BUSINESS VIABILITY AND POTENTIAL OF GUAR (CLUSTER BEAN) INDUSTRY IN INDIA

BY

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B.Sc. (Ag.)

PROJECT REPORT SUBMITTED TO THE ACHARYA N. G. RANGA AGRICULTURAL UNIVERSITY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF

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2013

DECLARATION

I, **HEMANT KUMAR SHARMA** hereby declare that the project report entitled **"BUSINESS VIABILITY AND POTENTIAL OF GUAR (CLUSTER BEAN) INDUSTRY IN INDIA"** Submitted to the **Acharya N.G. Ranga Agricultural University** for the degree of **MBA (Agribusiness Management)** is the result of the original work done by me. I also declare that no material contained in the project report has been published earlier in any manner.

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Date: 20/08/2013 **I. D. No. RMBA/11-07**

CERTIFICATE

Mr. HEMANT KUMAR SHARMA has satisfactorily prosecuted the course of project and that the report entitled **"BUSINESS VIABILITY AND POTENTIAL OF GUAR (CLUSTER BEAN) INDUSTRY IN INIDA"** submitted is the result of original work and is of sufficiently high standard to warrant its presentation to the examination. I also certify that neither the project report nor its part thereof has been previously submitted by him for a degree of any University.

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CERTIFICATE

This is to certify that the project report entitled **"BUSINESS VIABILITY AND POTENTIAL OF GUAR (CLUSTER BEAN) INDUSTRY IN INDIA"** submitted in partial fulfilment of the requirements for the degree of 'Master of Business Administration in Agribusiness Management' of the Acharya N. G. Ranga Agricultural University, Hyderabad is a record of the bonafide original work carried out by **Mr. HEMANT KUMAR SHARMA** under our guidance and supervision.

No part of the project report has been submitted by the student for any other degree or diploma. The published part and all assistance received during the course of investigations have been duly acknowledged by the author of the project report.

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SYMBOLS AND ABBREVIATIONS

The following abbreviations shall be used both for singular and plural units

%	:	Per cent
@	:	At the Rate
^{0}C	:	Degree Celsius
^{0}F	:	Degree Forenhight
ac	:	Acre
AICRP	:	All India Co-ordinated Research Project
APEDA	:	Agricultural and Processed food Export Development Authority
BCR	:	Benefit Cost Ratio
CAZRI	:	Central Arid Zone Research Institute
cm	:	Centimetre
CAGR	:	Compound Annual Growth Rate
Dept	:	Department
et al.	:	and others people
etc.	:	For example, for instance
FOB	:	Free On Board
ha	:	Hectare
IRR	:	Internal Rate of Return
ICAR	:	Indian Council of Agricultural Research
ICRISAT	:	International Crop Research Institute for the Semi-Arid Tropics
Kg	:	Kilogram
Km^2	:	Square Kilometre
mm	:	Millimetre
MNC's	:	Multi-National Company's
MT	:	Metric Tonnes
No.	:	Number
NPV	:	Net Present Value

NSC	:	National Seeds Corporation
PBP	:	Pay Back Period
RAU	:	Rajasthan Agriculture University
R & D	:	Research and Development
ROI	:	Return on Investment
Rs	:	Rupees
Sl. No.	:	Serial Number
SAU's	:	State Agricultural Universities
SFCI	:	State Farms Corporation of India
SSC	:	State Seed Corporation
t	:	Tonne
TPD	:	Tonnes Per Day
TPA	:	Tonnes Per Annum
UK	:	United Kingdom
USA	:	United state of America
VAT	:	Value Added Tax
Viz.	:	Namely
VKGUY	:	Vishesh Krishi and Gram Udyog Yojana
WSP	:	Water Soluble Polymers

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ABSTRACT

Guar is an economically important pulse crop of Indian economy. India is the leading producer of guar in the world followed by Pakistan. Presently in India, guar is cultivated in an area of about 3639 thousand hectares with a total production of 2441 thousand tonnes and productivity of 670 kg/ hectare. Rajasthan produces nearly 70 per cent of total guar of the country with 80 per cent of the area under cultivation. It is cultivated in an area of about 3094 thousand hectares with a total production of 1846 thousand tonnes and productivity of 597 Kg/ hectare (http://www.guargum.biz). It is mainly cultivated in the arid districts of Rajasthan. Area and production of guar is significantly increasing over the past few years. The present study entitled "Business viability and potential of guar (cluster bean) industry in India" was studied with the following objectives:

1. To study the trend in area, production and productivity of cluster bean in India as well as in selected state.
2. To analyze the cost-return pattern of guar production in the selected study area
3. To study the various marketing channels and their marketing efficiency.
4. To assess the trend in exports of value added product of cluster bean.
5. To study the economic feasibility of cluster bean processing plant in the study area.
6. To understand the problems encountered by the farmers and other stakeholders in the production and marketing of cluster bean.

This study plays an important role in assessing business viability and potential of guar industry in India. It helps the producers as well as processors to analyze the

profitability of guar production and feasibility of guar industries. About 120 guar growers, 12 commission agents and three large scale processors were selected from three districts of Shekhavati region in Rajasthan viz. Churu, Sikar and Jhunjhunu. Secondary data on area, production and productivity of guar in India as well as in Rajasthan was collected for a period of ten years from 2002-03 to 2011-12, from which trends in growth rates of guar production were analysed by using Compound Annual Growth Rate (CAGR) function.

The result of the study showed the Compound Growth Rate of area, production and productivity of guar in India during the period of 2002-03 to 2011-12 was 7.58, 16.07 and 1.60 per cent respectively while the Compound Growth Rate of area, production and productivity of guar in Rajasthan during the period of 2002-03 to 2011-12 was 12.24, 26.51 and 12.75 per cent respectively. The cost of cultivation of guar is Rs. 8375.71 per acre and gross return per acre is 15607.80. Thus, Benefit Cost Ratio in guar cultivation is 1.86 and Return on Investment is 86.34 per cent per acre. Two channels of marketing were identified for guar gum, which are

Channel I Producer – Commission agent – Processor – Exporter

Channel II Producer – Processor – Exporter

The producers share in consumer's rupee in channel II is higher than channel I since it is the shorter channel (78.28 per cent). Whereas the producers share in consumer's rupee in channel I is 74.89 per cent. The marketing efficiency index of channel I and II was 2.98 and 3.60 respectively indicating the superiority of channel II. Guar gum is obtained after processing of guar and mostly exported to Western countries especially USA, which is the largest importer of Indian guar gum. The Compound Growth Rates of exported quantity and value of guar gum from India for the period of 2003-04 to 2012-13. was 18.28 and 44.90 per cent respectively.

The Benefit Cost Ratio and financial feasibility of large scale processing unit of guar having a processing capacity of 5000 TPA is calculated considering 250 working days in a year. The BC Ratio, NPV, IRR and Pay Back Period were 1.11, Rs.1101.04 lakh, 72.53 per cent and 2 years 24 days respectively for large scale guar processing unit. Major problems of producers and market intermediaries in the study area are inadequate supply of quality certified seed and lack of storage facilities respectively. The processors are facing the unavailability of input as the major problem during the peak season. The study suggested an overall improvement in providing market information, quality of produce, provision of storage facilities etc.

Keywords: Guar, Guar gum, Compound Annual Growth Rate (CAGR), Cost of cultivation, Marketing, Profitability, Benefit Cost Ratio, Financial feasibility, Export.

Chapter I

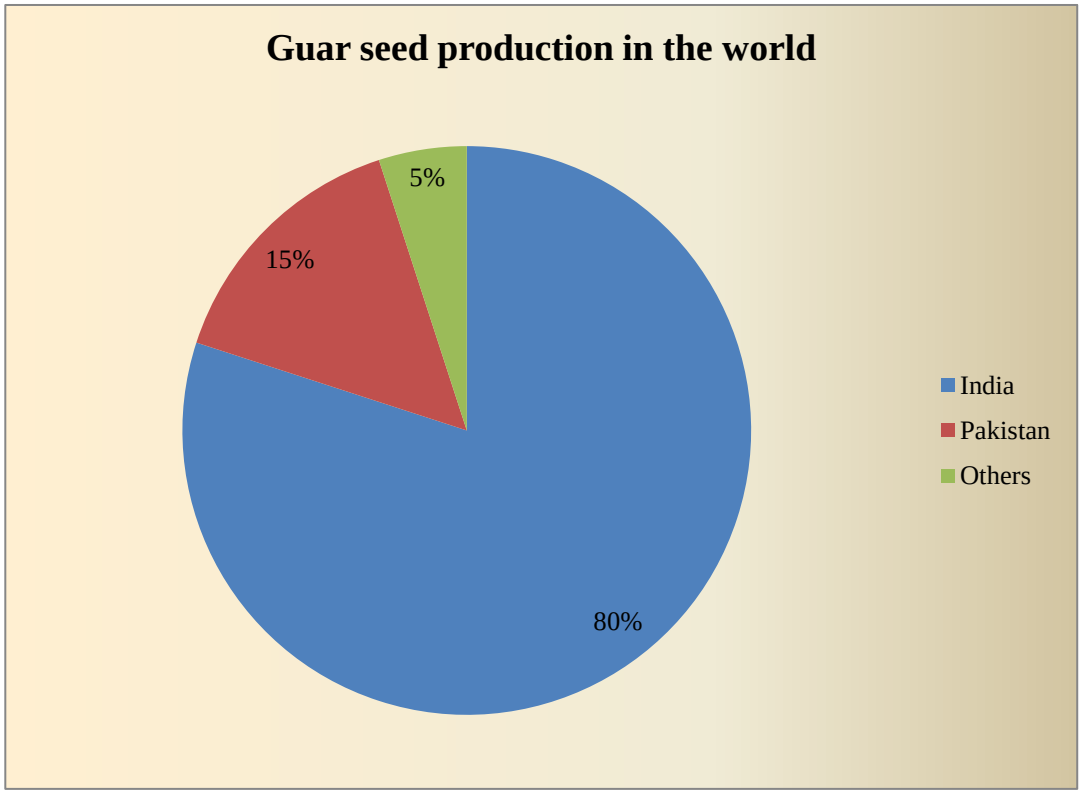
INTRODUCTION

Guar (cluster bean) is a legume crop that is cultivated mostly in the arid and semi arid areas as it is drought resistant. Guar is believed to have originated in Africa but is been grown throughout Southern Asia since ancient times as a vegetable and fodder crop. The word "GUAR" represents a derivation from the Sanskrit word "GAUAHAR" which means cow fodder or fodder of livestock. The Arabian people first domesticated guar to feed it to their horses. Guar has been cultivated in India and Pakistan for ages for use of its tender pods as fresh vegetables and other parts of the plant to be used as cattle feed. It is a self pollinated, multipurpose and restorative leguminous vegetable crop. The Southern Asian continent suits well to the cultivation of this crop especially the Indian subcontinent. The plant is extremely drought resistant, being able to absorb efficiently all ground water. It grows therefore easily in those semi arid regions where less hardy crops perish. Guar is a crop of semi arid, sub- tropical areas spread over the North and North West of India and East and South East of Pakistan.

This crop is drought-tolerant, warm weather, deep rooted summer growing annual legume. Plant height ranges from 2 to 9 feet which has pointed, saw toothed and trifoliate leaves. Hairy pods of the plant are generally 3 to 4 inches long and grow in clusters. There are both tall and dwarf cultivars. In India, the growing season for guar seed is end of July and it is harvested during November. It is usually a 90 days crop. Guar is a rainfed monsoon crop which requires plenty of sunshine and dry weather to come up really well. It can tolerate saline and moderately alkaline soils with pH ranging between 7.5 and 8.0. During harvesting period it again needs good sunshine in order to dry up and become usable for industries. The main varieties Durgapur Safed, FS-277, Ageta Guara-111, Guar No.2, Pusa Sadabhar, Pusa Navbahar are quite popular in the growing areas of North-West India.

Guar is an agricultural produce spreading over into Indo-Pakistan subcontinent for numerous generations. India and Pakistan provide better agro-climatic conditions for the cultivation of guar. The world's total production of guar figures around 7.5 to 10 lakh tonnes every year. India produces around 6 lakh tonnes of guar annually i.e. the maximum level of production in the world. It contributes to around 80% share in the

world's total production (www.guargum.biz.2011). In Pakistan, before 90s, about 80% of the guar was grown under irrigated conditions therefore the per hectare yields were higher. During that period guar was grown in Punjab, Multan, Muzaffargarh, Mianwali and Sargoda. The other areas include Bahawalpur, Banawalnagar and Sind Province. Guar is also cultivated in USA, Brazil and in some African countries like South Africa, Malawi, Zaire and Sudan. The total production of guar seed in these countries is estimated at 15,000 TPA. The agro-climatic conditions in Australia are also quite conducive to the cultivation of guar. Efforts have been made to promote cultivation of guar in Australia by the Department of Agriculture and Rural Industrial Development Agency. Similarly, it is reported that countries like China and Thailand are also trying to grow guar. Therefore, in the future, it is indicated that guar may not remain monopoly of India and Pakistan.



(Source: www.guargum.biz.2011)

Figure 1.1. Country wise Guar seed production in the world

In India guar is grown in the North-Western parts of the country encompassing states of Rajasthan (Churu, Nagaur, Barmer, Sikar, Jodhpur, Ganganagar, Sirohi, Dausa, Bikaner, Hanumangarh and Jhunjhunu districts), Gujarat (Kutch, Banaskantha, parts of

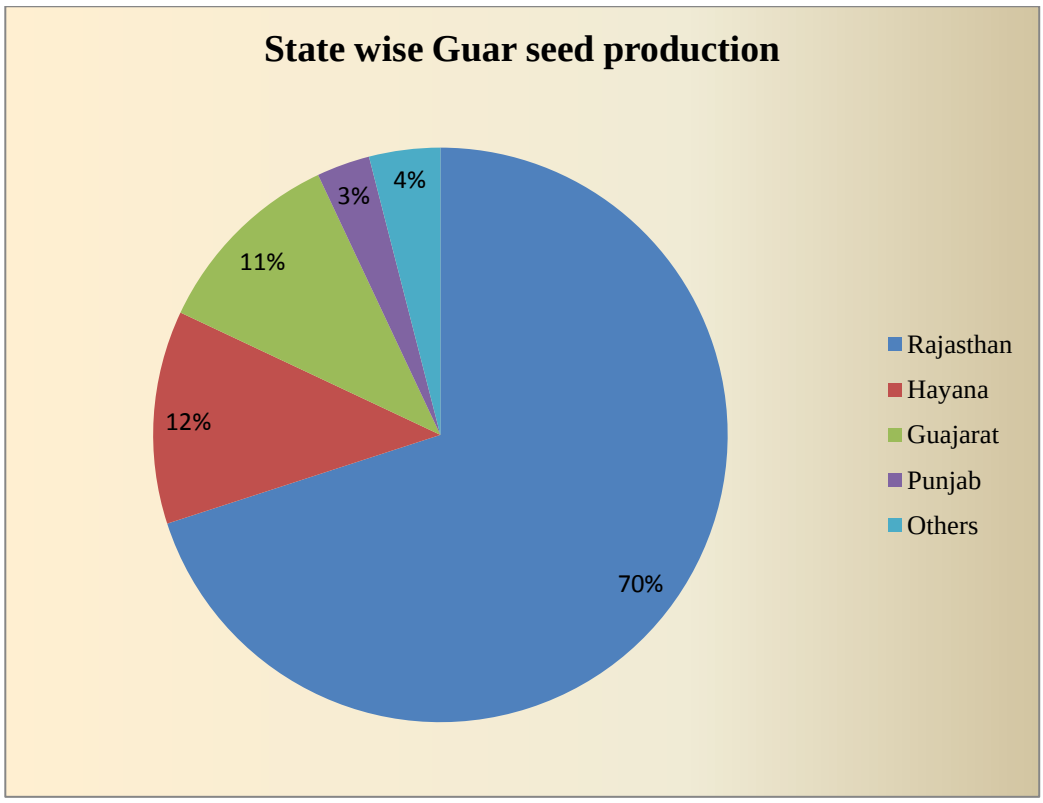
Mehsana, Sabarkantha, Vadodara and Ahmedabad districts), Harayana (Bhiwani, Gurgaon, Mahendragrh and Rewari districts) and Punjab (Bhatinda, Ferozpur, Muktsar and Mansa districts). During 1970s guar was also grown regularly in the State of Uttar Pradesh, Madhya Pradesh and Odisha. As the processing facilities have been closed down in Uttar Pradesh and Madhya Pradesh, the cultivation in these states is negligible now. In Odisha too guar is not cultivated any more.

Table 1.1 Area and production of Guar in India (2002-03 to 2011-12)

Sl.No.	Year	Area in '000 ha	Production in '000 tonnes
1	2002-03	974	203
2	2003-04	2854	1513
3	2004-05	2867	903
4	2005-06	2956	1059
5	2006-07	3343	1169
6	2007-08	3472	1788
7	2008-09	3862	1935
8	2009-10	2989	593
9	2010-11	2528	2036
10	2011-12	3639	2441

(Source: Directorate of Economics and Statistics, Government of India.2011-12)

Rajasthan can be termed as the largest guar producing state in the world as it dominates the Indian production scenario contributing to around 4,20,000 tones of this crop i.e. over 70% of the total production in India (www.guargum.biz). The average production of guar seed in the country is 10-11 lakh MT and fluctuates largely from year to year based on rainfall pattern. Since guar seed is largely grown and traded in Rajasthan and as minor crop at national level, this state has been taken as reference for all studies on guar seed.



(Source: www.guargum.biz.2011)

Figure 1.2. State wise Guar seed production in India

In Rajasthan, the area under guar is 3 million hectare and the productivity is 515 kg/ha for the year 2010-11. (Source: Department of Agriculture, Government of Rajasthan.2010-11). The trend in guar production in Rajasthan has been erratic due to heavy dependence on monsoon. This has direct and corresponding effect in the price of guar and guar gum. It has witnessed fluctuation in prices from Rs 7200/quintal to Rs 14000/quintal during the last three years (www.karvy.com). Guar being pest resistant and with longer shelf life is the fittest commodity for hedging so that the risk of price volatility can be managed and supplement stability to the market. The Shekhavati region which comprises of three districts viz., Churu, Sikar and Jhunjhunu, is gaining a lot of popularity for guar production and exports. The region is emerging as a potential area in the state both for production of guar and exports of guar gum and its derivatives.

Table 1.2 Area and production of Guar in Rajasthan (2002-03 to 2011-12)

Sl.No.	Year	Area in ‘000 ha	Production in ‘000 tonnes
1	2002-03	557	28
2	2003-04	2278	1163
3	2004-05	1944	368
4	2005-06	2445	593
5	2006-07	2808	658
6	2007-08	2310	622
7	2008-09	2909	1243
8	2009-10	2581	201
9	2010-11	2980	1540
10	2011-12	3094	1846

(Source: Ministry of Agriculture, Government of Rajasthan.2011-12)

The traditional uses of guar are as follows:

1. **Human consumption-**Immature pods are dried, salted and preserved for future use and can be fried like potato chips. Green pods are cooked like french beans. Mature seeds are used as an emergency pulse during the time of drought.
2. **Cattle feed-** Plants are cut and fed as green forage. Beans are boiled in a large kettle and fed to cattle, a high protein source.
3. **Medicinal purposes-**Plants are mashed, then mixed with oil and used as a poultice on cattle boils. Leaves are eaten to cure night blindness. Seeds are used as a chemotherapeutic agent against smallpox. Boiled Guar seeds are used as poultices for the plague, enlarged livers, head swellings and on swellings due to broken bones. Seeds are used as laxative.
4. **Crop and soil improvement:** Plants are used as shade for ginger. Guar is commonly used as a cover crop and green manure.

Guar products

The most important industrial use of guar is in the form of guar gum. Approximately 90% of total guar produced is used for production of guar gum and rest is used for culinary purposes and cattle feed. Guar gum is derived from guar seed that is of about 3 mm. diameter and contains a germ which contains high protein and divides the endosperm into two halves. Other important products of guar are guar meal and churi.

Guar gum processing

The guar gum is produced from endosperm and consists mainly of gummy polly groups of mono galactoses with small amount of fibre and minerals. Different grades are made on the purity and present viscosity of the powders in water. Several methods have been used for the manufacture of different grades of guar gum but due to its complex nature, the thermo mechanical process is generally used for the manufacture of edible grade and industrial grade guar gum.

An important by-product of the guar processing is guar meal (mixture of husks and germ) which is a potential source of protein. It is used for cattle as well as for poultry feeding. Toasting of guar meal improves its nutritive value. It can be used up to 10% in poultry diet and can replace upto 100% protein supplements such as groundnut oil cakes in ruminants. The gum is a polysaccharide with a straight chain of mannose units and one galactose is 2:1. The gum contains about 6% protein. Guar is more than 6 times as effective as starch in thickening power and is used for upgrading starches. Various derivatives of guar gum are available that will stiffen gels even upto a water content of 99%.

Export scenario

India is the world leader in the exports of guar and its by-products followed by Pakistan. About 25000 tonnes of the total production in the country constitutes to the domestic market. Guar gum has a vast range of industrial applications and the major share of demand comes from various industrial sectors only. As per the latest data released by APEDA, country exported 408575 tons of guar gum and its derivatives, which had net worth of Rs 21287 crores in the fiscal year 2012-13. India exports about 70 to 80 percent of guar gum annually. After India, Pakistan is the major competitor in exports. Since the crop is mainly monsoon dependent, it has always remained a major

factor for any sharp movement in guar prices. In the current season too, it was only monsoon which has derived the guar prices to such high levels. Nevertheless the export figures show a bright future of guar at global level.

The production list of guar is dominated by India as a leading producer of this crop. The consumption pattern of guar seeds is largely influenced by the demands from the petroleum industry of United States of America and the oil fields in the Middle East as the derivative products of these seeds are quite useful in the petroleum drilling industries. United States alone constitute to around 40 thousand tons of guar and its derivatives demand. Also, in rest of the world, the trend of consumption has increased with time that has lead to the introduction of this crop in many countries (www.guargum.biz). The major importing countries of Indian guar gum and its derivatives are USA, France, Germany, UK, South Africa, Netherland, Italy and Japan.

Indian Guar gum industry

Indian industries are manufacturing either guar gum split or guar gum powder. There are more than 110 split units in India, and total installed capacity is more than 6 lakhs tones per annum. All the split units have indigenous plant and machinery. Split is available in various grades, in terms of purity 90%, 92%, 95% and 97%. There are more than 25 units which manufacture textile grade powder from splits. The total industry is estimated at about 2.25 lakhs to 2.50 lakhs tones per annum. The products manufactured in India are mainly food grade guar gum powder and some modified guar gum derivatives for textile printing industry. There are a few large manufacturers like HICHEM, Dabur, Vikas WSP etc. who produce value added derivative for export as well as domestic market.

1.1 PROBLEM STATEMENT

The state of Rajasthan is the leading producer of guar in the country. There is enormous potential to increase the area and production of the crop which has a good export market. The trend on area, production and productivity will be an indicator of growth of this industry. The cost structure, marketing channels and problems encountered will be some of the important issues to study about. Similarly, the feasibility of establishing processing units is the biggest challenge for the new investors.

1.2 OBJECTIVES

1. To study the trend in area, production and productivity of cluster bean in India as well as in selected state
2. To analyse the cost-return pattern of guar production in the selected study area
3. To study the various marketing channels and their marketing efficiency
4. To assess the trend in exports of value added product of cluster bean
5. To study the economic feasibility of cluster bean processing plant in the study area
6. To understand the problems encountered by the farmers and other stakeholders in the production and marketing of cluster bean

1.3 SCOPE OF THE STUDY

The findings of the study will be useful to the guar growers in identifying the pattern of production and marketing of guar seed which will enable them to make decisions to obtain maximum profits. This study would also enable the growers in making decision to overcome the problems in the marketing system of guar in the study area. The potential for export of guar gum, establishment of processing industry, the estimated cost and returns, the growth of industry etc. will help the producers to look keenly into the investment opportunities. The study would be timely and of considerable economic value in providing real facts and figures to the planners, policy makers and extension workers of the region for developing a sound plan and imparting technical knowledge to the farmers for maximizing, its output with available capital inputs of the farmers.

1.4 LIMITATIONS OF THE STUDY

A one man research is always confronted with various bottlenecks and the present study is not an exception to these limitations. One of the most important limitations of the study was that the study was confined to a particular agro-climatic and agro-economic region and hence conclusions drawn are applicable to that area and areas with similar conditions only. Therefore, the extent of generalization has to be cautiously made. Secondly, the data was collected through survey method by interviewing farmers. Therefore, the objective of the data is limited to the extent that the farmers are able to sum up from their memory, as they do not maintain any records. However all care has been taken to get reliable data from informants. Due to fluctuation in the price of guar and guar gum, the average price during the study period has been taken for the

computation of the price spread, margins and marketing efficiencies. Hence it could be considered as one of the limitations of the study. The study is also confronted with the constraints of limitation of time, sample size and resources at the disposal of investigator.

1.5 STRUCTURE OF THE PROJECT REPORT

The study is presented in five chapters as follows.

I. **Introduction:** The importance of the study, problem setting and objectives are covered.

II. **Review of Literature**: The available and relevant literature is thoroughly reviewed.

III. **Materials and Methods**: The methodology adopted in sampling, data collection, analytical tools used and methods of evaluation are explained.

IV. **Results and Discussion:** The results of the study and the discussion evolved from the study are presented under this sub head.

V. **Summary and Conclusions:** Summary and conclusions of the study are presented under this section.

Chapter II

REVIEW OF LITERATURE

For any investigation, the findings of earlier studies may possibly give insight of the problem and sets direction for the research. An extensive survey of literature was undertaken in order to have an understanding of various concepts related to the problem concerned, interpretation of findings of the study and the limitations. Careful study of the earlier studies conducted in India and abroad on production and marketing provides guidance and clarity while conducting the research study. In this chapter an attempt is made to review the literature of the past research work relevant to the present study. The review has been presented under the following subheads.

2.1 Studies on trend in area, production and productivity of vegetables and pulses

2.2 Studies on cost of cultivation and profitability

2.3 Studies on marketing channels and their efficiency

2.4 Studies on trend in exports of Agri-commodities and their value added products

2.5 Studies on economic feasibility of Agro processing plants

2.6 Studies on problems encountered in production and marketing of vegetables and pulses

2.1 STUDIES ON TREND IN AREA, PRODUCTION AND PRODUCTIVITY OF VEGETABLES AND PULSES

Sharma and Gummagolmath (2012) examined the trend in the area, production and productivity of guar in India as well as in Rajasthan state for the period of 1990-91 to 2007-08. They found in their study that there was a high year-to-year variation in the both area and production in the country and in Rajasthan state. Fluctuation in production of guar was the major problem in having sustained supply. The major problem of farmers was non-availability of certified seed at the time of sowing. They suggested the need to establish a Research and Development Centre as the centre of excellence and promoting the improved cultivation practices of guar among the farmers.

Mondal and Roychowdhury (2010) analyzed the area, production and yield of pulses in West Bengal during the period of 1980-81 to 2007-08. In this, an attempt had been made to find out the district wise variations of Compound Annual Growth Rate (CAGR) of area, production and yield of pulses during the study period. This study

revealed that the Compound Growth Rate of area under pulses declined in all the districts and the Compound Growth Rate of production of pulses decreased in all districts except Birbhum district. The Compound Growth Rate of yield of pulses increased in all the districts except four districts i.e. Dakshin Dinajpur, Jalpaiguri, Darjeeling and Purulia. The study also highlighted district wise variations of productivity of pulses following the technique of Productivity Index of Enyedi (1964) which revealed the wide regional disparity in pulses productivity in West Bengal.

Rao (2010) studied the performance of pulses during the pre and post-WTO period in the Andhra Pradesh. The time series data for the period 1986-87 to 2007-08 on area, production and productivity were used for the study. Hierarchical and K-Means clustering, Compound Growth Rate (CGR), Coppock's Instability Index (CII) and decomposition analysis (change in average production) were employed for achieving the objectives. He found that growth performance of pulses production was high, but it was accompanied by high degree of instability. Decomposition analysis revealed that area effect was marginally higher than the productivity effect on the production differential. Therefore, growth in production should mainly come from area attributing factors like assured supply of farm inputs and provision of remunerative prices.

Sharma (2007) observed the growth in area, production and productivity of vegetable crops in North West Himalayan region during the period of 1995-96 to 2004-05. He found that the increase in production and productivity was higher than increase in area. The area, production and productivity of vegetable crops recorded a significant growth, however, growth in production (7.51%) and productivity (4.65%) was found higher as compared to area (2.85%). The results highlight the fact about comparative advantage of growing vegetable crops on account of its varied agro-climatic conditions. Tomato crop has the highest value productivity both at current as well as constant prices followed by cauliflower and pea. The decomposition analysis revealed that overall increase in vegetable production was mainly due to acreage expansion.

Henry and Kumar (2005) studied the trend in area, production and productivity of guar for long-term period (1976-2000) and recent period (1991-2002) for arid Rajasthan, Rajasthan state and for the whole country. The Compound Growth Rate (CGR) for area in arid Rajasthan and Rajasthan state had an increasing trend on long-term basis, but a decreasing trend on all-India basis. In recent years, area under the crop revealed an increasing trend in arid Rajasthan and all-India basis, but a decreasing trend

in Rajasthan state. CGR for production and productivity had a decreasing trend in both arid Rajasthan and Rajasthan state. On all-India basis, these indicated a positive trend both on long-term and recent year basis. The total mean production on all-India basis was 7.3 lakh tones, out of which arid Rajasthan contributed 51%, and whole Rajasthan contribution was 67% on the long-term basis. CGR for guar gum quantity and foreign exchange earnings revealed a significant positive growth trend.

Devraj (2005) studied the pulse production and acreage in Uttar Pradesh, India, from 1989-90 to 1998-99. Time series data on area, production and productivity for Western, Eastern, Bundelkhand and Central regions and for the whole state were analyzed. Pulse acreage registered a significant and positive growth in the Bundelkhand region (1.73%), but negative growth rates were recorded for the Western (-4.48%), Central (-2.03%), Eastern (-1.08%) regions and for the whole state (-0.81%), mainly due to the replacement of pulses by wheat, sugarcane and other renumerative crops. Pulse production registered a positive growth in the Bundelkhand region (1.93%), but showed a negative growth trend in the Western (-5.68%), Central (-2.25%), Eastern (-1.34%) regions, and in the whole state (-1.13%).

Malik *et al.* (2002) analyzed the annual Compound Growth Rate of vegetable production in Haryana, for the period 1990-91 to 1997-98. Study revealed that the annual Compound Growth Rates of area, production and yield were 11.44, 13.38 and 1.74% for onion; 9.32, 7.27 and -1.88% for tomato; 14.52, 21.09 and 5.74% for cauliflower; 19.97, 14.23 and 2.94% for chillies; 6.69, 7.38 and 0.64% for okra and 2.82, -0.87, and -3.60% for potato, respectively. Overall, the annual growth rate for vegetable crops in the state was positive.

2.2 STUDIES ON COST OF CULTIVATION AND PROFITALIBITY

Yadav and Rai (2012) carried out study of cost of cultivation of vegetables by survey method in Kon block of Mirzapur district of Uttar Pradesh during 2009-10. Per hectare total cost of cultivation was analyzed and it showed that the highest cost per hectare involved in potato cultivation (Rs 51,806.45) followed by tomato (Rs 26,755.92), green pea (Rs 26,103.28) and cauliflower (Rs 23,514.89). Variable cost directly associated with the level of production, and share of variable cost (cost-A) was highest of the total cost in case of Potato (76.23%) followed by green pea (59.63%), tomato (52.37%) and cauliflower (43.97%). The average yield per hectare of potato, cauliflower, tomato and green pea crops were 226.67 qt, 184.67 qt, 184qt and

80.67 qt. The return over cost per hectare for different vegetables showed that highest net return was obtained from potato (Rs 61,526.88) followed by tomato (Rs 46,844.08), cauliflower (Rs 31,855.11) and green pea (Rs 30,363.39). Input-output analysis reflects that tomato crop is most remunerative among all four vegetables and fetched highest return of Rs 2.75 on investment of Re 1 followed by cauliflower (1:2.35), potato (1:2.19), and green pea (1:1.20) benefit-cost ratio.

Thakare *et al.* (2011) made an attempt to work out the economics of production and marketing of cowpea in Anjangaon tehsil of Amravati district in Maharashtra for the period of 2007-08. The study revealed that per hectare input cost for cowpea was higher for large farmers as compared to other size of farmers. Per hectare total cost of cultivation of cowpea for the sample farmers as a whole was Rs. 15429.83 and return from cowpea for all farmers was Rs. 29382.60. The output-input relationship of overall size group was 1.90 at cost 'C'.

Asmattodin *et al.* (2009) made an attempt to study the economics of cultivation pulse crops *viz.*, soybean, green gram and pigeon pea on medium farm during agricultural year 2005-06 in Marathwada region of Maharashtra. The data were taken from Cost of Cultivation Scheme, Marathwada Agricultural University, Parbhani. The sample of 100 medium farm size farmers throughout the zone was selected. Data were tabulated and analyzed by appropriate statistical tools. The results revealed that, in case of soybean, per hectare cost of cultivation *i.e.* cost 'C' was Rs. 11355.60 and net profit was Rs. 4761.86. In case of pigeon pea per hectare cost of cultivation was Rs.12632.42 and net profit was Rs.2012.16. In green gram, per hectare cost of cultivation was Rs.8935.48 and net profit was Rs.3292.80.

Tripathi *et al.* (2005) conducted study to determine the economics and problems encountered by growers (n=80) of aubergines and other seasonal vegetables with different size of holdings in Vindhyan and Bundelkhand areas of Uttar Pradesh in the year of 2002-03. It was found that the overall cost of cultivation and gross return were Rs. 26 199.68 and 53 081.25 per hectare resulting in a net return of Rs. 26 881.57 per hectare. The input-output ratio was 1:2.01. However, the cost, return and input-output ratio varied significantly on different size of holdings, 1:1.9 on large holdings and 1:2.06 on marginal holdings. The low input-output ratio on large holdings could be attributed to the low yield of 187.00/ha, relative to higher yield on marginal holdings (195.47 qt/ha). This accounts for the higher production cost of aubergines on large farms Rs. 142.76 qt/ha compared to marginal holdings with Rs. 135.34 qt/ha. It is

concluded that aubergines production is highly remunerative for farmers, though it has high cost.

Chandrasekhar (2001) stated in his study in Kurnool district of Andhra Pradesh that the total cost of cultivation of onion per hectare worked out to Rs.33049.55, Rs.36282.84 and Rs.34907.88 on small, large and pooled farms. The income measures viz., gross, net, farm business, family labour and farm investment incomes were higher on large farms compared to small farms. The returns per rupee of investment were Rs.0.39, Rs.0.47 and Rs.0.42 on the corresponding farms respectively.

Prabhavathamma (2000) analyzed the cost of cultivation of green and dry chillies per hectare on pooled farms which worked out to Rs.51287.81 and Rs.53625.58 respectively in Cuddapah district of Andhra Pradesh. Human labour, manures and fertilizers, plant protection chemicals and bullock labour were the major items of cost of cultivation of green and dry chillies and showed negative relationship with the farm size. The net returns from dry chillies production were Rs.42993.94 for the sample as a whole compared to Rs.14232.61 per hectare from green chillies. The benefit cost was 0.28 and 0.80 in green and dry chillies respectively.

Singh and Kumar (1999) studied on production and marketing of vegetable crops for the year 1995-96 in Varanasi district of Uttar Pradesh. They revealed that highest cost of production per hectare was involved in the production of potato crop (Rs.20971) followed by cauliflower (Rs.14587), pea (Rs.14032), brinjal (Rs.12719.50), tomato (Rs.12388), chillies (Rs.11970) and lauki (Rs.10296). Returns per rupee of investment was maximum for chillies followed by lauki, tomato, brinjal, cauliflower and potato.

Chada *et al.* (1997) conducted an experiment to determine the suitable vegetable cropping systems for Madhya Pradesh state for the year 1993-94. They revealed that different vegetable cropping systems require very high investment on inputs and practices for cultivation ranging from Rs.21000, to Rs.27000 per hectare. The cropping system of tomato-pea-okra incurred maximum expenditure (Rs.27000 per hectare) and yielded monetary returns of Rs.60590 per hectare. Onion-fenugreek-brinjal was the next best vegetable cropping system giving a benefit cost ratio of 2.14 with the investment of Rs.22000 per hectare. Cowpea-tomato-cucumber cropping sequence had a benefit cost ratio of 2.10 with an investment of Rs.20000 per hectare. Onion-french bean-okra or okra-sweet potato-cowpea in sequence resulted in a benefit cost ratio of 2.00 and 1.92

respectively with the respective cost of cultivation of Rs.25000 and Rs.23000 per hectare.

2.3 STUDIES ON MARKEITNG CHANNELS AND THEIR EFFICIENCY

Farkade *et al.* (2011) studied the various marketing channels of soybean in Vidarbha region of Maharashtra. Among the various marketing channels, soybean cultivators sold 53 per cent of their produce through channel III (producer-commission agent-wholesaler-processor-oil wholesaler-oil retailer-consumer) followed by channel II (producer-village trader-processor-oil wholesaler-oil retailer-consumer) which was 30 per cent and 17 per cent cultivators sold through channel I (producer-processor-oil wholesaler-oil retailer-consumer). Producer's share in consumer rupee did not vary much from across the identified channels. The marketing efficiency was also more or less similar across the three channels.

Shelke *et al.* (2009) studied the institutions, agencies and channels involved in marketing of cole crops and assessed the price spread in Parbhani district of Maharashtra. A survey was conducted in 2005-06 on 50 farmers from different sizes of farms. Findings show that farmers mostly adopted Channel II in marketing of their surplus produce with the wholesaler as one of the intermediaries. Transportation cost was high due to the private system. The estimation of price spread for the cole crops indicated lower share of farmers due to higher marketing costs and margins charged by the intermediaries. The marketing margins were as high as 37 to 39% in the sale of these crops.

Birari *et al.* (2004) conducted survey among 180 vegetable growers in Western Maharashtra, to study the channels, costs, margins and efficiency of marketing of cole vegetables (cabbage and cauliflower). Results showed that the most important channel in both the primary and terminal markets is the one involving a commission agent, a wholesaler and a retailer. Majority of the produce are sold in the terminal markets in both seasons (kharif and rabi) for the cole vegetables. The per quintal marketing cost for cabbage was highest in the terminal market during the rabi season (Rs. 70.49) and lowest in the primary market during the kharif season (Rs. 40.57), while the per quintal marketing cost for cauliflower was also highest in the terminal market during the rabi season (Rs. 72.57). The producers' share in consumer's rupee for cabbage was more than 50% in both markets, while that for cauliflower was

higher in the primary market for both seasons. The marketing efficiency indicated for both cabbage and cauliflower indicate that these vegetables were not marketed efficiently.

Vasudev and Chowdhary (1999) identified two marketing channels which were predominant in marketing of tomato in all the three regions of Andhra Pradesh, viz., Channel-I: commission agent-secondary wholesaler-retailer-consumer-producer. Channel-II: producer-commission agent-primary wholesaler-retailer-consumer. The producer's share in consumer's rupee was found to be substantially higher in channel-I over channel-II in all the regions (Coastal Andhra, Rayalseema and Telangana) of Andhra Pradesh, indicating better efficiency of channel-l over channel-II.

Chauhan *et al.*. (1998) reported that marketing of vegetables in Azamgarh district of Uttar Pradesh involved three channels. The channel involving commission agent and retailer was found to be the most important and adopted by majority of the farmers. However, the producer's share in consumer's rupee was maximum (90 to 94 %) in direct sale of vegetables to consumers whereas, it ranged between 85 and 89 percent when sold through commission agent. Further, in the most predominant channel, which included producer, commission agent, retailer and consumer, the net price received by the producer (60.63%) was found to be the lowest. They suggested the need for a channel which would to be efficient, cost effective and producer-friendly, by regulating the trade margins of traders.

Durga (1999) studied the public intervention in the marketing of vegetables in Rythu Bazars in Visakhapatnam district of Andhra Pradesh. It was found that in case of normal channels for tomato, the producers share was 65.89 per cent, wholesaler's margin was 7.06 per cent and the margin of retailer was 27.06 per cent. Price spread was 34.11 per cent. For brinjal the shares of the producer, the wholesaler and the retailer were 48.74, 5.42, and 45.85 per cent respectively. The price spread was 51.26 per cent. The producer-seller of Rythu Bazaar gets 100 per cent of the price paid by the consumer (as the vegetables are directly sold by producers to the consumers).

Shiyani *et al.*. (1998) made an attempt to study the various aspects in marketing of vegetables in South Saurashtra zone of Gujarat in the period of 1994-95. They concluded that the marketing cost incurred by the producers was highest in the case of tomato (Rs.108.04/q) followed by chillies (Rs.101.84/q), brinjal (Rs.61.75/q) and cabbage (Rs.50.44/q). The total expenditure incurred at the retailer's level was the

highest in case of tomato (Rs.139.76/q) and the producers share in consumer's rupee for tomato was 56.87 per cent.

2.4 STUDIES ON TREND IN EXPORTS OF AGRI-COMMODITIES AND THEIR VALUE ADDED PRODUCTS

Meipproul and Bhanumathy (2010) studied the direction of trade and changes in export of coir products from India. The annual time series data on quantity of coir products, which are exported to various countries were collected for the period of 25 years from 1982-83 to 2006-07. The collected data were analyzed and results showed that CAGR for the quantity which is exported to various countries was 7.29%.

Sidhu (2005) analyzed the export performance of chilli in India. Results revealed that India exports only 5 to 8 per cent of its output due to high domestic consumption and low international demand for our chillies in the developed countries such as North America and European countries. Despite being low, exports of chilli were also highly fluctuating from year to year. During 1999-2002, the average yearly exports were estimated as 58653 tonnes against 4096 tonnes by 1975-78. The export grew at the rate of 12.0 per cent per annum during 1975-76 to 2001-02.

Tejaswi (2004) employed the Markov Chain Model to analyze the export of coffee from India. The results indicated that US was one of the most reliable with high loyalty index with probability of retention of 80 per cent than any other importing countries, followed by other countries (51%) and Russian federation (36%) etc.

Mruthyunjaya and Chauhan (2003) indicated that the average NPC of cashew kernel export from India was found to be less than unity (0.79), which indicated that the cashew kernels export from India were marginally competitive.

Desai (2001) examined the export potentialities of mango from India by using Nominal Protection Coefficients for the period 1990-1998, which is the ratio of domestic price to the border price. The findings of the study indicated that on an average, the Nominal Protection Coefficients value in fresh mango (0.89), and mango slices (0.45) were lower than one indicating their competitiveness in international market because of their preference for Indian spices.

Jayesh (2001) used the Nominal Protection Coefficient technique for evaluating the export competitiveness of Indian pepper. Under the exportable hypothesis, the

Nominal Protection Coefficient value were found to be lesser than unity (0.849) in Calicut and (0.817) in Sirsi markets, indicating that the Indian pepper is competitive in the international market and therefore is an efficient export oriented commodity.

Arvind Kumar (2000) studied on performance of India's rice exports and used co- integration approach to test the extent of integration between Indian domestic rice market (New Delhi) and the major world rice markets (Bangkok and Houston). The results clearly indicated that the domestic rice market was not integrated, in the long run with the major rice markets of the world i.e., Bangkok and Houston. This is inferred from the fact that 'b' co-efficients of the price series integration were less than their respective Dickey Fuller critical values.

Balappa Shivaraya (2000) studied the changes in trade directions of export of selected vegetables using Markov Chain Analysis. The results of the study revealed that UAE and Malaysia were the loyal markets for Indian onion. In case of potato, Sri Lanka and Nepal were found to be the most loyal markets whereas; Bangladesh and Nepal were the most stable importers of Indian fresh tomatoes.

2.5 STUDIES ON ECONOMIC FEASIBILTY OF AGRO PROCESSING PLANT

Sachin Kumar *et al.* (2012) studied the economics of jaggery production in Karnataka during the year 2006-07. The study was undertaken in Belgaum district of Karnataka. They revealed that the cost of establishing jaggery processing unit with a capacity of one ton per day was Rs. 1,68,347. The total cost of jaggery production including marketing cost was Rs. 14.57 lakh per year of which, the raw material cost accounted for 72.97 per cent. The returns from jaggery processing unit per year was Rs. 16.19 lakhs with a net margin of Rs. 1,61,715 for producing 140 tones of jaggery. Positive NPV and very high IRR indicated the financial viability of jaggery processing units in the study area.

Kakade *et al.* (2011) studied the financial feasibility of grape winery units in Maharashtra. About 32 grape winery units were selected from Pune, Nasik and Sangli districts. In order to know the financial feasibility of project, the evaluation measures used were Net Present Worth (NPW), Benefit Cost Ratio (BCR), and Internal Rate of Return (IRR). The results revealed that present worth of benefit was Rs. 651.47 lakh while present worth of cost was Rs. 439.93. Thus, Net Present Worth was Rs. 211.54

lakh. Benefit Cost Ratio was found to be 1.48 and the Internal Rate of Return (IRR) was found to be 65.50 per cent.

Changule (2010) studied the profitability of aonla processing units in Maharashtra. The unit as a whole consisted of eight aonla product enterprises in which raw aonla was processed about 60 quintals in 75 days per annum. As a result, the net profit of unit as whole was Rs. 226020.05 in which Aonla – murraba, candy enterprises were dominant. The cost of production of Aonla – murraba was Rs 30.02/ kg which was lowest among all the Aonla product.

Gajanana *et al.* (2010) in their study on exploring market potential and developing linkage – A case of underutilized fruit product in India conducted the economic analysis of small scale processing units of tamarind and aonla. The results indicated the share of the underutilized fruit products is small but these products have made their presence felt in the market. The study also revealed the profitability of small scale processing units.

Sharma and Pandey (2008) studied the costs and net profits from Guava processing in Uttar Pradesh in the year 2004-05. The cost of processing guava into jam and jellies was estimated at Rs. 3,96,482 per year, the gross returns obtained from selling it was worked out to Rs. 5,28,750 per year and the net returns obtained were Rs 1,32,268 per annum. It was observed that the processing of guava was more profitable than selling it raw.

Deorukhakar *et al.* (2007) in their study in Sindhudurg district of Maharashtra, worked out costs and returns structure and employment potential in kokum (*Sardinia indicia)* processing units. The study revealed that processing of kokum into kokum syrup was more profitable than kokum algal and kokum rind. The processing of kokum into kokum syrup resulted in gross returns of Rs 3780 per quintal at a cost of Rs 2440/-, thereby yielding net returns of Rs 1339.63 per quintal. On the other hand, kokum rind and kokum algal yielded net returns of Rs 604.91 and Rs 476.33 per quintal.

Gondalia *et al.* (2007) studied the economic evaluation of investment on aonla orchard in Gujarat in the year 2002-03. The study found that establishment of aonla orchard involves high investment, but the annual net returns are also quite high, after the third year of plantation the values of economic parameters, viz. NPV, BCR, IRR and PBP have been found to be Rs 652652, 5.25, 65.03 percent and 55 months, respectively

at 10 percent discount rate. Under varying cost and return situations, values of all these feasibility parameters have satisfied the acceptance rules for the investment proposition.

Meena *et al.* (2006) conducted a study to examine the economic viability of different sizes of chilli processing units in Jodhpur district of Rajasthan. The data was gathered from 12 processing units in the district during 2000-01. Results showed that the cost of processing per quintal of chilli was Rs. 180.06, Rs. 167.30, and Rs. 234.42 for small, medium and large processing units, respectively. Margin of processors increased with an increase in the size of processing unit. The processing cost and returns to per rupee investment, also increased with an increase in size of processing unit. All the processing units were operating above the break-even quantity, but failed to utilize their installed capacity.

Singh *et al.* (2003) conducted a study to find out the techno-economic feasibility of processing of aonla products in Chattisgarh state, like pulp based products (jam, squash, sauce) and non pulp based product (candy). They found that the per litre processing cost of squash and cost of 1 kg candy was much lower than that the cost of 1 litre sauce and one kg jam.

2.6STUDIES ON PROBLEMS ENCOUNTERED IN PRODUCTION AND MARKETING OF VEGETABLES AND PULSES

Hile *et al.* (2012) studied the problems in production and marketing of summer capsicum in Nasik district of Western Maharashtra during the year of 2009-10. The main constraints in production of capsicum faced by sample farmers were high cost of seeds and plant protection measures, inadequate irrigation and costly fertilizers. The main problems in marketing of capsicum faced by the growers were high cost of transportation, high commission charges, lack of awareness of market price and delay in payments. It was suggested that the cultivation of summer capsicum needs to be popularized among the farmers in Igatpuri tehsil for those who are having assured irrigation facilities in summer season.

Amutha (2011) analyzed the status and constraints of pulses production and the techniques for improving production in the areas under study in Tuticorin, Tirunelveli and Madurai district of Tamil Nadu. In 2010, a total of 648 respondents were selected using stratified random sampling from different categories of farming community. Statistical tools like standard error, standard deviation, trend analysis, variance, chi-

square tests, t-tests etc. were used for interpretation of data. The reasons of low production and productivity, according to farmers' perceptions, were due to use of poor quality seed, low area coverage, poor management, inadequate irrigation facilities, low investment, etc. Use of improved seed, adoption of optimum cropping pattern, maintenance of quality germplasm, application of nutrients in the soil through micro-nutrient, bio-fertilizer, organic manures, adoption of crop protection measures, etc. are some of the important aspects which need immediate attention.

Baskaur (2011) studied the problems of vegetable cultivation in rural areas of Haryana. For the purpose, four districts, namely, Sonipat, Gurgaon, Kurukshetra and Hisar were selected on the basis of highest area under vegetable cultivation. Respondents were personally interviewed using well structured schedule. The study reported that unavailability of labour during peak season ranked first having 2.21 mean score followed by cost of labour (1.93) and great financial problem for vegetable cultivators. The major marketing problems of vegetable cultivation were inadequate and costly transport, lack of knowledge about potential market in big cities, which were ranked first (2.16) and second (1.99), respectively.

Singh (2008) made an attempt to study the role of fruit processing units in income and employment generation in Uttar Pradesh during the period of 2004-05. He found that the major problems faced by processing sector were, low productivity of raw materials leading to high unit price of final products, lack of storage infrastructure leading to wastage and increasing unit price of finally available quantity, lack of trained human resource, inadequate knowledge of material and lack of market intelligence and inadequate cold storage and refrigerated transport facility of the fresh as well as processed commodities which needs to be solved immediately for the growth of processing sector.

Alam *et al.* (2001) studied the problems faced by winter vegetable growers in selected areas of Bangaldesh. Data were collected through structured interviews from 70 farmers of 3 villages of Norsingdi district, Bangladesh, during October 1997-April 1998 to investigate the cropping pattern and cropping intensity of the selected vegetable growers and to determine and compare the relative profitability of selected winter vegetables. The study also identified the major problems associated with production and marketing and suggested some policy recommendations. The selected winter vegetables constitute about 15% of the total gross cropped area; the average cropping intensity of land was 195.52%. Production of selected vegetables

(cauliflower, cabbage, tomato, radish, bean, and bottle gourd) was profitable although the growers faced a lot of production and marketing problems.

Sakiliba (2000) studied constraints and strategies related to the marketing and quality of transformed products of fruits and vegetables in Mali of Indonesia during the period of 1994-95. Major constraints for the marketing of fruits and vegetables in Mali were, long distance to markets and little support for individual producer from cooperative groups and associations. Constraints for quality control were also outlined, including the absence of norms, lack of suitable control equipment (such as refractometer and pH meter), poor packaging, and low level of training. Strategies to improve the situation were discussed, including more publicity (use of mass media), participation in expositions and trade markets, and standardized quality controls.

Patel *et al.* (1997) in their study on marketing efficiency of Anand vegetable market in Gujarat reported that lack of storage facilities, delay in payment of sale proceeds, high cold storage charges, monopoly of few middlemen and need of timely display of these perceptive products etc. were the major problems faced by the cabbage and cauliflower growers.

Bonny (1996) surveyed the constraints of commercial vegetable production in Pananchery and Duthur districts of Kerala in the year 1993-94. He reported that increased cost of plant protection chemicals was perceived as the most important factor by the respondents in the commercial vegetable production followed by inadequate market facilities, poor storage and poor post-harvest facilities, insufficient capital and high labour costs.

Chapter III

MATERIAL AND METHODS

The design of the study is a prerequisite for any scientific investigation. So, this chapter deals with the material and methods adopted for conducting the present study. The present research had been taken up in Churu, Sikar and Jhunjhunu districts of Shekhavati region in Rajasthan. The details regarding methodology adopted in selection of location, methods of data collection and analytical tools employed in achieving the objectives of the study has been discussed under the following sub-headings

3.1 Selection of study area.
3.2 Selection of sample farmers.
3.3 Collection and source of data.
3.4 Tools and techniques.
3.5 Concepts, definitions and procedures adopted in computation
3.6 Description of study area.

3.1 SELECTION OF STUDY AREA

Shekhavati region is predominantly known for potential guar cultivating belt in Rajasthan. Almost all popular varieties of guar like Durgapur Safed, FS-277, Ageta Guara-111, Guar No.2 are cultivated in this region and it offers high potential for sale of guar. Three districts namely; Churu, Sikar and Jhunjhunu of Shekhavati region are selected for the study as these districts are emerging as potential areas in the state for guar production. From each district two tehsils i.e., Churu and Rajgarh from Churu district, Sikar and Laxmangarh from Sikar district and Jhunjhunu and Nawalgarh from Jhunjhunu district were identified based on the criteria of highest production. From each tehsil again four villages were selected randomly to gather the information. Therefore altogether 3 districts, 6 tehsils and 24 villages formed the basis for the study.

3.2 SELECTION OF SAMPLE FARMERS

From each selected village, 5 guar growing farmers were interviewed randomly for collecting the data. A total of 120 farmers were selected for the study.

Table 3.1. List of selected districts, tehsils and villages in the study area

District	Tehsil	Village	No. of farmers	No. of Commission Agents
Churu	Churu	Gajasar	5	2
		Khansoli	5	
		Sirsala	5	
		Shyampura	5	
	Rajgarh	Ratanpura	5	2
		Sadpura	5	
		Bairasar Bada	5	
		Khariya	5	
Sikar	Sikar	Piprali	5	2
		Mandoli	5	
		Dhod	5	
		Bajor	5	
	Laxmangarh	Manasi	5	2
		Narodara	5	
		Ghassu	5	
		Jajod	5	
Jhunjhunu	Jhunjhunu	Malsisar	5	2
		Nua	5	
		Hameerwas	5	
		Bhojasar	5	
	Nawalgarh	Jhajhar	5	2
		Matwa ki	5	
		Dhani	5	
		Balwantpura	5	
		Todpura		
Total			**120**	**12**

In addition, 12 commission agents were interviewed from 6 tehsils for gathering information about the marketing cost and marketing channels in the study region. The detail about selection of study area is shown in the Table 3.1.

3.3 COLLECTION AND SOURCE OF DATA

For the study, the data were collected from primary and secondary sources. Primary data were collected from farmers, commission agents and processors, using different interview schedules developed specially for different groups of respondents. The purpose of the study was explained to the respondents so as to get their cooperation. One lead processor from each district was interviewed to access the information of processing units. The primary data pertained to the year 2012-13. Secondary data were collected from website of Ministry of Agriculture, Government of India; Website of Government of Rajasthan, reports of various Commodity Exchanges of India, books, journals etc. The data on area, production and productivity were collected for the period from 2002-03 to 2011-12. The data pertained to the exports of guar gum were collected for the period of 2003-04 to 2012-13.

3.4 TOOLS AND TECHNIQUES

3.4.1 Tabular analysis

The data collected were complied and tabulated to draw valid inferences from the study. Apart from the functional analysis, simple percentages and averages were also used to compute and compare the results of the study.

3.4.2 Functional analysis

3.4.2.1 Estimation of Compound Annual Growth Rate (CAGR):

Keeping in view the objective of the study, growth rates of area, production and productivity of guar in India and Rajasthan state were calculated by fitting exponential function of the form

$$Y=AB^t$$

(or)

$$\textbf{Log Y= Log A + Log B}$$

Where,

Y = Area under cultivation

T = Time in years (1, 2, 3…. …6)

A = Constant and

B = Regression coefficient

The above equations can be fitted by using the least squares method of estimation. That equation also enables to obtain the Compound Growth Rate (CGR in %) as follows

Compound Growth Rate= (Antilog of B-1) * 100

3.4.2.2 Financial analysis

The techniques used for the financial analysis were

1. Net Present Value (NPV)
2. Benefit Cost Ratio (BC Ratio)
3. Internal Rate of Return (IRR) and
4. Pay Back Period (PBP)

1. Net Present Value

The Net Present Value represents the discounted value of the net cash inflows of the project. In the present study, a discount factor of 14 per cent was used to discount the net cash inflows representing the opportunity cost of capital. It can be represented by

$$NPV = \sum_{i=1}^{n} Yi\,(1 + r)\text{-}i - I$$

Where,

Yi = Net cash inflows in the year n

r = Discount factor

I = Initial investment

i = Year of life period 1, 2…….n.

2. Benefit Cost Ratio

Benefit Cost Ratio analysis is an important tool to assess economics of farming. It is the ratio of net value of the crop produce after deducting the cost of different inputs. It indicates the rate of returns from the use of an input.

BCR = Net returns /Total costs

While doing investment analysis, BCR is worked out by using the following formula

$$BCR = \frac{\text{Discounted net cash flows}}{\text{Initial investment}}$$

$$= \frac{\sum_{i=1}^{n} Yi\,(1 + r)\text{-}i}{I}$$

3. Internal Rate of Return (IRR)

The rate at which the Net Present Value of the project is equal to zero is called Internal Rate of Return (IRR) to the project. The net cash inflows were discounted to determine the present worth by the following interpolation technique

$$IRR = Lower\ discount\ rate + \left(Difference\ between\ two\ discount\ rates\right)\left(\frac{Present\ worth\ of\ cash\ flows\ at\ lower\ discount\ rate}{Absolute\ difference\ between\ present\ worth\ of\ cash\ flows\ at\ the\ two\ discount\ rates}\right)$$

4. Pay Back Period (PBP)

Pay Back Period represents the length of time required for the stream of cash proceeds produced by the investment to be equal to the original cash outlay i.e., the time required for project to pay for itself. In the present study, Pay Back Period was calculated by using the following formula

$$PBP = \frac{\text{Initial investment}}{\text{Net returns (average)}}$$

3.4.3 Cost of marketing (C)

The total cost incurred on marketing, in cash or in kind, by the producer-seller and by various intermediaries involved in the sale and purchase of the commodity till the commodity reaches the ultimate consumer was computed as follows.

C = Cf + Cm1 + Cm2 + Cm3 + …….Cmn

Where,

C = Total cost of marketing of the commodity

Cf = Cost paid by the producer from the time, the produce leaves the farm till sale.

Cmn = Cost incurred by the nth middleman in the process of buying and selling the product.

3.4.4 Producer's share in consumer's rupee (Ps)

It is the price received by the producer as a percentage in the consumer's price.

$$Ps = (PF/PC) \times 100$$

3.4.5 Analysis of price spread under different channels

It is the difference between the price paid by the consumer and the price received by the producer. The price spread was worked out by using the following method

$$\text{Price Spread} = Pp - Pf$$

Where,

Pp = Price paid by the consumer

Pf = Price received by the farmer

3.4.6 Marketing Efficiency

The Marketing Efficiency was assessed by applying Modified Shepherd's formula as shown below:

ME = (V/I - 1)

Where ME = Index of Marketing Efficiency

V = Value of goods sold

I = Total marketing costs + Total net margin of intermediaries

3.5 CONCEPTS, DEFINITIONS AND PROCEDURES ADOPTED IN COMPUTATION

Concepts, definitions and procedures adopted in this study are presented below

3.5.1 Cost of cultivation

All costs incurred in the cultivation of guar i.e., operational and fixed costs are considered to arrive at the total cost. It always refers to unit area (acre).

Operational costs include human labour, machine labour, seed, fertilizer and manures, insecticides, interest on working capital and miscellaneous expenditure.

Fixed costs include rental value of owned land, land revenue, taxes, depreciation on machinery, implements and farm buildings and interest on fixed capital etc.

3.5.2 Human labour

Family labour is imputed at the general wages prevailing for the permanent labourers in the villages. In case of permanent labours, payments made in kind like grain, vegetables, meals and other prerequisites are evaluated at the prevailing market rates. Payment made in cash is added to this. The actual wage paid was considered in case of casual labour.

3.5.3 Seed

The farm produced seed is charged at the standard rates on purchasing price at National Seed Corporation and at the prevailing local rates. Purchased seed is charged at the rates actually paid.

3.5.4 Manures and fertilizers

Farm produced manures are charged at the prevailing local rates. Chemical fertilizers and other manures purchased are charged at the rates actually paid.

3.5.5 Plant protection chemicals

The actual prices paid for the plant protection chemicals by the growers are considered.

3.5.6 Interest on working capital

The interest on working capital is charged at the rate of 12.5 per cent for the crop period.

3.5.7 Rental value of owned land

The prevailing land rents for agricultural production were imputed for the sample, since all land holdings were observed to be owner operated.

3.5.8 Depreciation

The depreciation was worked out for the items like farm machinery and implements, farm buildings and wells. Depreciation was calculated by using straight line method. Total depreciation of the farm was apportioned on crop acreage basis.

3.5.9 Interest on fixed capital

Interest on fixed capital excluding land is charged at the rate of 11 per cent.

3.5.10 Gross returns

These are the total receipts obtained by selling total produce.

3.5.11 Net returns

These are the profits left after deducting the total cost of production from the gross returns.

3.5.12Return on investment

The earning power of assets measured as the ratio of net income to the average capital employed in a project is worked out. It is usually expressed in per cent. It can be calculated by the following formulae.

$$ROI = \left(\frac{\text{Returns} - \text{Investment}}{\text{Investment}} \right) \times 100$$

3.6 DESCRIPTION OF STUDY AREA

The description of the study area was felt necessary because of the fact that the profitability and productivity of any crop is determined to a larger extent by the resource endowment, physical environment, social matrix and agro-climatic conditions of that region.

3.6.1 Features of Shekhavati region

The Shekhavati is one of the most important regions in Rajasthan state of India. Shekhavati is a semi arid historical region located in North East part of Rajasthan state. It's name originated from the Shekhavat Rajputs. Churu, Sikar and Jhunjhunu districts are the part of this region. The inhabitants of Shekhawati are considered brave, sacrificing and hard working people. The region provides the highest number of people to the Indian Army.

3.6.2 Churu district

3.6.2.1 Geographic and demographic features

The town of Churu is the administrative headquarters of the district. Churu is located at 28.30°N 74.95°E. It has an average elevation of 292 m (958 ft).The district has an area of approximately 16,830 km², with a road length of 1901 km. There are 6 tehsils in the district namely; Churu, Ratangarh, Sardarshahar, Taranagar, Rajgarh and Sujangarh. The major crops of the district are guar, bajra, moth and gram. The major minerals found in the district are copper and gypsum.

According to the 2011 census, Churu district has a population of approximately 20,41,172. This gives it a ranking of 224th in India (out of a total of 640 districts). The district has a population density of 148 inhabitants per square kilometre. Its population growth rate over the decade (2001-2011) was approximately 20.35 per cent. Churu has a sex ratio of 938 females for every 1000 males, and a literacy rate of about 67.46 per cent.

Table 3.2. Demographic details of Churu district

S. No.	Particulars	Number
1	Total Population	20,41,172
2	Males	10,53,375
3	Females	9,87,797
4	Rural Population	14,64,691
5	Urban Population	5,76,481
6	Sex Ratio	938
7	Population Density (Persons /Sq. Km.)	148
8	Decade Growth Rate of Population (2001 - 2011)	20.35%

(Source: Directorate of Economics and Statistics, Government of Rajasthan.2011)

3.6.2.2 Climate and rainfall

The district has dry climate with large variation in temperature. The minimum and maximum temperature varies from -1 to 48.2 degree Celsius. The large variation in the temperature is due to desert area near the district. Monsoon starts in the third week of July but rainy season is of very short duration. The average rainfall is only 32.8 cm. The average humidity is low in the district as 10-15 per cent during the year.

3.6.2.3 Soil

The soil is poor in humus with organic carbon content less than 0.2 percent. Its water retaining capacity is very poor. Sandy and Sandy-loam soils are generally found in the Churu district. Sandy soil is dominantly found in most of the areas of the district but some areas are covered by Sandy-loam soil. Sandy soil is less fertile as compared to the Sandy-loam soil. Sandy soil is porous having fine to medium texure whereas Sandy-loam soil is yellowish brown having deep or light texure.

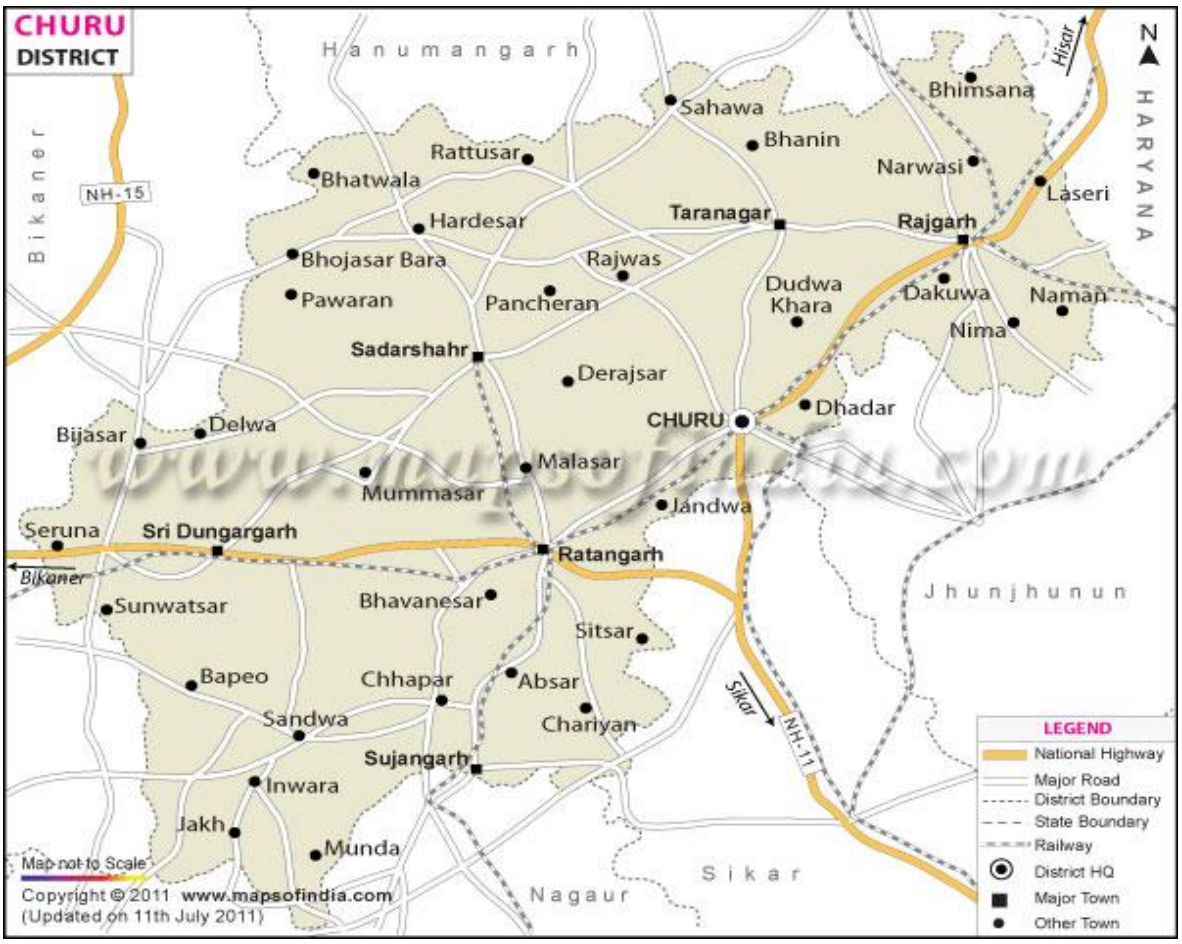


Figure 3.1. Map of Churu district

3.6.3 Sikar district

3.6.3.1 Geographic and demographic features

Sikar district is located in the North Eastern part of Rajasthan state. The town Sikar is the district headquarters of the Sikar district. The district has an area of 7742.44 km². According to the 2011 census, Sikar district has a population of 26,77,737. This gives it a ranking of 150th in India (out of a total of 640). The district has a population density of 346 inhabitants per square kilometer. Its population growth rate over the decade 2001-2011 is 17.04%. Sikar has a sex ratio of 944 females for every 1000 males, and a literacy rate of 72.98%. Major crops of the district are guar, bajra, moth, groundnut and mustard.

Table 3.3. Demographic details of Sikar district

S. No.	Particulars	Number
1	Total Population	26,77,737
2	Males	13,77,120
3	Females	13,00,617
4	Rural Population	20,44,434
5	Urban Population	6,33,300
6	Sex Ratio	944
7	Population Density (Persons /Sq. Km.)	346
8	Decade Growth Rate of Population (2001-2011)	17.04%

(Source: Directorate of Economics and Statistics, Government of Rajasthan.2011)

3.6.3.2 Climate and rainfall

Sikar has a hot semi-arid climate, rains occur in the monsoon months between June and September. Temperatures remain relatively high throughout the year, with the summer months of April to July having average daily temperatures of around 30 °C (86 °F). The maximum temperatures during the months of May & June can reach close to50 °C (122 °F) with little to no humidity. During the monsoon, there are frequent, heavy rains and thunderstorms, but flooding is not common. The winter months of November to February are mild and pleasant, with average temperatures ranging from 15–18 °C (59–64 °F) and with little or no humidity. There are however occasional cold fronts that lead to temperatures near freezing. The normal rainfall, mostly received from the south-west monsoon, is 459.8 mm.

3.6.3.3 Soil

Three types of soils are mainly found in Sikar district.

1. **Sandy soil**: Sandy soil is very porous but not suitable for general type of vegetation. The colour varies from brown to grey and texture from fine to medium.

2. **Sandy-loam soil**: This soil is semi-porous and fertile; it is generally yellowish brown with deep or light texture.

3. **Clay soil**: This type of soil is blackish, greyish or dark brown in colour, having medium to heavy texture. The soil is less porous but highly fertile with almost balanced macro and micro-nutrients. It is found in some parts of the district.

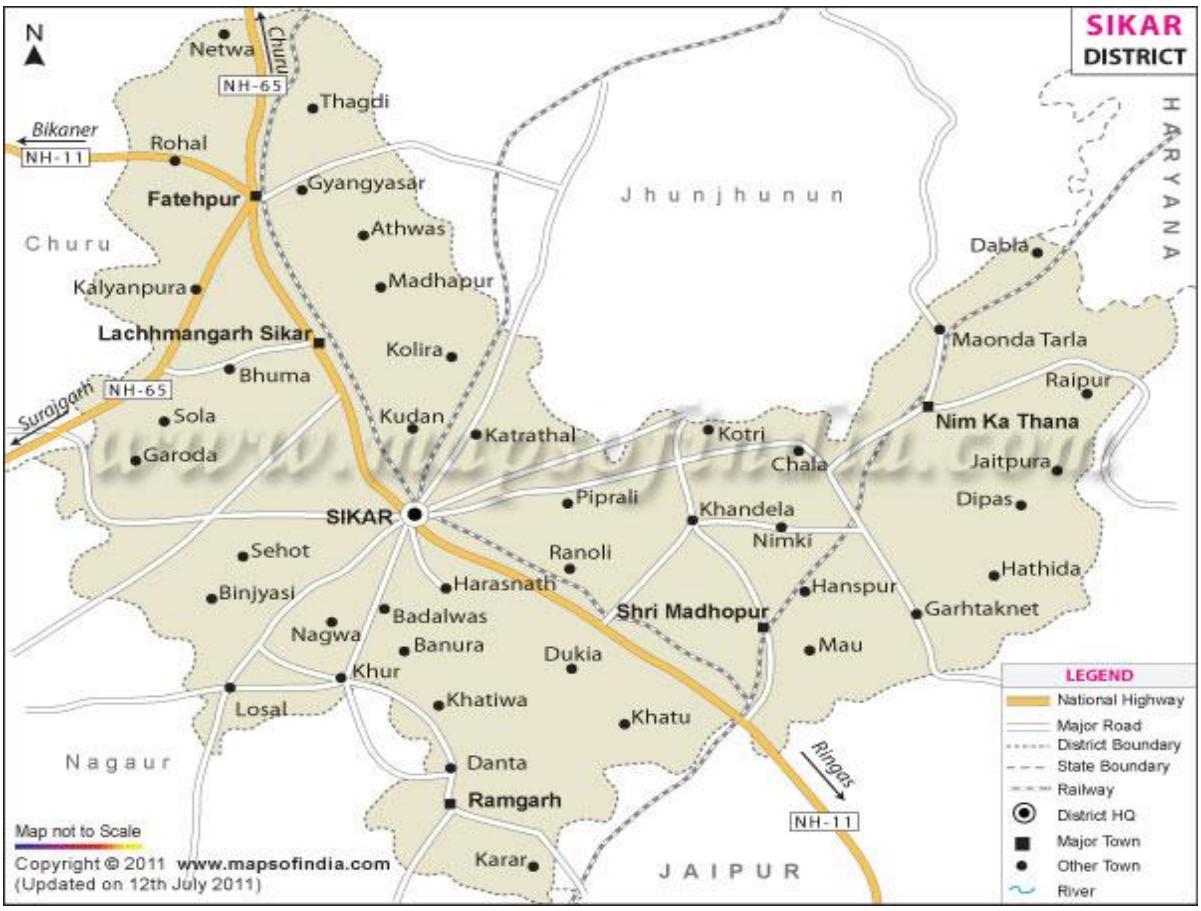


Figure 3.2. Map of Sikar district

3.6.4 Jhunjhunu district

3.6.4.1 Geographic and demographic features

Jhunjhunu district is located in the north Eastern part of Rajasthan state. The town Jhunjhunu is the district headquarters of the Jhunjhunu district. The district has an area of 5926 km². According to the 2011 census, Jhunjhunu district has a population of 21,39,658. This gives it a ranking of 214th in India (out of a total of 640).The district has a population density of 361 inhabitants per square kilometre. Its population growth rate over the decade 2001-2011 is 11.81%. Jhunjhunun has a sex ratio of 950 females for every 1000 males, and a literacy rate of 74.72%. Principle crops grown in the district are guar, wheat, barley, bajra etc.

Table 3.4. Demographic details of Jhunjhunu district

S. No.	Particulars	Number
1	Total Population	21,39,658
2	Males	10,97,390
3	Females	10,42,268
4	Rural Population	16,49,538
5	Urban Population	4,90,120
6	Sex Ratio	950
7	Population Density (Persons /Sq. Km.)	361
8	Decade Growth Rate of Population (2001-2011)	11.81%

(Source: Directorate of Economics and Statistics, Government of Rajasthan.2011)

3.6.4.2 Climate and rainfall

The climate of the district can be classified as semi-arid. It is charaterised by very hot summers and very cold winters with poor rainfall during south-west monsoon period. In May and June, the maximum temperature may sometimes go upto 48^{o}C. The potential evapotranspiration rates are quite high, especially during May and June. The total annual potential evapotranspiration is 1502.6 mm. The mean annual rainfall of the district is 485.6 mm.

3.6.4.3 Soil

The distribution of soil in Jhunjhunu district is given below

1. Desert soil- Occurs extensively in the central part of the area covering parts of all the blocks except Surajgarh block. These are yellowish brown, sandy to sandy loam, loose, structure less, well drained with high permeability. They are scanty of vegetation due to severe wind erosion and wind velocity high.

2. Sand dunes-They are present mostly in northern part of the district covering parts of Alsisar, Buhana, and Chirawa blocks. These are non-calcareous soils, sandy to loamy sand, loose, structureless and well drained. In favourable localities they are cultivated.

3. Red desertic soil-Rests in parts of Jhunjhunu and Nawalgarh blocks. These are pale brown to reddish brown colour, structureless, loose and well drained having texture from sandy loam to sandy clay loam. Suitable for agriculture but suffers from adverse climatic conditions.

4. Lithosols and regisols of hills-Found on Delhi hills and hill slopes between Khetri and Gudagaurji and south of Udaipurwati in parts of Khetri and Udaipurwati and Nawalgarh blocks. They are shallow with gravels very near the surface, light textured, fairly drained, reddish brown to grayish brown in colour. Cultivation is restricted because of limited root zone.

5. Older alluvium-Found in southern most parts of the area in parts of Khetri, Udaipurwati and Nawalgarh blocks. They are derived from alluvium and are non-calcareous, semi-consolidated to unconsolidated brown soils, loamy sand to sandy loam in texture. Well drained and occupy gently sloping terrains.

Figure 3.3. Map of Jhunjhunu district

Chapter IV

RESULTS AND DISCUSSION

In accordance with the set objectives of the study, this chapter deals with the presentation and description of results with critical discussion so as to arrive at meaningful conclusions. For easy understanding and convenience, the results of the study are discussed under two sections. Section-I focused on discussion of growth performance of guar in India and Rajasthan state for the period of 2002-03 to 2011-12 and trends in exports of guar gum from India for the period of 2003-04 to 2012-13. The findings of the field survey are presented in section-II.

Section-I

4.1. Trends in area, production and productivity of guar in India and in Rajasthan state

4.2. Trends in exports of value added product of guar

Section-II

4.3. Socio-economic profile of the sample farmers

4.4. Cost and return pattern of guar production

4.5. Marketing channels of guar and their efficiency

4.6. Economic efficiency of guar processing plant

4.7. Problems encountered in production and marketing of guar

4.1 TRENDS IN AREA, PRODUCTION AND PRODUCTIVITY OF GUAR IN INDIA AND IN RAJASTHAN STATE

4.1.1 Trends in area, production and productivity of Guar in India

In this section an attempt has been made to analyze the Compound Growth Rate (CGR) and per cent change in area, production and productivity of guar in India and the data pertaining to it was accessed from the secondary source for a period of ten years (2002-03 to 2011-2012).

The area, production and productivity of guar in India from 2002-03 to 2011-2012 has been presented in the Table 4.1. The area under guar cultivation in 2002-03 is seen as 974 thousand hectares. In 2003-04 the area increased to 2854 thousand hectares i.e. 193.02 per cent increase over the previous year and it further increased to 2867 thousand hectares (0.45 per cent) in the subsequent year. Similarly, in 2005-06, the area increased to 2956 thousands hectare (3.10 per cent) and again it further increased to

3343 thousand hectares (13.09 per cent increase) in the year 2006-07, 3472 thousands hectare (3.86 per cent) in the year 2007-08 and 3862 thousand hectares (11.23 per cent) in 2008-09 whereas in 2009-10, the area decreased to 2989 thousand hectares i.e. 22.60 per cent decrease over the previous year and again it decreased to 2528 thousand hectares (-15.42 per cent) in 2010-11. Finally, in 2011-12, the area increased to 3639 thousands hectare i.e. 43.95 per cent over the previous year which may be due to remunerative price of guar.

The production of guar in India in 2002-03 is seen as 203 thousand tonnes. In 2003-04 it increased to 1513 thousand tonnes (645.32 per cent) but it further decreased to 903 thousand tonnes (-40.32 per cent) in subsequent year. Whereas in 2005-06, the production increased to 1059 thousand tonnes (17.27 per cent) and further to 1169 thousand tonnes (10.38 per cent) in the subsequent year. In 2007-08, the production rose to 1788 thousand tonnes (52.95 per cent) and to 1935 thousand tonnes (8.22 per cent) in the year 2008-09. In the year 2009-10, the production drastically decreased to 593 thousand tonnes (-69.35 per cent) due to severe drought in major cultivating areas in Rajasthan. In the year 2010-11 the production increased to 2036 thousand tonnes (243.34 per cent) and finally, it went upto 2441 thousand tonnes (19.89 per cent) in the year 2011-12.

The productivity of guar in India in 2002-03 is seen as 208 kg/ha which increased to 530 kg/ha (154.81 per cent) in 2003-04 but decreased to 315 kg/ha (-40.57 per cent) in the year 2004-05.Whereas in 2005-06, the productivity increased to 358 kg/ha (13.65 per cent) and then slightly decreased to 350 kg/ha (-2.23 per cent) in the year 2006-07. The productivity increased to 515 kg/ha (47.14 per cent) in 2007-08 but decreased to 501 kg/ha (-2.72 per cent) in 2008-09. In 2009-10, the productivity drastically decreased to 198 kg/ha (-60.48 per cent) over the previous year due to drought conditions in the major growing areas of Rajasthan. It increased to 805 kg/ha (306.56 per cent) in the subsequent year due to use of good quality seed and better management practices. Finally, in 2011-12, the productivity decreased to 670 kg/ha (-16.77 per cent) .

The Compound Growth Rates for area, production and productivity were 7.58 per cent, 16.07 per cent and 1.60 per cent respectively. For the all three variables, the growth rate is not significant.

4.1.2 Trends in area, production and productivity of Guar in Rajasthan

In this section, an attempt has been made to analyze the Compound Growth Rate (CGR) and per cent change in area, production and productivity of the guar in Rajasthan for the period of ten years (2002-03 to 2011-2012).

The area, production and productivity of guar in Rajasthan from 2002-03 to 2011-2012 has been presented in the Table 4.2. The area under guar in 2002-03 is seen as 557 thousand hectares whereas in 2003-04 the area increased to 2278 thousand hectares i.e. 308.97 per cent over the previous year and it decreased to 1944 thousand hectares (-14.66 per cent) in the subsequent year. Similarly, in 2005-06, the area increased to 2445 thousand hectares (25.77 per cent) and it further increased to 2808 thousand hectares in the subsequent year. In 2007-08, the area decreased to 2310 thousand hectares (-17.17 per cent) and later it increased to 2909 thousand hectares (25.93 per cent) in the subsequent year. In 2009-10, the area decreased to 2581 thousand hectares i.e. 11.27 per cent decrease over the previous year but it increased to 2980 thousand hectares (15.46 per cent) in the year 2010-11. In 2011-12, the area increased to 3094 thousands hectare i.e. 3.82 per cent increase over the previous year. The increased trend is due to better returns being received by the guar growers.

The production of guar in Rajasthan in 2002-03 was only 28 thousand tonnes. In 2003-04 it increased to 1163 thousand tonnes i.e. 4053.57 per cent increase over the previous year which is quite a substantial growth due to good rainfall in the major cultivating areas and increased productivity level but it decreased to 368 thousand tonnes (-68.35 per cent) in subsequent year. In 2005-06, the production increased to 593 thousand tonnes i.e. 61.14 per cent increase over the previous year and further again it increased to 658 thousand tonnes (10.96 per cent) in the subsequent year. In 2007-08, the production decreased further to 622 thousand tonnes (-5.47 per cent) over the previous year but it almost doubled i.e. 1243 thousand tonnes (99.83 per cent) in the subsequent year.

Table 4.1.Percentage change and growth rates in area, production and productivity of Guar in India (2002-03 to 2011-12)

Sl.No.	Year	Area in '000 ha	% change over previous year	Production in '000 tonnes	% change over previous year	Productivity in Kg/ha	% change over previous year
1	2002-03	974	-	203	-	208	-
2	2003-04	2854	193.02	1513	645.32	530	154.81
3	2004-05	2867	0.45	903	-40.32	315	-40.57
4	2005-06	2956	3.10	1059	17.27	358	13.65
5	2006-07	3343	13.09	1169	10.38	350	-2.23
6	2007-08	3472	3.86	1788	52.95	515	47.14
7	2008-09	3862	11.23	1935	8.22	501	-2.72
8	2009-10	2989	-22.60	593	-69.35	198	-60.48
9	2010-11	2528	-15.42	2036	243.34	805	306.56
10	2011-12	3639	43.95	2441	19.89	670	-16.77
	% change in 2011-12 over 2002-03		273.61		1102.46		222.11
	CGR	1.93 (7.58)		2.17 (16.07)		1.60 (7.88)	

(Source: Directorate of Economics and Statistics, Government of India.2011-12)

Figures in parentheses are 't' values;
CGR: Compound Growth Rate

In 2009-10, the production declined drastically to 201 thousand tonnes (-83.82 per cent) due to severe drought conditions in the major growing areas. In the year 2010-11, the production increased to 1540 thousand tonnes (666.17 per cent) due to high acreage and

good rainfall. Finally, in 2011-12, the production increased to 1846 thousand tonnes i.e. 19.87 per cent over the previous year.

The productivity of guar in Rajasthan in 2002-03 showed 50 kg/ha and in 2003-04 it increased to 511 kg/ha (922 per cent) due to good rainfall in the growing areas and later it decreased to 189 kg/ha (-63.01 per cent) in the subsequent year. In 2005-06, the productivity increased to 243 kg/ha (28.57 per cent) and later slightly decreased to 234 kg/ha (-3.70 per cent) in the subsequent year. In 2007-08, the productivity increased to 269 kg/ha i.e. 14.95 per cent over the previous year and it further increased to 427 kg/ha (58.73 per cent) in the subsequent year. In 2009-10, the productivity decreased to 78 kg/ha (-81.73 per cent) due to severe drought conditions but it increased to 517 kg/ha (562.82 per cent) in the subsequent year due to increased acreage and good monsoon. Finally, in 2011-12, the productivity increased to 597 kg/ha (15.47 per cent).

The Compound Growth Rates for area, production and productivity were 12.24 per cent, 26.51 per cent and 12.75 per cent respectively. Among the all three variables, only the growth rate of area is significant.

Table 4.2. Percentage change and growth rates in area, production and productivity of Guar in Rajasthan (2002-03 to 2011-12)

Sl.No.	Year	Area in '000 ha	% change over previous year	Production in '000 tonnes	% change over previous year	Productivity in Kg/ha	% change over previous year
1	2002-03	557	-	28	-	50	-
2	2003-04	2278	308.97	1163	4053.57	511	922.00
3	2004-05	1944	-14.66	368	-68.35	189	-63.01
4	2005-06	2445	25.77	593	61.14	243	28.57
5	2006-07	2808	14.84	658	10.96	234	-3.70
6	2007-08	2310	-17.17	622	-5.47	269	14.95
7	2008-09	2909	25.93	1243	99.83	427	58.73
8	2009-10	2581	-11.27	201	-83.82	78	-81.73
9	2010-11	2980	15.46	1540	666.17	517	562.82
10	2011-12	3094	3.82	1846	19.87	597	15.47
	% change in 2011-12 over 2002-03		455.47		6492.85		1094.00
	CGR	2.72* (12.24)		1.98 (26.51)		1.38 (12.75)	

(Source: Ministry of Agriculture, Government of Rajasthan.2011-12)

Note: *Significant at 5 per cent level of probability

Figures in parentheses are 't' values; CGR: Compound Growth Rate

4.2 TREND IN EXPORTS OF VALUE ADDED PRODUCT OF GUAR

Value addition is always done to obtain more useful and convenient product from the crop. Among the value added products of guar, guar gum is the most important product that is used in many industries like cosmetic industry, herbal product industry and petroleum refineries. It is mainly manufactured for the export purpose. The export of guar gum from India during last ten years is given in the Table 4.3.

4.2.1 Trends in exports of Guar gum from India

In this section an attempt has been made to analyze the Compound Growth Rate (CGR) and per cent change in quantity and value of exported guar gum from India and the data pertaining to it was accessed from the secondary source for a period of ten years (2003-04 to 2012-2013).

The quantity and value of guar gum exported from India from 2003-04 to 2012-2013 has been presented in the Table 4.3. The quantity of guar gum exported in 2003-04 is seen as 120.5 thousand tonnes. In 2004-05 the quantity increased to 131.3 thousand tonnes i.e. 8.91 per cent over the previous year and it further increased to 186.7 thousand tonnes (42.20 per cent) in the subsequent year. Similarly, in 2006-07, the quantity increased marginally to 189.3 thousand tonnes (1.38 per cent) and 211.1 thousand tonnes (11.54 per cent) in the year 2007-08. The increase continued to 258.5 thousand tonnes (22.43 per cent) in the year 2008-09 whereas the quantity decreased to 218.4 thousand tonnes (-15.49 per cent) in 2009-10. Further in 2010-11, the quantity increased to 441.6 thousand tonnes i.e. 102.13 per cent over the previous year and again it increased to 707.3 thousand tonnes (60.17 per cent) in 2011-12 and it may be due to remunerative prices in the international market. Finally, in 2012-13, the quantity of exported guar gum decreased to 408.5 thousand tonnes i.e. -42.23 per cent over the previous year.

The value of guar gum exported from India in 2003-04 is seen as Rs.507.88 crore. In 2004-05 it increased to Rs.689.46 crore (35.75 per cent) and it further increased to Rs.1049.24 crore (52.18 per cent) in subsequent year. Whereas in 2006-07, the value increased to Rs.1125.76 crore (7.29 per cent) and it slightly decreased to Rs.1125.72 crore (-0.003 per cent) in the subsequent year. In 2008-09, the value raised further to Rs.1338.94 crore (18.94 per cent) but it decreased to Rs.1133.29 crore (-15.36 per cent) in the year 2009-10. In the years 2008-09 the value increased to Rs.2938.72 crore

(159.31 per cent) and it of Rs.16523.83 crore in 2011-12 due to high demand from middle-east, USA and other Western countries. Finally in 2012-13 the value was Rs.21287.06 crore i.e. an increase of 28.82 per cent over the previous year.

The Compound Growth Rates for quantity exported and its value were 18.28 per cent and 44.90 per cent respectively. The growth rates of both quantity and value are significant.

Table 4.3. Percentage change and growth rates in exports of Guar gum from India (2003-04 to 2012-13)

Sl.No.	Year	Quantity in '000 tonnes	% change over previous year	Value in Crores	% change over previous year
1	2003-04	120.5	-	507.88	-
2	2004-05	131.3	8.91	689.46	35.75
3	2005-06	186.7	42.20	1049.24	52.18
4	2006-07	189.3	1.38	1125.76	7.29
5	2007-08	211.1	11.54	1125.72	-0.003
6	2008-09	258.5	22.43	1338.94	18.94
7	2009-10	218.4	-15.49	1133.29	-15.36
8	2010-11	441.6	102.13	2938.72	159.31
9	2011-12	707.3	60.17	16523.83	462.28
10	2012-13	408.5	-42.23	21287.06	28.82
	% change in 2012-13 over 2003-04		239.00		4091.35
	CGR	18.28* (6.25)		44.90* (5.15)	

(Source: www.agriexchange.apeda.gov.in.2012-13)

Note: * Significant at 5 per cent level of probability

Figures in parentheses are 't' values; CGR: Compound Growth Rate

4.2.2 Country wise exports of Guar gum from India

India exports guar gum to more than 90 countries in the world but USA is the major importing country followed by China. Both of these countries account for more than 50% of India's exports of guar gum. The other major importing countries from India are

Germany, Canada, Russia, Australia etc. The export of guar gum from India to top 10 countries in the year 2012-13 is presented in the Table 4.4.

Table 4.4. Export of Guar gum to top 10 countries from India (2012-13)

Sl. No.	Country	Quantity in '000 tonnes	Value (Rs. in crores)
1	USA	244.82	17281.65
2	China	32.26	1368.33
3	Germany	12.08	375.49
4	Canada	5.46	360.45
5	Russia	5.38	292.12
6	Australia	3.95	227.08
7	Italy	12.65	179.56
8	Netherland	3.64	160.27
9	Indonesia	14.43	113.73
10	Switzerland	1.40	99.74

(Source: www.agriexchange.apeda.gov.in.2012-13)

It can be clearly observed from the Table 4.4 that USA is the largest importer of Indian guar gum in the year 2012-13 which amounts to nearly 60 per cent of the overall export of guar gum from India. The interesting fact is that though USA imported only 60 per cent of the total guar gum but the value earned form USA was nearly 81 per cent of the total value. The high demand of guar gum is due to its usage in the petroleum refineries of USA. The second major importer is China followed by Germany and Canada. Other major importing countries are Russia, Australia, Italy, Netherland, Indonesia and Switzerland.

4.3 SOCIO-ECONOMIC PROFILE OF THE SAMPLE FARMERS

The socio- economic characteristics of the respondents include educational status, age group, size of the holdings and size of the family. This analysis was required to have a comprehensive view about the socio-economic conditions of the respondents so as to execute the research in a most appropriate manner and also suggest suitable measures.

4.3.1 Age group of the respondents

Age is one of the most important factors that influence decision making of individuals. Age has a bearing on the farmers risk taking attitude and innovativeness in adopting

new technologies. Particulars regarding the age of the sample farmers are presented in the Table 4.5. It was found that 30.84 per cent of sample farmers were young (<35years) in the selected area, whereas 43.33 per cent of the sample farmers were middle aged (35-50 years) and remaining 25.83 per cent were seniors (>50 years).

Table 4.5. Age profile of sample farmers in selected districts

Sl.No	Particulars	No. of respondents	Percentage
1	Young (<35 years)	37	30.84
2	Middle aged (35-50 years)	52	43.33
3	Seniors (>50 years)	31	25.83
	Total	120	100.00

(Source: Estimates from the survey data of the study.2013)

4.3.2 Educational status of the respondents

The educational status of the farmer plays a vital role in the adoption of any new technology. In the present study, the sample farmers are categorized into five groups with respect to literacy status, viz., illiterate, primary school, high school, inter and college level. Among the sample farmers, 20 were illiterate which constitute 16.70 of the total sample size, 14.20 percent had primary school education and 23.30 per cent possessed high school education. The proportion of farmers possessing inter level education was somewhat high i.e. 30.00 per cent and farmers having college level education constituted 15.80 per cent of the total sample farmers.

Table 4.6. Literacy status of sample farmers in selected districts

Sl.No	Particulars	No. of respondents	Percentage
1	Illiterate	20	16.70
2	Primary school (1^{st} to 5^{th})	17	14.20
3	High school (6^{th} to 10^{th})	28	23.30
4	Inter (11^{th} to 12^{th})	36	30.00
5	College (above 12^{th})	19	15.80
	Total	120	100.00

(Source: Estimates from the survey data of the study.2013)

4.3.3 Family size of the respondents

Particulars regarding the family size are presented in the Table 4.7. It is observed from the Table 4.7 that the majority of the respondents had a family size between 4 to 6 members (62.50 per cent) and 18.33 per cent of them were having a family size between 7 to 9 members. Only 8.33 per cent of families had less than 4 members and 10.83 per cent families had more than 10 members.

Table 4.7. Family size of respondents

Sl.No	Family size	Number of respondents	Per cent
1	Less than 4	10	8.33
2	4 to 6	75	62.50
3	7 to 9	22	18.33
4	10 & above	13	10.83
	Total	120	100.00

(Source: Estimates from the survey data of the study.2013)

4.3.4 Land holding particulars of the respondents

The total sample of 120 farmers and was categorized into 3 categories namely; small (<2 ha), medium (2-5 ha) and large (>5 ha) in the proportionate manner. It can be clearly observed from the Table 4.8 that 57.50 per cent farmers had medium land holding whereas 23.33 per cent had small land holding. Farmers having large land holding were 19.17 per cent of the total sample farmers. Average size of farm holding was found 2.8 ha in the Shekhavati region.

Table 4.8. Land holdings of respondents

Sl.No	Category	Number of respondents	Per cent
1	Small	28	23.33
2	Medium	69	57.50
3	Large	23	19.17
	Total	120	100.00

(Source: Estimates from the survey data of the study.2013)

4.4 COST AND RETURN PATTERN OF GUAR PRODUCITON

The cost of cultivation comprises of both fixed and operational costs and the same for selected crop is worked out and presented below

4.4.1 Cost of cultivation of Guar

The farmers of Rajasthan predominantly grow guar in kharif season, especially in Shekhavati region and other arid areas of the state so it is essential to find out profitability of guar production in the study area. Is guar production profitable in terms of per unit area as well as per rupee of investment is the prime question. Therefore, an attempt has been made to assess the profitability of production of guar in the study area based on cost and returns.

The input use pattern in guar cultivation is clearly indicated in the Table 4.9. It is observed from the Table that the cost of cultivation per acre for guar amounted to Rs.8375.71 per acre. Operational costs and fixed costs are individually computed on per acre basis. Total operational cost amounted to Rs.5747.28 and fixed cost was Rs.2628.43. The major expenditure under operational cost was human labour followed by cost of seed and they accounted to 33.87 per cent and 12.56 per cent of the total cost respectively. However labour utilization in guar was found to be higher as compared to use of machines. The higher use of human labour in guar was mainly due to their usage for harvesting, hand weeding, application of manure etc. similarly machines were used largely on land preparation followed by sowing and threshing. Other costs included in the operational cost are; cost of machinery and equipment, manures and fertilizers, plant protection chemicals and interest on working capital.

Table 4.9. Cost of cultivation of Guar (Rs/acre)

Sl.No.	Particulars	Total cost (Rs)	Per cent
I	**Operational cost**		
1	Human labour	2837.13	33.87
2	Machinery and equipment	685.11	8.18
3	Seed	1051.80	12.56
4	Manures and fertilizers	544.25	6.50
5	Plant protection	290.92	3.47
6	Interest on working capital	338.07	4.04
	Total operational cost	5747.28	68.62
II	**Fixed cost**		
7	Depreciation	541.66	6.46
8	Land revenue	6.54	0.08
3	Rental value of own land	1943.20	23.20
10	Interest on fixed capital	137.02	1.64
	Total fixed cost	2628.43	31.38
	Total cost of cultivation	8375.71	100

(Source: Estimates from the survey data of the study, kharif season.2012-13)

The fixed costs also constitute major portion in guar production and it constituted to 31.38 per cent of the total cost. The major cost under fixed cost was rental value of owned land which constituted around 23.20 per cent of the total cost of cultivation. The other items are; depreciation, land revenue and interest on fixed capital. It is clear from the analysis that the operational cost is more than double in case of guar production due to high cost of labour and seed.

4.4.2 Returns from Guar production

The analysis of cost and return structure revealed that guar production was profitable in the study area. Per acre average guar seed production in the study area was 1.74 quintal and the average price of guar seed was Rs.8970 per quintal. Thus BC Ratio obtained in guar cultivation was 1.86. Even though the cost of cultivation of guar was higher at

Rs.8375.71, still the gross returns were also substantially higher resulting in good net returns. This is reflected in higher Benefit Cost Ratio (Table 4.10). The ROI in the cultivation of guar was also good at 86.34 per cent. However, most of the farmers in the study area were still following traditional methods of cultivation that led to the higher cost of cultivation. Therefore it is essential to educate the guar farmers to use new and improved techniques so that the cost of cultivation can be reduced. This would facilitate in further enhancing profitability of guar cultivation.

Table 4.10. Cost and return structure of Guar production

Sl. No.	Particulars	Unit	Quantity
1	Guar seed produced (per acre)	Quintal	1.74
2	Price of guar seed (per quintal)	Rs	8970
3	Total cost per acre	Rs	8375.81
4	Gross return per acre	Rs	15607.8
5	Net return per acre	Rs	7232.09
6	BC Ratio	-	1.86
7	ROI	Per cent	86.34

(Source: Estimates from the survey data of the study, kharif season.2012-13)

4.5 MARKETING CHANNELS OF GUAR GUM AND THEIR EFFICIENCY

The selection of marketing channel becomes imperative for the farmers, since the real benefit accrued to them mainly depends upon the choice of agency and channel for disposal of their produce. The channel selected by them must account for minimum marketing cost and ensure higher share in consumer's rupee. The selection of marketing channel depends upon quantity of marketable surplus available with the farmer, withholding capacity of the farmer, price structure, availability of infrastructure facilities etc.

4.5.1 Marketing channels and price spread in Guar gum

The marketing channel is the chain of intermediaries through whom the produce move from producers to consumers. Price spread refers to the difference between consumer price and net price received by the producer. The difference consists of the charges borne by the producer and other market functionaries against marketing margin of

intermediaries involved in the system. In the study area, two important channels were identified in marketing of guar gum in different markets and price spread has been calculated for these channels.

Channel-I Producer- Commission agent-Processor-Exporter

Channel-II Producer-Processor-Exporter

The study also revealed that nearly 75 per cent of the guar growers prefer channel II and this channel is more popular and convenient to the farmers. Only 25per cent of the selected producers prefer to sell through channel I.

Price spread in marketing channel I

Price spread for guar gum in channel I is given in Table 4.11. The analysis indicates that the net share of the producer in the consumer's rupee was 75.69 per cent. The cost incurred by producer on bagging, loading and unloading, transportation, spoilage loss and other expenses etc. was Rs. 95.08 per quintal which is 0.80 per cent of consumer's rupee. Among all the costs, bagging cost was high which shared 0.21 per cent of total cost paid by the consumer. Net price received by the farmer was Rs. 8874.92.

Table 4.11. Price spread in Guar gum marketing through channel-I (Producer-Commission agent- Processor-Exporter)

Sl.No.	Particulars	Rs./quintal	% of consumer price
1	Price received by the farmer as a producer	8970.00	75.69
2	Marketing cost incurred by producer		
	Bagging	24.50	
	Loading and unloading	5.20	
	Transportation	55.70	
	Spoilage	5.50	
	Other expenses	4.18	
3	Total marketing cost of producer	95.08	0.80
4	Net price received by the producer	8874.92	74.89
5	Selling price of farmer or purchase price of commission agent	8970.00	75.69
6	Marketing cost incurred by commission agent		
	Transportation	54.90	

	Loading and unloading	4.50	
	Weighing	2.20	
	Market tax @ 1 per cent	89.70	
	Storage cost	2.65	
	Spoilage	3.72	
	Other expenses	5.20	
7	Sub total	162.87	1.37
8	Commission agent's margin	330.28	2.79
9	Total marketing cost of commission agent	493.15	4.16
10	Selling price of commission agent or processor's purchasing price	9463.15	79.86
11	One quintal guar seed = 33 kg guar gum (processing efficiency is 33%)		
12	Marketing cost incurred by processor		
	Salaries to permanent employees	52.35	
	Cost of packing material	13.21	
	Power charges	155.60	
	Transportation cost	42.60	
	Labour charges	56.06	
	Office maintenance & telephone charges	22.36	
	Sales tax	150.80	
13	Sub total	492.98	4.16
14	Processor's margin	1893.87	15.98
15	Total marketing cost of processor	2386.85	20.14
16	Selling price of processor or purchasing price of consumer/ exporter	11850	100
17	Price spread	2975.08	25.10
18	Producer's share in consumer rupee		74.89

(Source: Estimates from the survey data of the study.2013)

The commission agent sold directly to the processor at Rs.9463.15 per quintal. The cost incurred by commission agent were the market fee @ 1per cent, transportation cost, bagging, weighing, loading and unloading, storage cost, spoilage and miscellaneous charges etc. which was Rs.162.87 per quintal i.e. 1.37 per cent of consumer's rupee. Thus, the margin retained by the commission agent amounted to Rs.330.28 per quintal which is 2.79 per cent of the consumer's rupee. Among the other costs, market tax was high which shared 0.76 per cent of the consumer's rupee.

The processor sold directly to the exporter at Rs.11850.00 per quintal. The cost incurred by processor were, salaries to permanent employees, cost of packing material, power charges, transportation cost, wages of labour, office maintenance and telephone charges, sales tax etc. which was Rs.492.98 per quintal i.e. 4.16 per cent of consumer's rupee. Thus, the margin retained by the processor amounted to Rs.1893.87 per quintal which is 15.98 per cent of consumer's rupee. The price spread which shows the difference between price paid by the consumer and price received by the producer is Rs.2975.08 per quintal.

Price spread in marketing channel – II

Price spread for guar gum in channel-II is given in Table 4.12. This table indicates that the net share of the producer in the consumer's rupee was 78.98 per cent. Producer sells to the processor at Rs.8970.00 per quintal. The cost incurred by producer on bagging, loading and unloading, transportation cost, spoilage and miscellaneous charges etc. was Rs.80.07 per quintal which is 0.71 per cent of consumer's rupee. Thus, net price received by the producer was Rs.8889.93.

Table 4.12. Price spread in Guar gum marketing through channel-II (Producer-Processor-Exporter)

Sl.No.	Particulars	Rs./quintal	% of consumer price
1	Price received by farmer as a producer	8970.00	78.98
2	Marketing cost incurred by producer		
	Bagging	24.50	
	Loading and unloading	5.42	
	Transportation	42.56	
	Spoilage	4.39	
	Other expenses	3.20	
3	Total marketing cost of producer	80.07	0.71
4	Net price received by producer	8889.93	78.28
5	Selling price of farmer or purchase price of processor	8970.00	78.98
6	One quintal guar seed = 33 kg guar gum (processing efficiency is 33%)		
7	Marketing cost incurred by processor		
	Salaries to permanent employees	52.35	
	Cost of packing material	13.21	

	Power charges	155.60	
	Transportation cost	42.60	
	Labour charges	56.06	
	Office maintenance & telephone charges	22.36	
	Sales tax	150.80	
8	Sub total	492.98	4.34
9	Processor's margin	1893.87	16.68
10	Total marketing cost of processor	2386.85	21.02
11	Selling price of processor or purchase price of exporter	11356.85	100
12	Price spread	2466.92	21.72
13	Producer's share in consumer rupee		78.28

(Source: Estimates from the survey data of the study.2013)

The processor sold directly to the exporter at Rs.11356.85 per quintal. The cost incurred by processor were, salaries to permanent employees, cost of packing material, power charges, transportation cost, wages of labour, office maintenance and telephone charges, sales tax etc. which was Rs.492.98 per quintal i.e. 4.34 per cent of consumer's rupee. Thus, the margin retained by the processor amounted to Rs.1893.87 per quintal which is 21.02 per cent of consumer's rupee. The price spread which shows the difference between price paid by the consumer and price received by the producer was Rs.2466.92 per quintal.

Thus the above analysis clearly shows that longer the channel and more the number of intermediaries in the system, larger is the price spread and the share of producer in consumer rupee declines. The above results are in accordance with the findings of Thakare *et al.* (2011) who also gave similar results in their study on economics of production and marketing of cowpea in Amravati district of Maharashtra.

4.5.2 Marketing channel efficiency

The efficiency of each channel is analyzed and presented in the Table 4.13. Marketing Efficiency moves around the fact that to what extent the marketing agencies have been able to move the goods at minimum cost extending the maximum service from producer to final consumer.

Table 4.13. Marketing efficiency of different marketing channels

Sl.No.	Channel	Consumer's price (V)	Total marketing cost* (I)	Marketing Efficiency (M)
1	Channel I	11850.00	2975.08	2.98
2	Channel II	11356.85	2466.92	3.60

(Source: Estimates from the survey data of the study.2013)

*Total marketing cost includes marketing cost and profit margin of intermediaries

Marketing Efficiency (M) represents the effectiveness of a marketing system which it operates. The Marketing Efficiency for channels I and II were 2.98 and 3.60 respectively. It is concluded that the channel II is more efficient than channel I. This is because of the fact that channel-II involves only one intermediary and hence, this channel was more efficient than channel I. The channel I is seen as the less efficient because of presence of more intermediaries and multiplicity of margins to the intermediary and losses due to spoilage.

4.6 ECONOMIC EFFICIENCY OF GUAR PROCESSING PLANT

Guar seeds are processed in order to obtain the guar gum which is the main value added product used for industrial purpose.

4.6.1 Guar gum manufacturing process:

Depending upon the requirement of end product, various techniques are used for processing of guar. In India, commercial production of guar gum contains process of roasting, differential attrition, sieving and polishing. Using heating, grinding and polishing process, the husk is separated from the endosperm halves and the refined guar gum split is obtained. The stage wise process of manufacturing guar gum powder is as follows:

Screening of guar splits: Selected guar splits are screened to remove impurities like dust, churi and korma particles.

Prehydration of guar splits: Screened guar splits are then taken in a double cone mixer and required amount of water is added in the mixer. Prehydrating stage is very important in the process as it derives the rate of hydration of the final product.

Flaking, grinding and drying of guar splits: Soaked and hydrated guar splits, which have reasonably high moisture content, are passed through a flaker. The flaked guar splits are ground followed by drying of the material.

Screening of guar powder: The powder is then screened through rotary screens to deliver required particle size. Oversized material is either recycled or reground, as per viscosity and particle size requirements. The soaked splits are difficult to grind. Direct grinding of such splits generates more heat in the grinder, an undesirable process, as it results in insoluble or reduced hydration in the end product.

During the splits separation process, husk and germ are obtained and these are widely used as cattle feed, as they are rich in protein.

4.6.2 Economic efficiency of Guar processing plant

To assess the economic efficiency of guar processing plant; investment pattern and cost and return structure were estimated. Apart from that financial feasibility parameters such as NPV, BCR, IRR, Pay Back Period were also calculated.

4.6.2.1 Investment pattern in Guar processing unit

The investment pattern of large scale guar processing units was taken for the study and it is indicated in Table 4.14. One lead processing unit from each district was taken for the study of economic efficiency of plant. The requirement of capital investment increased with the increase in size of the units because of the increased requirement of land, building, machinery and other fixtures on the one hand and the increased requirement of working capital on the other. It can be seen that the fixed capital investment on the guar processing units was highest on buildings (39.32 %) followed by machinery and equipments like aspirators, separators, driers, graders, hi-tech machineries etc. (28.35 per cent), land (21.61 per cent), infrastructure (6.79 per cent) and other fixtures (3.93 per cent). The total capital investment was Rs. 241.60 lakh for the unit of size 20 TPD or 5000 TPA processing capacity considering 250 working days in a year. The fixed capital investment on other fixtures like almirahs, lockers and electrical installations was Rs.9.5 lakhs (3.93 per cent).

4.6.2.2 Cost and returns of value added product of Guar

Guar processing units taken in the study are large in size hence they required huge initial investment. It requires 3-4 months time to set up the plant and start the activities. In the present study, the one leading guar processing unit from each district, involved in production of guar gum is selected for the study. The processing capacity of the unit was 5000 tonnes of guar seed in a year. Processing units were working for 8 hours in a day and 250 days in a year.

Table 4.14. Investment pattern in Guar processing unit (Rs. in lakhs)

Sl.No.	Particulars	Amount	Percentage
1	Land	52.2	21.61
2	Building	95.0	39.32
3	Machinery and equipment	68.5	28.35
4	Infrastructure	16.4	6.79
5	Other fixtures*	9.5	3.93
	Total	241.6	100

(Source: Estimates from the survey data of the study.2013)

*Other fixtures include almirahs, lockers, electrical installations etc.
Figures in the parentheses indicate percentages of the total

The main component of fixed costs of processing unit of guar seed was salaries to permanent employees (Rs.25 lakh /year). The permanent employees of the processing unit are trained to take up the assigned job and hence need to be paid suitably. The depreciation on the machinery and equipments also formed a major cost component since the value was Rs.68.5 lakhs with 15 years of expected life. The interest on fixed capital was employed @ 9 per cent and it also constituted an important component in the fixed cost. Thus the total fixed cost was worked out to Rs.46.69 lakhs for a year.

The major component of variable cost incurred was raw material i.e. guar seed, which had 87.32 per cent of the total cost of processing unit. The second major component was the interest on working capital which constituted 7.78 percent of the total processing cost. The guar gum processing machineries require consistent and long hours electricity supply to fulfill the high demand for export purpose. Sales tax paid form of value added tax (VAT) was Rs,75 lakhs for a year and it accounted to 1.38 per cent of the total processing cost. The other costs involved in the variable costs are cost of packing

material, transportation cost, wages for labour, telephone charges and office maintenance cost. Thus the total variable cost worked out as Rs.5381.00 lakhs for a year. The total processing cost of a plant having a capacity of 5000 TPA was worked out to be Rs.5427.69 lakhs.

Table 4.15. Structure of processing cost of Guar seed into Guar gum **(**Rs. in lakhs)

Sl.No.	Particulars	Amount	Percentage
A	**Fixed cost**		
1	Salaries to permanent employees	25.00	0.46
2	Depreciation	05.48	0.10
3	Others	01.50	0.03
4	Interest on fixed capital	14.71	0.27
	Total fixed cost	46.69	0.86
B	**Variable cost**		
1	Cost of raw material purchased	4739.37	87.32
2	Cost of packing material	06.50	0.12
3	Power charges	77.80	1.44
4	Transportation cost	21.30	0.39
5	Wages for labour	28.00	0.51
6	Office maintenance	09.50	0.18
7	Telephone charges	01.22	0.02
8	Sales tax	75.00	1.38
9	Interest on working capital	422.31	7.78
	Total variable cost	5381.00	99.14
	Total cost	5427.69	100

(Source: Estimates from the survey data of the study.2013)

4.6.2.3 Cost and return structure of Guar processing plant

The processing plant of capacity 20 TPD gave an output of 7 TPD of guar gum. Total cost of the processing was Rs 5427.69 laks and the gross return was Rs 6037.50 lakh. The price of guar gum during the study period was Rs.34500 per ton. Therefore a net return of Rs.609.81 lakh was obtained from the processing of guar seed into guar gum.

Thus, for every rupee of investment in guar gum processing, about Rs.1.11 was obtained as returns, indicating its profitability.

Table 4.16. Returns structure of Guar seed processing into Guar gum

Sl. No.	Particulars	Value
1	Quantity of guar seed processed (tonnes)	20
2	Quantity of guar gum produced (tonnes)	7
3	Price of guar gum (Rs/qtl)	34500
4	Total cost (lakh Rs/year)	5427.69
5	Total cost (lakh Rs/ton)	3.10
6	Gross return (Rs/year)	6037.50
7	Gross return per ton of guar seed processed (Rs)	3.45
8	Net return (Rs)	609.81
9	Net return per ton of guar seed processed (Rs)	0.35
10	BC Ratio	1.11

(Source: Estimates from the survey data of the study.2013)

4.6.2.4 Financial feasibility of Guar processing unit

Guar processing unit, once established continues to generate returns up to 15 years. To establish guar processing unit, the initial investment depends on the capacity of the plant. The costs and returns are analyzed carefully to test the worthiness of investment in processing enterprise. This would help guar processors in making appropriate decision making. The techniques of project evaluation such as Net Present Value, Benefit-Cost Ratio, Pay Back Period and Internal Rate of Return were employed to assess the financial feasibility of investment on guar processing units. In analyzing the investment feasibility, the establishment costs, maintenance costs and gross returns from the guar processing units were discounted at 14 percent discount rate to since it represents the opportunity cost of the capital. Large scale processing units involved in production of guar gum having a processing capacity of 5000 TPA of guar seed were taken for the study to assess the financial feasibility.

The Net Present Value (NPV) criterion helps to evaluate the benefits accrued and costs incurred during the project life. The advantage of NPV is that it gives an idea about surplus and varies with level of investment and discount rates. In this study, NPV was calculated to indicate the money that would be generated by a project at a given discount rate. It is an absolute measure by discounting the net cash inflows. The NPV of

guar processing unit at 14 per cent discount rate was Rs 1101.04 lakh (Table 4.17). The formal selection criterion of NPV is to accept all the projects with positive values. Applying this principle, the Net Present Value of guar processing units clearly indicated financial feasibility of investment.

Benefit-Cost (BC) Ratio is another tool for appraising the worthiness of investment and it helps to ascertain the profitability of an enterprise. In production of guar gum, initial investment was made to establish the guar processing units and maintenance costs be incurred during subsequent years of establishment. The decision in BC Ratio frame work is to select the projects where the ratio is more than one. The BC ratio of the processing unit confined 1.11 at 14 per cent discount rate, which is more than unity indicating the worthiness of investment on these units.

Internal Rate of Return (IRR) is suggested to be very suitable measure for evaluating the profitability of investment on different projects. The IRR is the rate of discount at which the net present worth of project is zero or the discounted costs are equal to the discounted returns. It is superior over the other measures since it takes into consideration the reinvestment opportunities of enterprises during the life span. The formal selection criterion of IRR is to accept the projects with IRR more than the opportunity cost of capital. The Internal Rate of Return being 72.53 per cent for guar processing units was higher than the interest rate at which the processors could borrow from lending agencies and invest on these units. In other words, it is the average earning power of money invested on guar processing units during its life span. Since IRR was more than the opportunity cost of capital, it clearly indicated that investment on guar processing units is financially feasible.

The Pay Back Period refers to the time required for the net benefits to equal the cost of the project. In the present study, it worked out to be 2 years 24 days. Thus, it is calculated that the investment in guar processing units is financially feasible and economically viable.

Table 4.17. Estimates of investment analysis parameters in Guar processing unit

Sl. No.	Particulars	Unit	Value
1	Net Present Value (NPV)	Lakh Rs	1101.04
2	Benefit Cost Ratio (BCR)	-	1.11
3	Internal Rate of Return (IRR)	Per cent	72.53
4	Pay Back Period (PBP)	Years	2 years 24 days

(Source: Estimates from the survey data of the study.2013)

4.7 PROBLEMS ENCOUNTERED IN PRODUCTION AND MARKETING OF GUAR

In this section an attempt has been made to analyze the problems faced by producers, intermediaries and processors in the production, marketing and processing of guar in the study area. The producers, commission agents and processors were asked to indicate the most important problem faced by them and the results are presented below

4.7.1 Problems faced by producers in the production of Guar

It is observed from the Table 4.18 that the major problems faced by the producers in the production and marketing of guar of were; Inadequate supply of quality certified seed, lack of irrigation facilities, electricity problem, labour scarcity, high cost of inputs and non availability of technical know how.

Table 4.18. Problems faced by producers in the production of Guar

Sl.No.	Particulars	No. of farmers	Percentage
1	Inadequate supply of quality certified seed	52	43.33
2	Lack of irrigation facilities	23	19.16
3	Electricity problem	19	15.83
4	Labour scarcity	12	10.00
5	High cost of inputs	9	7.50
6	Non availability of technical know how	5	4.16
	Total	**120**	**100**

(Source: Estimates from the survey data of the study.2013)

Inadequate supply of quality certified seed was the major problem expressed by 52 farmers that constituted about 43.33 percent of the total number of farmers followed by lack of irrigation facility which was expressed as a major problem by 23 farmers (19.16 per cent). Electricity problem was expressed as a major problem by 19 farmers (15.83 per cent) and 12 farmers (10.00) expressed labour scarcity as a major bottleneck in the production of guar. High cost of inputs was highlighted as a major problem by 9 farmers (7.50 per cent) whereas only 5 farmers (4.16 per cent) expressed that non availability of technical know how was a major problem in the guar production.

4.7.2 Problems faced by commission agents in the marketing of Guar

It is observed from the Table 4.19 that the major problems faced by the commission agents in the marketing of guar of were; lack of storage facilities, lack of transportation facilities, delay in payments, high market taxes and lack of grading facilities. Lack of storage facility was the major problem expressed by 4 (33.33 per cent), the maximum number of total commission agents. Lack of transportation facilities and delay in payments, both were expressed as a major problem by 3 commission agents (25 per cent) distinctly. High market taxes and lack of grading facilities were highlighted as a major bottleneck by 1 processor distinctly (8.33 per cent).

Table 4.19. Problems faced by commission agents in the marketing of Guar

Sl.No.	Particulars	No. of respondents	Percentage
1	Lack of storage facility	4	33.33
2	Lack of transportation facility	3	25
3	Delay in payments	3	25
4	High market taxes	1	8.33
5	Lack of grading facilities	1	8.33
	Total	**12**	**100**

(Source: Estimates from the survey data of the study.2013)

4.7.3 Problems faced by processors in the processing of Guar

It is observed from the Table 4.20 that the major problems faced by the processors in the processing of guar of were; non availability of input or raw material, electricity problems, transportation problems, lack of effective technology and high cost of labour. Non availability of input i.e. guar seed, was the major problem expressed by 3 processors that constituted about 30 percent of the total number of processors followed by electricity problem which was also expressed as a major problem by 3 processors (30 per cent). Transportation problem was expressed as a major problem by 2 processors (20 per cent). Lack of effective technology and high cost of labour were expressed as major problems by one processor distinctly which constituted 10 per cent of the total number of processors.

Table 4.20. Problems faced by processors in the processing of Guar

Sl.No.	Particulars	No. of processors	Percentage
1	Non availability of input	3	30
2	Electricity problems	3	30
3	Transportation problems	2	20
4	Lack of effective technology	1	10
5	High cost of labour	1	10
	Total	**10**	**100**

(Source: Estimates from the survey data of the study.2013)

Chapter V

SUMMARY AND CONCLUSION

Guar (cluster bean) is an important semi arid legume crop of the country. In India, guar was introduced through Africa, further it spread to many countries. India and Pakistan account for 95 per cent of the world's guar production and it is mainly produced for export of guar gum after processing. India ranks first in production of guar in the world.

With regard to area and production in India, Rajasthan secured first rank. The demand for guar gum in international market is increasing over time. It earns a sizeable amount of foreign exchange through its exports. In spite of good produce obtained, without proper marketing, all efforts will go waste. In the light of above fact, it is felt necessary to conduct a micro level study and examine the prospects of guar industry in India and to know the problems associated with production, marketing and processing of guar.

The study was under taken with the following specific objectives:

1. To study the trend in area, production and productivity of guar in India as well as in Rajasthan state.
2. To analyze the cost and return pattern of guar production in the study area.
3. To study the various marketing channels and their efficiency.
4. To assess the trend in exports of value added product of guar.
5. To study the economic feasibility of guar processing plant in the study area.
6. To understand the problems encountered by the farmers and other stakeholders in production and marketing of guar.

To fulfill the objectives of the study, the data were collected through personal interviews from the selected guar growers, marketing intermediaries and processors with the help of pretested scheduled designed for the purpose. Besides data on quantity purchased, price paid/received, costs incurred were collected from the market functionaries. Data on establishment cost of guar gum plant, processing cost were collected from processors. The data collected was subjected to various analytical tools apart from functional analysis. The various problems associated with production, marketing and processing were also analyzed.

MAJOR FINDINGS OF THE STUDY

Trend in area, production and productivity of Guar

The Compound Growth Rates for area, production and productivity of guar in India during 2002-03 to 2011-12 were 7.58 per cent, 16.07 per cent and 1.60 per cent respectively. Growth rate is not significant for all three variables.

The Compound Growth Rates of area, production and productivity of guar in Rajasthan during 2002-03 to 2011-12 were estimated to be 12.24, 26.51 and 12.75 per cent respectively. Among the all three variables, only the growth rate of area is significant.

Trend in exports of Guar gum

The Compound Growth Rates for quantity and value of guar gum exported from India during 2003-04 to 2012-13 were 18.28 per cent and 44.90 per cent. Growth rates for both quantity and value were found statistically significant. USA is the leading importer of Indian guar gum due to its high demand in petroleum refineries of USA.

Socio-economic profile

It is observed that only 16.70 per cent of the total respondents were illiterate. About 43.33 per cent of the farmers were in the age group of 35 and 50. The average family size of the farmers was six. The average size of the land holding was 2.8 hectares and about 57.50 per cent of farmers were having medium size land holdings.

Cost and return pattern of Guar production

The guar cultivation in the study area was totally under rain fed conditions because of the non-availability of irrigation sources and semi arid conditions. The machine labour utilization was found low in the study area for guar cultivation as most of the farmers were still using traditional cultivation practices. Total cost of cultivation of guar was Rs. 8375.71 per acre and average production per acre was 1.74 quintal in the study area. The returns were per quintal was Rs. 8970.00 per quintal hence, the Benefit Cost Ratio for guar production was 1.86 i.e. for every rupee investment, farmers were getting Rs. 1.86. The Return on Investment was found to be 86.34 per cent.

Marketing channels

Marketing system of guar was observed to be totally producer dominant as majority of the producers were selling their produce directly to the processors. Two important channels of guar marketing were identified and are here under

Channel I Producer-Commission agent-Processor-Exporter

Channel II Producer-Processor-Exporter

PRICE SPREAD OF GUAR

Channel I (Producer-Commission agent-Processor-Exporter)

In channel I, the net share of the producer in the consumer's rupee was 74.89 per cent. The cost incurred by producer was Rs.95.08 per quintal which is 0.80 per cent of consumer's rupee. The commission agent sold directly to the processor at Rs.9463.15 per quintal. The cost incurred by commission agent was Rs.162.87 per quintal which is 1.37 per cent of consumer's rupee. The margin retained by the commission agent amounted to Rs.330.28 per quintal which is 2.79 per cent of consumer's rupee. The processor sold directly to the exporter/consumer at Rs.11850.00 per quintal. The cost incurred by processor was Rs.492.98 per quintal. The price spread which shows the difference between price paid by the consumer and price received by the producer is Rs. 2975.08 per quintal.

Channel II (Producer-Processor-Exporter)

In channel-II, the net share of the producer in the consumer's rupee was 78.28 per cent. Producer sold to the processor at Rs.8970.00 per quintal. The cost incurred by producer was Rs.80.07 per quintal which is 0.71 per cent of consumer's rupee. Thus, net price received by the producer was Rs.8889.93. The processor sells directly to the exporter/consumer at Rs.11356.85 per quintal. The cost incurred by processor was Rs.492.98 per quintal i.e. 4.34 per cent of consumer's rupee. Thus, the margin retained by the processor amounted to Rs.1893.87 per quintal which is 21.02 per cent of consumer's rupee. The price spread which shows the difference between price paid by the consumer and price received by the producer was Rs.2467.31 per quintal. Thus the above analysis clearly shows that longer the channel and more the number of intermediaries in the system, bigger the price spread and the share of producer in consumer rupee declines.

Economic efficiency of Guar gum processing plant

The precise scanning of large scale processing units was done to assess the economic efficiency of guar gum processing plant. It was found in the study that establishment of large scale unit requires high investment. In the findings of research, the initial investment of processing unit was Rs. 241.6 lakh in which major investment was on Building (95 lakh) followed by Machinery and equipments (68.5 lakh).

Processing cost of guar gum was calculated on yearly basis. Out of total processing cost the major share was occupied by cost of raw material which accounted 87.32 per cent of the total processing cost. Other major cost were taxes, salaries to permanent employees, transportation charges etc. The returns structure of the guar gum processing plant revealed that Benefit Cost Ratio was 1.11 for the plant having processing capacity of 5000 TPA guar seed. The NPV and IRR for the investment were found to be Rs.1101.04 lakh and 72.53 per cent respectively at 14 per cent discount rate showing the financial feasibility of investment. The Pay Back Period for the investment was 2 years 24 days. Thus it can be analyzed that investment pattern in guar processing plant is financially feasible and profitable for investors.

Production and marketing constraints

Different types of constraints encountered by the farmers, intermediaries and processors were analyzed in the study. The major problem faced by the farmers in the production of guar was inadequate supply of quality certified seed followed by lack of irrigation facilities as the study areas comes in desert part of Rajasthan. The other problems faced by farmers were electricity problem, labour scarcity, high cost of inputs and non availability of technical know how.

Lack of storage facility was the major problem expressed by intermediaries followed by lack of transportation facilities and delay in payments. Other problems expressed by intermediaries in marketing of guar were high market taxes and lack of grading facilities. Non availability of input i.e. guar seed, was the major problem expressed by processors followed by electricity and transportation problems. Lack of effective technology and high cost of labour were some of the other problems expressed by processors in the processing of guar.

CONCLUSIONS

It may be concluded from the study that there is an immense scope for expansion of area, production and productivity of guar in Rajasthan as well as in other suitable parts of India. The cost of cultivation for guar is somewhat higher but due to good demand in market, the returns are also very high resulted in good net margin by the producers. Producers can get a net profit of Rs.8303.77 per acre by guar cultivation in case of good monsoon or well irrigated facilities. The system of marketing reveals that the guar growers get good share in price paid by exporters and there is a need to promote the guar cultivation among the farmers so that they can get good earnings. Out of the two channels of guar gum marketing, second channel i.e. producer-processor-exporter was the more efficient from producer as well as consumer point of view as the producer could get as high as 78.28 per cent of the consumers rupee. Further it is found that marketing channel efficiency index was the higher in channel II (3.60) than channel I (2.98).

There is a huge demand of Indian guar gum in the international market, showing the great scope in the future. The USA is the largest importer followed by China and Germany. The guar gum processing is a profitable business for the investors and it can be seen by good Benefit Cost Ratio (1.11) and lower Pay Back Period. The investment is also financially feasible as represented by NPV and IRR of the investment in the findings of the study. The major problem identified in production of guar was lack of certified seeds at the time of sowing and major problem faced by intermediaries was lack of storage facilities in the market premises. The major problem of the processor in the processing was unavailability of input i.e. guar seed during the peak season.

SUGGESTIONS AND POLICY IMPLICATIONS

1. The trend in area, production and productivity of guar in India and in Rajasthan state has indicated fluctuations during the past few years but still there is a lot of potential for increasing guar production. Therefore, there should be encouragement and good support from research centers and the government bodies to the growers.

2. Major problem of farmers is the non-availability of certified seed at the time of sowing. NSC, SSC, SFCI, SAUs should look after at this point. Well organized research program for seed production of high viscous varieties of guar is needed. MNCs and

Indian seed companies should come ahead to make sure the better availability of quality certified seeds for farmers.

3. Most of the guar producing areas in Rajasthan are totally dependent on monsoon for production of guar. It can be suggested that Indira Gandhi Nahar Pariyojana should be extended from nearby states of Haryana and Punjab upto some areas in Rajasthan so as to ensure the irrigation facilities for guar growers.

4. Most of the guar producing areas of Rajasthan have poor electricity supply. State electricity board and Central government should pay attention towards this. Wind energy plants and solar power plants can be established in desert areas to make sure the better electricity supply to both producers as well as processors.

5. Most of the times, producers are not aware of the prices existing in the market and dispose off the produce at village level itself to intermediary. Adequate and timely information about the market arrivals, varieties preferred, existing prices etc. will help in forecasting the demand and plan accordingly.

6. Marketing infrastructure such as better access to market yards, better roads, good transport facilities, timely payment, provision of storage facilities, credit provision etc. will improve the socio-economic conditions of the producer.

7. Research efforts may focus towards improvement of quality and productivity of the guar in the country. Though government has initiated some programmes to promote the guar production among the growers, the efforts may be intensified. This would enhance the productivity levels.

8. Most of the guar producers are still using traditional cultivation practices in guar production. There is a strong need to intensify the better extension services in order to provide the better information about the new and improved cultivation practices to the farmers.

9. There role of commission agents should be eliminated in the marketing of guar gum. In channel II, due to absence of commission agents the producer’s share in consumer rupee is more. Therefore it is suggested that all the farmers can form a producers association and collectively market the produce more on the co-operative lines so that price spread can be minimized.

10. With the help of an appropriate mechanism the number of intermediaries can be reduced and the commission paid to the mediators can be avoided.

11. There is an immense potential for export of value added products of guar. Therefore lot of focus may be paid towards improving the quality of the produce in order to receive good price of value added products and widen the market.

12. There is need to develop a research and development centre as the centre of excellence for guar. The major activities of this centre could be collection and dissemination of information, promoting usage of guar and its derivatives, development of processing technology according to changing market demand and food safety concerns and development of value added products. This centre should also have R&D facilities and pilot plant/ machinery for trial production of value added derivatives of guar. The centre should also have facilities and authority to issue quality certification. Capacity building of small and medium enterprises in guar processing on the lines of growing food safety concerns is of utmost importance.

13. Consistent funding for Research from government is required. The institutes/ agricultural universities lack funding for guar research.

14. In most of the areas where guar is produced, proper storage facilities are not available. Therefore warehouses should be developed in order to strengthen the storage facilities.

15. Farmer-Industry linkages should be enhanced through direct marketing arrangements at the mandi yards. Contract farming model should also be popularized in the major growing areas.

16. Since guar crop is highly dependent on monsoon rainfall, and if production fails there is no risk cover for farmers. Therefore, crop insurance scheme should be developed for guar crop.

17. Many of the guar processing industries does not have technical manpower/ skilled labour, and operate under unhygienic conditions. There is an urgent need of capacity building of manpower working with guar processing industries in all respect including food safety and quality aspects.

Steps initiated by the government through its various policies and development plans

- The research support for varietal and production technology improvement is provided through the All India Coordinated Research Project (AICRP) on pulses. High yielding varieties of guar are being developed at Central Arid Zone Research Institute (CAZRI), located at Jodhpur. Apart from that research stations are being established by Rajasthan Agriculture University in various parts of Rajasthan in order to develop the improved varieties of guar. Trails are aalso going on at Agriculture Research Station, Durgapura, Jaipur to develop the high yielding varieties of guar. International Crop Research Institute for Semi Arid Tropics (ICRISAT) has also launched some research programmes to develop high yielding and more tolerant varieties of guar.
- The state Governments of Rajasthan, Haryana and Gujarat are also having programmes for promoting guar cultivation among farmers. Rajasthan has special focus on guar production. APEDA is making efforts for improving the export of guar through the creation of infrastructure and enhancing capabilities.
- The exports of agricultural produce, minor forest produce and village and cottage industry products would be awarded duty free scrip at the rate of 5 per cent of the FOB value of exports under the *Vishesh Krishi and Gram Udyog Yojana* (VKGUY). In order to promote indigenous sourcing, a built-in incentive has been introduced under the VKGUY for exporters utilizing domestic raw materials for export production. Such exports would get additional benefits under VKGUY @ 1.5 per cent of FOB value of exports compared to those who use imported agricultural products.

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APPENDICES

A. QUESTIONNAIRE FOR FARMERS
BUSINESS VIABILTY AND POTENTIAL OF GUAR (CLUSTER BEAN) INDUSTRY IN INDIA

No_____ Date_____

I. General Information:

(a) Name of the Farmer: _____

(b) Age of the farmer:_____

(c) Name of Village: _____

(d) Tehsil: _____

(e) District:_____

(f) Main occupation: _____

(g) Subsidiary occupation: _____

(h) Total land area owned:_____

i) Dry_____ ii) Irrigated_____

(i)Family size:_____

i) Adults_____ ii) Children_____

(j) Educational status (No. of schooling years)____

II. Cost of cultivation of cluster bean (per acre):

Particulars	Physical Units	Average cost/unit	Total cost
Human labour Bullock labour Machinery and equipment Seed Fertilizer Pesticide Miscellaneous Interest on working capital **Total working cost** Depreciation Interest on fixed capital Rental value of owned land **Total fixed cost** **Total cost of cultivation**			

Income parameters :

1.Yield/acre(quintals) :_____ 2.Total yield(quintals) :_____

3.Price/quintal(Rs.):_____ 4.Gross revenue(Rs.) :_____

5.Net revenue(Rs.):_____

III.Marketing cost incurred by the Producer

Sl. No.	Materials	Cost (Rs.)
	Gross price received by the farmer	
1.	Bagging	
2.	Loading and unloading	
3.	Transportation	
4.	Spoilage	
5.	Commission paid to commission agent	
6.	Incidental charges	
	Total expenditure incurred by the producer	
	Net price received by the farmer	

Sold to whom_____

Place of sale_____

IV. Which problem do you think is the most crucial in the production of cluster bean :

Sl.No.	Problem	Priority given
1.	Lack of irrigation facilities	
2.	Electricity problem	
3.	Labour scarcity	
4.	Non availability of technical know how	
5.	High cost of inputs	
6.	Inadequate supply of quality certified seed	

B. QUESTIONNAIRE FOR INTERMEDIARIES
BUSINESS VIABILTY AND POTENTIAL OF GUAR (CLUSTER BEAN) INDUSTRY IN INDIA

No._____ Date_____

I.General Information :

Type of Intermediary:_____

Name :_____Age :_____

Village :_____ Tehsil :_____ District :_____

Educational qualification:_____

Produce purchased from :_____

Sold to whom :_____

Quantity purchased :_____ Quantity sold :_____

II.Marketing cost incurred by the intermediary _____ (Rs./Qtl.)

Sl. No.	Particulars	Cost in Rs.
1.	Transportation	
2.	Loading and unloading	
3.	Weighing	
4.	Market tax	
5.	Storage cost	
6.	Spoilage	
7.	Other expenses	
8.	Margin	
9.	**Total marketing cost**	

III.Which problem do you think is the most crucial in the marketing of cluster bean :

Sl.No.	Problem	Major Problem
1.	Lack of storage facility	
2.	Lack of transportation facility	
3.	Dealy in Payments	
4.	High market taxes	
5.	Lack of grading facilities	

C. QUESTIONNAIRE FOR PROCESSING UNITS
BUSINESS VIABILTY AND POTENTIAL OF GUAR (CLUSTER BEAN) INDUSTRY IN INDIA

I. General Information:

(a) Name of the Respondent: _____ (b) Location:_____

(c) Year of establishment: _____(d) Labours employed: _____

(e) Products manufactured: _____(h) Total investment: _____

II. Investment Pattern :

Sl.No.	Particulars	Value (Rs. Lakhs)
1.	Land	
2.	Building	
3.	Machinery and equipments	
4.	Infrastructure	
5.	Other fixures	

III. Processing cost of Guar seed into Guar gum:

Sl.No.	Particulars	Amount (Rs. Lakhs)
1	Salaries to permanent employees	
2	Cost of raw material purchased	
3	Cost of packing material	
4	Power charges	
5	Transportation cost	
6	Wages for labour	
7	Office maintenance	
8	Telephone charges	
9	Sales tax	

IV. Problems faced by the Processors:

Which problem do you think is the most crucial in the processing of cluster bean:

Sl.No.	Problem	Major Problem
1.	Non availabilty of inputs	
2.	Electricity problems	
3.	Transportation problems	
4.	Lack of effective technology	
5.	High cost of labour	