro-processing units in Hisar district is depicted in table 4.58. It is obviously clear that major problems highlighted at the time of plant installation were difficulty in getting no objection certificate from government departments (46.67%), getting licence (43.33%), getting power connection (16.67%) and getting land (30.00%). The problems faced in financial management were the lack of grants and subsidies advanced by the

**Table 4.58: Problems encountered by agro-processing units in Hisar district**

	<b>Response (Percent)</b>
<b>a) Problems faced in Plant installation</b>	
(i) Difficulty in getting no objection certificate from various government departments	14 (46.67)
(ii) Difficulty in land acquisition and high price of land	9 (30.00)
(iii) Difficulty in getting power connection	5 (16.67)
<b>b) Problems faced in financial arrangement</b>	
(i) Higher rate of interest	8 (26.67)
(ii) Insufficient fiancé from lending institution	2 (6.67)
<b>c) Problems faced in procurement of raw material</b>	
(i) Higher taxation on raw material purchased from market	30 (100.00)
(ii) Higher fluctuation in raw material purchased from market	30 (100.00)
(iii) Irregular supply of raw material	30 (100.00)
(iv) Higher marketing charges as compared to other neighbouring stables	20 (66.67)
(v) Lack of quality control	8 (26.67)
<b>d) Problems faced in processing of raw material</b>	
(i) Shortage of power	30 (100.00)
(ii) Under utilization of installed capacity	30 (100.00)
(iii) Higher rate of power charges and fuel charges	30 (100.00)
(iv) Huge amount is required as working capital for various purposes/operations	23 (76.67)
<b>e) Problems faced in marketing</b>	

(i)	Non-availability railway transport	30 (100.00)
(ii)	Higher government intervention	30 (100.00)
(iii)	Multiplicity of taxes and high rate of tax as processed material is considered as luxury item.	30 (100.00)
(iv)	Lower prices of end product	20 (66.67)
(v)	Higher cost of transportation by road	15 (50.00)
(vi)	Lack of marketing liason with other states.	5 (16.67)

---

Government/financial institutions (26.67%), higher rate of interest (26.67%) and insufficient amount of credit from lending institutions.

Regarding the problems faced in procurement of raw material, they opined as higher fluctuation in prices of raw material (100.00%), higher taxation on raw material purchased from market (83.33%), irregular supply of raw material (66.67%), and non-availability of quality raw material (23.33%).

The processors faced the problems in processing of farm produce were shortage of power (100.00%), under utilization of plant capacity (100.00%), higher rate of electricity/fuel charges (150.00%) and lack of technical manpower (65.00%).

The problems in marketing of processed products were inadequate transport facilities (83.33%), government intervention (66.67%), multiplicity of taxes & high rate of tax on processed products (considered as luxury items) (10.00%), higher cost of transportation charges (100.00%).

#### **4.3.2 Problem encountered by agro-processing units in Bhiwani district**

For studying the problems encountered in establishment, operation and development of agro-processing units in Bhiwani district, the response of selected agro-processors was ascertained. The problems by the processors were further categorised into (a) installation of plant (b) financial management (c) procurement of raw material (d) processing and (e) marketing are depicted in table 4.59. It is obviously

**Table 4.59: Problems encountered by agro-processing units  
in Bhiwani district**

<b>a) Problems faced in Plant installation</b>	<b>Response (Percent)</b>
(i) Difficulty in getting no objection certificate from various government departments	14 (46.67)
(ii) Difficulty in getting power connection	13 (21.67)
(iii) Difficulty in getting licenses	12 (43.33)
(iv) Difficulty in land acquisition and high price of land	6 (20.00)
<b>b) Problems faced in financial arrangement</b>	
(ii) Higher rate of interest	6 (20.00)
(iii) Insufficient fiancé from lending institution	5 (16.67)
<b>c) Problems faced in procurement of raw material</b>	
(i) Higher fluctuation in raw material purchased from market	30 (100.00)
(ii) Higher taxation on raw material purchased from market	27 (90.00)
(iii) Irregular supply of raw material	15 (50.00)
(iv) Higher marketing charges as compared to other neighbouring states	15 (50.00)
(v) Lack of quality control	12 (40.00)
<b>d) Problems faced in processing of raw material</b>	
(i) Shortage of power	30 (100.00)
(ii) Under utilization of installed capacity	30

		(100.00)
		30
(iii)	Higher rate of power charges and fuel charges	(100.00)
		15
(iv)	Huge amount is required as working capital for various purposes/operations	(50.00)
<b>e)</b>	<b>Problems faced in marketing</b>	
		30
(i)	Non-availability railway transport	(100.00)
		30
(ii)	Higher government intervention	(100.00)
		24
(iii)	Multiplicity of taxes and high rate of tax as processed material is considered as luxury item.	(80.00)
		18
(iv)	Lower prices of end product	(60.00)
		15
(v)	Lack of marketing liason with other states.	(50.00)
		12
(vi)	Lack of grants and subsidies advanced by government financial institution	(40.00)
		15
(vii)	Higher cost of transportation byroad	(50.00)
		5
(viii)	Lower financial limits fixed by financial institution	(16.67)

---

clear that major problems highlighted at the time of plant installation were difficulty in getting no objection certificate from Government departments (48.33%), difficulty in getting licences (41.67%), difficulty in getting power connection and difficulty in getting land (21.67%). The problems faced in financial management were the lack of grants and subsidies advanced by the Government/financial institutions (40.00%), higher rate of interest (20.00%) and insufficient amount of credit from lending institutions.

Regarding the problems faced in procurement of raw material, they opined as higher fluctuation in prices of raw material (100.00%), higher taxation on raw material purchased from market (90.00%), higher marketing charges (50%), irregular supply of raw material (50%) and lack of quality control (40%).

The major problems encountered in processing were shortage of power (100.00%), under utilization of installed capacity (100.00%), higher rate of electricity/fuel charges (50.00%), and lack of technical manpower (100.00%).

The major problems faced in marketing of finished products were non-availability of adequate transport facilities (100.00%), higher Government intervention, multiplicity of taxes & high rate of tax on processed products (80.00%) and higher cost of transportation charges.

## **CHAPTER-V**

# **Summary and Conclusions**

Developing countries have to promote value-added processing of primary products as a path to industrialization. The increasing human population, rising real income, changing life-styles conditions, media, advertisements, increasing quality consciousness and rapid urbanization induce disproportionately rapid growth of the demand for higher quality processed and packaged food.

The agro-industry provides the crucial farm-industry linkages which helps to accelerate agricultural development by creating backward linkages (supply of credit, input and other production enhancement services) and forward linkages (processing and marketing) adding value to the farmer's produce, generating employment opportunities and increasing the farm's net income.

The state of Haryana was deficit in food grains even for its requirement at the time of its inception in 1966 is now second in the country next to Punjab in terms of farm productivity, per capita income and contribution of food grains to the central pool. The phenomenal strides in agricultural production nearly more than 189 per cent increase in food grains from 1966-67 to 2004-05.

The establishment of agro-processing industries in rural areas appears to be necessary to sustain or enhance real farm income. The effort in this direction will also generate required employment

potential for educated and uneducated rural force to check their migration to urban areas.

At present, it has become important to develop linkages between farm and industry to help agricultural development by the creation of backward and forward linkages, adding value to farmers produce and increasing their net income. This can be achieved by introducing primary processing facilities for on-farm processing of cereals, pulses, oilseeds, fruits and vegetables in rural areas. Keeping in view, all above facts an attempt has been made to study the status of agro-processing of commercial crops in Haryana state with the following specific objectives:

- (i) To examine the growth behaviour in area, production and yield of major crops.
- (ii) To workout the benefit-cost analysis of processing units for the commercial crops.
- (iii) To identify the constraints in the processing of commercial crops.

The data pertaining to area, production, yield and market arrivals of major crops for Hisar and Bhiwani districts as well as for the state as whole were scanned from the published sources.

Haryana state is divided into two agro climatic zones i.e. Eastern zone and Western Zone. For this study, two district i.e. Hisar and Bhiwani from Western zone of the state were selected on the basis of surplus production of cotton, gram and rapeseed-mustard and higher number of agro-processing units for the selected commercial crops. From each district, ten processing

units for each selected crop were selected randomly. Thus a total of 60 processing units i.e. 20 cotton processing units, 20 rapeseed-mustard processing units and 20 pulse (chickpea) processing units formed the sample size for present investigation. The information were collected from the agro-processors with regards to machinery, equipments, raw material, labour, electricity/fuel charges etc. with help of well structured interview schedule for the year 2004-05. Simple statistical tools like average, percentage, compound growth rate were employed. For agro-processing units, costs, returns, benefit-cost ratio and break even point were calculated to draw meaningful references. To ascertain the problems encountered in installation of agro-processing unit, financial arrangement, processing of farm produce, marketing of processed products and procurement of raw material, the agro-processors were personally interviewed.

### **5.1 Area, production and yield of major crops in Hisar district**

The cropping pattern in Hisar district showed a substantial change. The crop acreage twisted towards wheat, rice, rapeseed-mustard, cotton, and sugarcane. The acreage under coarse cereal and pulses declined over time period. The production of wheat, rice, rapeseed-mustard, cotton and sugarcane increased as a result of both increase in area and yield of these crops. The production of cotton crop increased upto T.E. 1992 and then declined to 500.61 thousand bales in T.E. 2004 due to severe incidences of insect-pests and diseases. The decline in production of pulses and coarse cereals was recorded as result of shift in area

towards other remunerative crops even with enhanced productivity of these crops. The yield of all major crops increased over the time period due to evolution of high yielding varieties, expansion of irrigation facilities and use of recommended doses of modern input.

## **5.2 Area, production and yield of major crops in Bhiwani district**

The cropping pattern in Bhiwani district showed that the acreage shifted towards wheat, rapeseed-mustard and cotton. The acreage under pulses and coarse cereals declined over the time period. The production of wheat, rapeseed-mustard and cotton increased as a result of both increase in area and yield of these crops. The production of gram increased upto T.E. 1992 and then declined sharply to 43 thousand tonnes in T.E. 2004 due to fall in area under this crop despite increase in productivity. The decline in production of coarse cereals was recorded as a result of shift in area towards other remunerative crops even with enhanced productivity. The yield of all major crops increased over the time period due to evolution of high yielding varieties, expansion in irrigation facilities introduction of sprinkler irrigation system and use of recommended doses of inputs. The yield of cotton decreased in T.E. 2004 due to severe incidences of insect pests and leaf-curl diseases.

## **5.3 Area, production and yield of major crops in Haryana State**

The area shifted towards wheat, rice, rapeseed-mustard and cotton in Haryana state. The acreage under coarse cereals and pulses declined over the time period. The production of wheat, rice,

rapeseed-mustard increased as a result of increase in area as well as increase in yield of these crops. The production of crop increased upto T.E. 1992 and then declined to 1077.67 thousand bales in T.E. 2004 due to severe incidence of insect-pests and diseases. The increase in production of coarse cereals was obtained due to enhanced productivity despite decrease in area. The decline in production of pulses was due to sharply fall in area under pulses particularly gram crop. The yield of all major crops increased over the time period due to evolution of high yielding varieties, expansion in irrigation facilities, use of recommended doses of inputs and modern farm application of improved farm practices and mechanization of farm operation.

#### **5.4 Market arrivals of major crops in Hisar district**

The market arrivals of wheat, paddy and bajra showed increased over the years. This was due to rise in production of these crops and heavy purchase by government and semi-government agencies especially in case of wheat and paddy. The arrivals of gram decreased due to fall in production level. The arrivals of oilseeds and cotton declined due to direct purchase of produce of these crops by the processors. The market arrivals of gur-khandsari was less due to establishment of sugar mills.

#### **5.5 Market arrivals of major crops in Bhiwani district**

The market arrivals of wheat and bajra increased in Bhiwani district as a result of increase in area and productivity of these crops. The arrivals of gram decreased due to fall in production. The arrivals of oilseeds and cotton was less in the regulated markets because of direct purchase of produce by agro-processing units.

## **5.6 Market arrivals of major crops in Haryana state**

The market arrivals of wheat, paddy, bajra increased over the year as a result of increase in production as well as purchase of produce by the government agencies. The decline in market arrivals of barley and gram were due to fall in production of these crops. The arrivals of cotton crop was less due to direct purchase by cotton processing units. The arrivals of gur-khandasari decreased over the period because of sugarcane was disposed off to the sugar mills at higher price.

## **5.7 Cost and returns of agro-processing units in Hisar district**

In cotton processing unit; investment, fixed cost and variable cost per quintal of raw material calculated Rs. 122.47, Rs. 30.72 and Rs. 2214.57, respectively. The cost of raw cotton per quintal worked out was Rs. 1895.00 and the cost of processing per quintal was Rs.350.44. The net returns per quintal calculated were Rs. 117.41 and B-C ratio was 1.05. The processing unit was operating at higher than the break-even point.

In rapeseed-mustard processing unit, investment, fixed cost and variable cost per quintal of raw material were Rs. 70.84, Rs. 21.19 and Rs. 1968.99, respectively. The cost of rapeseed-mustard per quintal was Rs. 1705.00 and the cost of processing per quintal as Rs. 285.18. The B-C ratio calculated was more than unity indicate the economic viability of processing unit in the study area. The processing unit was operating at higher than the break-even point.

In pulse (chickpea) processing unit, investment, fixed cost and variable cost per quintal of raw material worked cost were Rs. 53.01, Rs. 22.33 and Rs. 1939.48, respectively. The cost of chickpea per quintal and B-C ratio were Rs. 1695 and 1.05, respectively. The processing cost per quintal of chickpea calculated was Rs. 266.80. The processing unit processed the raw material in the year more than the quantity required to run in the business.

### **5.8 Cost and returns of agro-processing units in Bhiwani district**

In cotton processing unit, investment, fixed cost and variable cost per quintal of raw material worked were Rs. 132.21, Rs. 31.84 and Rs. 2200.25, respectively. The processing cost per quintal was Rs. 337.11. The value of B-C ratio more than one indicates the economic viability of processing unit in the study area. The processing unit was working at more than break even point.

In rapeseed-mustard processing unit, the investment, fixed cost and variable cost per quintal calculated were Rs. 57.91, Rs. 15.42 and Rs. 1969.10, respectively. The processing cost per quintal computed was Rs. 279.51 B-C ratio was 1.09. The processing unit processed higher amount of raw material in the year than the minimum quantity required to in the business.

In the pulse processing unit, investment, fixed cost and variable cost per quintal of raw material estimated were Rs. 29.43, Rs. 18.36 and Rs. 1942.42. The processing cost, per quintal of raw material calculated was Rs. 268.21. The value of B-C ratio was more than unity reveals the economic viability of processing units in the study area benefit-cost ratio was 1.06 the processing units were processing raw material at more than break-even quantity.

The cotton and pulses (Chickpea) processing plants were unable to utilize more than 40 percent of their installed capacity because of non-availability of raw material and large number of processing units in the study area. The capacity of rapeseed-mustard processing units was utilized more than 60 percent of their installed capacity due to availability of raw material and demand of oil throughout the year.

The cotton processing units had the maximum employment than the rapeseed-mustard and gram (chickpea) processing units.

The major problems in the smooth functioning of the processing units were shortage of light, seasonal availability of raw produce, fluctuation of the market price of raw produce and higher Govt. charges.

The following main suggestions were put forward by agro-processors operating their units in the study area as a measure for improvement in working and further development of agro-processing units in the state.

- Power supply should not be interrupted and needs improvement.
- Sale taxes and other market charges should be lowered down.
- Govt. should provide essential information which can benefit in disposing their produce in the market.
- Proper development of market and other required infrastructure.
- Govt. intervention should be reduced
- Cheaper transportation should be provided to reduce the burden of transportation cost.

- Developing greater linkages between farm and industry premising for village sale should be given to avoid unnecessary loading, unloading and transportation etc.
- Govt. should start special incentives for exporting of value added agri-products unit.
- Secondary processing units should be setup for further value addition to the agri-products

## Bibliography

- Aggarwal, N.L. (1989). Agro-processing a business entity: A study of oilseeds and pulses in Rajasthan. *Indian Journal of Agricultural Economics*, **44**(3): 321-322.
- Ali, S. (1989). Capacity utilization of Nizam Sugar factory-A case study of Amruthnagar unit. *Indian Journal of Agricultural Economics*, **44**(3): 341-342.
- Anonymous (1979-2005). Statistical Abstract of Haryana. Economic and Statistical Organization, Planning Department, Government of Haryana, Chandigarh.

- Anonymous (1950-51). Statistical Abstract of India. Central Statistical Organization, Ministry of Statistics and programme implementation, Government of India, New Delhi.
- Anonymous (2004-05). Statistical Abstract of India. Central Statistical Organization, Ministry of Statistics and programme implementation, Government of India, New Delhi.
- Atteri B.R. and Chand, P. (1997). Production, consumption and processing scenario of fruits and vegetables in *Indian Journal of Agricultural Economics*, **52**(3): 651-652.
- Awasthi, A. (1994). Trends in agricultural and industrial wages. *Asian Economic Review*, **36**(2): 343-367.
- Bastine, C.L. and Palanisami, K. (1994). An analysis of growth trends of principal crops in Kerala. *Agricultural Situation in India*, **48**(12): 885-891.
- Bhole, B.D., Galgalibar, V.D. and Kale, S.K. (1989). An approval to planning for location of oil mills in Rural Area. *Indian Journal of Agricultural Economics*, **44**(3): 336-337.
- Bhowmick, B.C. and Ahamed, A.U. (1993) Behaviour of trend and growth of area, production, productivity and supply response of major oilseed crops in Assam. *Agricultural Situation in India*, **48**(1): 3-7
- Borthakur, D.N. and Krishnamoorthy, D.S. (1997). Source of growth and instability in the production of rape and mustard in Assam. *Agricultural Situation in India*, **52**(1): 17-20.
- Chatha, I.S. and Singh, J. (1985). Causes of stagnation of pulses and oilseeds in Punjab. *Agricultural Situation in India*, **39**(12): 931-935.

- CII-Mc Kinsey company, Inc. 1997 Modernising Indian food chain and agriculture integrated development action.
- Dahiya, P.S. and Singh, R. (1997). Horticultural development in Himachal Pradesh. Profitability, policy and prospects. *Indian Journal of Agricultural Economics*, **52**(3): 592-599.
- Datta, T.N. and Dasgupta, T. (1989). Date Palm industry in west Bengal as supplementary means for rural development. *Indian Journal of Agricultural Economics*, **44**(3): 334.
- Dev, S.M. and Rao, N.C. (2005). Food processing and contract farming in Andhra Pradesh: A small farmer perspective. *Economic and political weekly*: 2705-2713.
- Devraj, O.K., Sharma and Khare, A.P. (2003). Trends in area, induction and productivity of pulses in Bundelkhand region of Uttar Pradesh. *Agricultural Situation in India*, **59**(2): 723-728
- Gangwar, A.C., Rai, K.N. and Srinivas (1983). Production and marketing of guava in Haryana. Research bulletin Number 10, Department of Agricultural Economics, Haryana Agricultural University, Hisar.
- Gangwar, B. (2004). Diversification in farming system. *Agricultural Situation in India*, **61** (9): 599-603
- Gangwar, L.S. and Sen, C. (1997). The comparative analysis of technology adoption and its impact on cropping pattern and productivity-Nainital Vs. Uttar Pradesh, *Agricultural Situation in India*, **52**(8): 510-503.
- George, P.S. and Mukherjee, C. (1986). A disaggregate analysis of the growth performance of rice in Kerala. *Indian Journal of Agricultural Economics*, **41**(1): 11-16.

- Goswami, S.N., Choudhary, A.N. and Sharma, B.K. (1995). Growth trend of oilseeds and pulses in India. *Agricultural Situation in India*, **50**(4): 191-193.
- Gupta, S., Sharma, R.K. and Lal, H. (2006). Oilseed scenario in India-A special reference to sesame crop. *Indian Journal of Agricultural Marketing*, **20**(1): 111-123.
- Gupta, S.K. and Athavale, M.C. (2003). Pulses production, Constraints and strategies:A state wise analysis. *Agricultural Situation in India*, **59**(11): 685-692.
- Hazra, C.R. (2001). Rice production scenario in India and Central intervention. *Agricultural Situation in India*, **58**(1): 3-8.
- Hemalatha, B. Reddy, Y.V.R., (2003). Present status and Prospects of agriculture in India. *Agricultural Situation in India*, **59**(10): 629-634.
- Jagadiswar, V., Reddy, T.C. and Reddy, S.S. (1989). An economic appraisal of groundnut oil processing industries in Chittoor district of Andhra Pradesh. *Indian Journal of Agricultural Economics*, **44**(3): 333-334.
- Jain, H.C. (1989). Economics of processing units of arhar pulse in Narsinghpur district of Madhya Pradesh. *Indian Journal of Agricultural Economics*, **44**(3): 319-320.
- Jairath, M.S. (1996). Agro-processing and infrastructure development in hilly area: a case of fruit and vegetable processing. *Indian Journal of Agricultural Marketing*, **10**(2): 28-33.
- Joshi, P.K. and Agnihotri, A.K. (1984). Millet production in India: Problems and prospects. *Agricultural Situation in India*, **39**(5): 329-332.

- Kasar, D.V. and Tilekar, S.N. (1989). Impact of Sugar Industry on employment and income of seasonal migratory farm Households in Maharashtra state. *Indian Journal of Agricultural Economics*, **44**(3): 329.
- Kaur, G. (1989) Productivity performance of the Jute Textiles in India. *Indian Journal of Agricultural Economics*, **44**(3): 348.
- Kaur, M. and Kaur, M. (2000), Agro-processing industries in Punjab- Status, potential and strategies. *Indian Journal of Agricultural Marketing*, **14**(1): 101.
- Khatkar, R.K. (1996). Status and prospectus for food processing industry in India. *Indian Journal of Agricultural Marketing*, **10**(2): 48.
- Kumar, N. and Singh, B. (1989). Role of milk processing industry in Punjab. *Indian Journal of Agricultural Economics*, **44**(3): 325.
- Malliswari, M.N. (1996). Mango processing in Andhra Pradesh. Potential, Infrastructure and Constraints. *Indian Journal of Agricultural Marketing*, **10**(2): 18-27.
- Meena, G.L., Pant, B.C. and Kumar, S. (2006). Economics of chilli processing in Rajasthan. *Agricultural Science Digest*, **83**(2): 83-86.
- Mundinamani, M.S., Sastry, K.N.R. and Murthy, T.N. (1995). Growth performance of oilseeds in Karnataka. *Agricultural Situation in India*, **50**(7): 451-456.
- Nachane, D.M., Sawant, S.D. and Achuthan, C.V. (1989). Agriculture and industry: A study of selected linkages. *Indian Journal of Agricultural Economics*, **44**(2): 140-148.

- Nagaraj, N., Achoth, L. and Venkataram, J.V. (1989). Economic analysis of fruit processing and its impact on employment generation: A case study of Karnataka agro-fruits Ltd. *Indian Journal of Agricultural Economics*, **44**(3): 327-328.
- Nain, N., Khathar, R.K. and Singh, V.K. (2002). Role of Sugarcane processing industry and efficiency of processing in Haryana. *Indian Journal of Agricultural Marketing*, **16**(3): Conf. Spl. 2002.
- Narurudeen, P. and Sundaresen, R. (1999). Impact of economic liberalization on agricultural export. *Indian Journal of Agricultural Marketing*, **13**(2): 129-131 Conf. Spl. 1999
- Niwas, S., Kharinta, S. and Singh, V.K. (1989). Growth and economic of rapeseed and mustard processing units in Hisar district. *Indian Journal of Agricultural Economics*, **44**(3): 316-317.
- Om, H. and Agarwal, N.L. (1990). Comparative economics of agro-processing units for rapeseed mustard – A case study of Bayana market of Rajasthan State. *Indian Journal of Agricultural Marketing*, **4**(1): 93-94.
- Pandey, R.K. and Singh, R.P. (1989). Performance of Lac processing industry (BISCOLAME) in Bihar. *Indian Journal of Agricultural Economics*, **44**(3): 318.
- Pandey, U.K., Suhag, K.S. and Manocha, V.P. (1989). Performance of agro-processing industries in Haryana. *Indian Journal of Agricultural Economics*, **44**(3): 338.
- Pant, D.C. and Pal, P. (2004). Comparative economics of agro-processing units for groundnut in Southern

- Rajasthan. *Indian Journal of Agricultural Marketing*, **18**(1): 50-57.
- Parhi, B.K., Pati, L.K. and Parida, A.K. (1997). Acreage response to price for groundnut in orissa. *Agricultural Situation in India*, **51**(8): 505-508.
- Pawar, P.P., Rawat, R.C. and Sale, D.L. (1990). Economics of Agro-processing units – A case study of paddy processing into Rice, Pohe and Murmure. *Indian Journal of Agricultural Marketing*, **4**(1): 92-93.
- Prakash, B. (2000). Growth of fruit and vegetables processing industry in India: A major technological change in agricultural marketing. *Indian Journal of Agricultural Marketing*, **14**(3): 72-79 Conf. Spl. 2000.
- Rai, A.K. and Singh, R. (1989). Comparative economics and capacity utilization of various techniques of paddy processing in Nainital district of Uttar Pradesh, *Indian Journal of Agricultural Economics*, **44**(3): 337-338.
- Rai, K.N., Karwasra, J.C. and Singh, S.P., (1996). Status and potential of agro-processing industries in Haryana. *Indian Journal of Agricultural Marketing*, **10**(2): 50.
- Rajagopal (1989). Economic efficiency of paddy processing: A comparative study of relative technologies. *Indian Journal of Agricultural Economics*, **44**(3): 329-330.
- Ramaswamy, C. and Selvaraj, K.N. (2002). Slow growth crops: Coarse cereals, oilseeds and pulses. *Indian Journal of Agricultural Economics*, **57**(3): 289-315.
- Rao, I.V.R. and Ray, A.K. (1985). Stagnation in production of pulses: A quantitative analysis. *Agricultural Situation in India*, **40**(5): 369-376.

- Rao, K.H. (1989). Structure and performance of edible oil industry in Andhra Pradesh. *Indian Journal of Agricultural Economics*, **44** (3): 315-316.
- Rao, V.M. (1994). Farmers in the market economy: would farmers gain through liberalization. *Indian Journal of Agricultural Economics*, **49** (3): 393-402.
- Reddy, D.V.K. (1993). Econometric analysis of sugar industry. *Asian Economic Review*, **35**(1): 28-46.
- Reddy, M.C., Seema and Prasad, P. A. (2005). Economics of paddy processing in Prakasam district of Andhra Pradesh. *The Andhra Agricultural Journal*, **52** (182): 258-262.
- Rohal, B.S., Singh, K.V., Chaudhary, S. and Singh, R. (1989). Economics Analysis of agro processing Khandasari manufacturing industry- a case study of Muzaffar Nagar. *Indian Journal of Agricultural Economics*, **44**(3): 340.
- Saher, L.M. (1989). Expert performance and construction of some leading agro-processing industries. *Indian Journal of Agricultural Economics*, **44**(3): 345.
- Sain, I. (1989). Prospects for agro-processing industries in India with special reference to Punjab. *Indian Journal of Agricultural Economics*, **44**(3): 339.
- Saraswat, S.P. (1984). Growth in area, production and productivity for oilseed vis-à-vis cereals and pulses in Himachal Pradesh-A district-were study. *Agricultural Situation in India*. **39**(4): 217-219.
- Sarkar, S. (1995). Size structure of agro-industry: A linkage analysis. *Indian Journal of Agricultural Economics*, **50**(4): 634-347.

- Sarkar, S. (1997). Growth of agro-industry and its inter-relationship with agriculture. *Artha Vijnana*, **49**(2): 166-184.
- Seetharaman, S.P. and Pichholiya, K.R. (1989). Role of Government in Agro-Processing. *Indian Journal of Agricultural Economics*, **44**(3): 315.
- Shah D. (1997). Changing structure of Agricultural production in Maharashtra: Trends and indicators. *Indian Journal of Agricultural Economics*, **52**(3): 614-615.
- Shah, A. (1989). Understanding the growth of Agro-processing industries: An inter state analysis. *Indian Journal of Agricultural Economics*, **44**(3): 317-318.
- Sharma, T.R. (1997). Horticultural development in Himachal Pradesh: A case study of apple cultivation. *Indian Journal of Agricultural Economics*, **52**(3): 656.
- Sharma, P.M. and Kumar, Raj (1989). Economic performance of mustard oil expellers in Bharatpur district of Rajasthan. *Indian Journal of Agricultural Economics*, **44**(3): 331.
- Sharma, S. and Prihar, R.P. (1994). Marketing of apricot in Jammu and Kashmir. *Indian Journal of Agricultural Marketing*, **8**(1): 23-31.
- Shende, N.V., Deoghare, B.L., Shende, P.V. and Gorbhade, B.R. (1999). Economics of processing of selected fruits and vegetables in agro processing units in the vicinity of Nagpur (Maharashtra), *Indian Journal of Agricultural Economics*, **13**(3): 63-64.
- Siju, T. and Kombairaju, D.S. (2001). Rice production in Tamilnadu: A trend and decomposition analysis. *Agricultural Situation in India*, **58**(4):143-148.

- Singh, S. and Vyasulu, V. (1998). Growth and structure of the food processing industry in Punjab: 1966-86. *Indian Journal of Agricultural Economics*, **44**(3): 316.
- Singh, J.P. (1985). Identifying areas of good performance in Eastern region of India. *Agricultural Situation in India*, **40**(1): 93-99.
- Singh, P. (2002). Comparative study of processing cost of individual and joint entrepreneurship (A case study). *Indian Journal of Agricultural Marketing*, **16**(3): 84-91 Conf. Spl. 84-91.
- Singh, A.J. and Kaur, P. (1993). Growth and instability in oilseeds in India. *Agricultural Situation in India*, **48**(1): 9-16.
- Singh, B. and Mann, G.S., (1989). A study into the locational and operational aspects of important agro-based industry in the Punjab, *Indian Journal of Agricultural Economics*, **44**(3): 337.
- Singh, D.K., Sharma, B. and Tripathi, S.P. (1989). Performance and constraints of Guava processing and its processing units in Allahabad. *Indian Journal of Agricultural Economics*, **44**(3): 326.
- Singh, H. (1978). Role of agro-processing industries in rural development. *Agriculture and agro-industries Journal*, **11**(1): 29-30.
- Singh, P. (2002). Comparative study of processing cost of individual and joint entrepreneurship. *Indian Journal of Agricultural Marketing*, **16**(3): Conf. Spl. 2002.
- Singh, R.K. and Rai, J. (1989). Importance of agro-processing industry in diversification of agriculture in India. *Indian Journal of Agricultural Economics*, **44**(3): 323-324.

- Singh, S. (1996). Marketing infrastructure and agro-processing development: A case study of Gujarat. *Indian Journal of Agricultural Marketing*, **10**(2): 1-9.
- Singh, S. and Vyasulu, V. (1990). Growth and structure of food processing industry in the Punjab in the eighties. *Indian Journal of Agricultural Economics*, **45**(4): 457-467.
- Srinivas, T., Raju, V.T. and Shareef, S.M. (1996). Economics of agro-processing a case of cashewnut processing in Andhra Pradesh, *Indian Journal of Agricultural Marketing*, **10**(2): 48-49.
- Srivastava, S.C., Sen, C. and Reddy, A.R. (2003). An analysis of growth of pulses in Eastern Uttar Pradesh. *Agricultural Situation in India*, **59**(11): 771-775.
- Swamy, D.T.L.N. (2005). Economic reforms and khadi and village industries in India-Some issues. *Asian Economic Review*, **47**(1): 145-150.
- Talukadar, K.C. and Singh, R. (1989). Production, income and pricing efficiency with special reference to processing of pineapple in Manipur. *Indian Journal of Agricultural Economics*, **44**(3): 341.
- Tuteja, V. (2006). Growth performance and average response of pulse crop: A state level analysis. *Indian Journal of Agricultural Economics*, **61**(2): 218-237.
- Varghese, K.A. and Singh, I. (2006). Prospects and problems of agro-processing industries in Bikaner district of Rajasthan. *Indian Journal of Agricultural Marketing*, **20**(1): 124-130.

- Vatta, K. and Aggarwal, M. (2000). Pattern of growth of major agricultural crops in Punjab. *Agricultural Situation in India*, **57**(2): 81-83.
- Veerkar, P.D. and Borude S.G. (1989). Economic analysis of mango processing in Ratnagiri District (Maharashtra). *Indian Journal of Agricultural Economics*, **44**(3): 328.
- Verma, A.R. (1989). Economics of processing and marketing of Gur in district Indore (M.P.). *Indian Journal of Agricultural Economics*, **44**(3): 319.
- Viswanathan, K.V., and Satyasai (1997). Fruits and vegetables: Production trends and role of linkages. *Indian Journal of Agricultural Economics*, **52**(3): 574-583.
- Zeudeen, P. and Natash, N.P. (1991). An economic analysis of groundnut seed and oil processing. *Indian Journal of Agricultural Marketing*, **5**(1): 107.

## **ABSTRACT**

<b>Title of Thesis</b>	:	<b>Agro-Processing of Commercial Crops in Western Haryana - An Economic Analysis</b>
<b>Full Name of Degree Holder</b>	:	<b>Deepak Singh</b>
<b>Title of degree</b>	:	<b>Master of Science</b>
<b>Name and Address of Major Advisor</b>	:	<b>Dr. Dharmpal Malik Scientist, Department of Agricultural Economics, CCS Haryana Agricultural University, Hisar – 125004. India</b>
Degree Awarding University	:	CCS Haryana Agricultural University, Hisar.
Year of Award of Degree	:	2007
Major Subject	:	Agricultural Economics
Total No. of pages in thesis	:	
Number of words in the Abstract	:	447

**Key Words: Agro-Processing, Processing, Farm Products, Commercial Crops Break-Even Point, Benefit-Cost Ratio, Cost and Returns, Employment.**

Processing of farm products offers great scope, conversion of farm produce to the consumer commodity and in process reduces the wastage, increasing shelf-life, resulting in value addition and higher income transfer to the farmer. The present investigation is based on the time series data pertaining to area, production, yield and market arrivals of major crops scanned from published sources.

The information with regards to machinery & equipments, labour, various inputs like raw material, oil & greasing, electricity/fuel, packaging & miscellaneous etc., outputs, input-output prices and constraints encountered in processing of agricultural produce was collected from sixty agro-processors from the Hisar and Bhiwani districts of Haryana state through personal interviewing them. Appropriate analytical tools and techniques were employed to draw meaningful inferences from the study.

The results reveal that area twisted towards more remunerative crops wheat, paddy, cotton, rapeseed-mustard and sugarcane in Haryana state. The crop acreage shifted towards wheat, cotton and rapeseed-mustard in Bhiwani district while there was a shift in area towards wheat, paddy, cotton, rapeseed-mustard and sugarcane. The area under gram, other pulses, and coarse cereals was gradually replaced by profitable and less risky crops. Production of wheat, paddy, cotton, rapeseed-mustard increased in the study area as a composite effect of increased area and enhance productivity. The yield of almost crops registered increase over the time period due to evolution and cultivation of high yielding varieties, use of improved farm practices, use of chemical fertilizers, and efficient use of available irrigation water and mechanization of farm operation. The increased production of wheat, paddy, cotton and rapeseed-mustard resulted into increase in their market arrivals.

The value of Benefit-cost ratio calculated of processing units of commercial crops i.e. cotton, rapeseed-mustard and gram was

more than one. It indicates the economics viability of processing units in the study area. The break-even analysis also indicates that all processing units were operating more than the break-even quantity. The cotton, gram and rapeseed-mustard processing units utilized about 26, 34 and 74 percent of their plant capacity to the maximum extent. Among selected processing units, the cotton processing unit provides maximum employment of skilled labour and casual labour in the study area. The major problems encountered by the agro-processing units were getting no-objection certificate, license from Govt. department, difficulties in getting power connection, higher rate of interest and inadequate amount of credit, irregular supply of raw material, higher marketing charges, higher rate of electricity/fuel charges, lack of technical manpower and under utilization of installed capacity of the unit. First Govt. should take necessary step to mitigate the constraints of agro-processing units and encourage the establishment of processing units in the rural area through providing some incentives to absorb surplus rural work force.

**DEGREE HOLDER**

**MAJOR ADVISOR**

**HEAD OF THE DEPARTMENT**

