

**AN ECONOMIC ANALYSIS OF PRODUCTION AND
MARKETING OF CAULIFLOWER (BRASSICA
OLERACEAE VAR. BOTRYTIS.) IN
MIDDLE GUJARAT**

**A
THESIS
SUBMITTED TO THE
ANAND AGRICULTURAL UNIVERSITY
IN PARTIAL FULFILMENT OF THE DEGREE
OF**

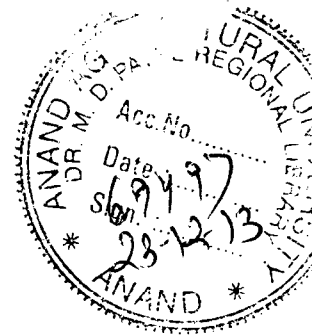
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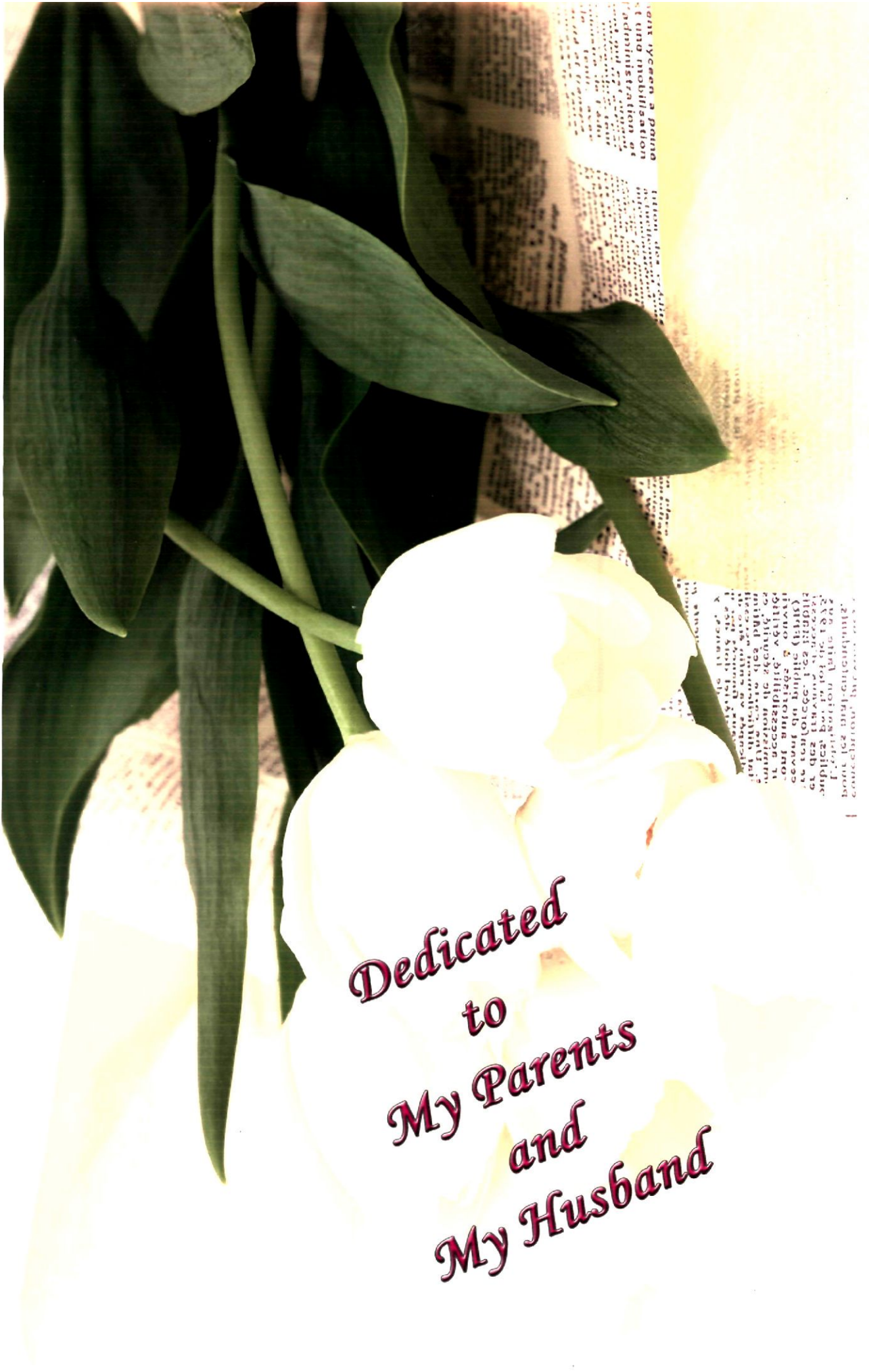
**(Agriculture)
IN
AGRICULTURAL ECONOMICS**

**BY
PATEL PALAKBEN HASMUKHBHAI**

B. Sc. (Agri.)

**DEPARTMENT OF AGRICULTURAL ECONOMICS
B. A. COLLEGE OF AGRICULTURE
ANAND AGRICULTURAL UNIVERSITY
ANAND - 388 110
2013**





*Dedicated
to
My Parents
and
My Husband*

Abstract.



**An Economics Analysis of Production and Marketing of
Cauliflower (*Brassica oleraceae var. botrytis*)
in Middle Gujarat**

Name of Student

Patel Palakben H.

Major Advisor

Dr. R. S. Pundir

ABSTRACT

The present investigation was undertaken with a view to study the cost and return, resource use efficiency, marketing cost and price spread and constraints in production and marketing of cauliflower in middle Gujarat. A multistage random sampling design was used for selecting the sample. The study covered 4 talukas, 12 villages and 120 cauliflower growers (27 marginal, 38 small, 29 medium and 26 large) from Anand and Kheda districts. For studying price spread in marketing, 5 functionaries from each category of cauliflower marketing were randomly selected from Anand and Kheda markets. The major analytical tools employed for the study were tabular analysis, cost concept, production function analysis (using SPSS software) and price spread.

Results of the study indicated that average cost of cultivation (Cost C_2) of cauliflower per hectare was ₹ 73232.95. It was highest ₹ 74577.4 on medium farms and lowest ₹ 72622.81 on large farms. On an average, Cost A (paid out cost) formed 72.46 per cent, while Cost B accounted for 86.07 per cent of total cost. Out of total cost (Cost C_2), human labour cost was ranked first with 15.81 per cent of the total cost followed by fertilizer cost (12.51 per

cent), manure and cakes (11.29 per cent), sapling charges (9.86 per cent), rental value of own land (9.27 per cent), managerial costs (9.09 per cent), tractor charges (8.45 per cent), irrigation charges (7.93 per cent), plant protection chemical (6.57 per cent), interest on fixed capital (4.33 per cent) and bullock labour (2.71 per cent) on overall basis. Thus, these major items of expenditure contributed 97.82 per cent of total cost.

The average yield of cauliflower per hectare was 333.13 quintals on sample farms which realized ₹ 118994.93, ₹ 66361.70, ₹ 56477.47 and ₹ 56250.72 as gross income, farm business income, family labour income and farm investment income, respectively. The net profit per hectare over Cost C₂ was ₹ 46366.49. It varied from ₹ 14939.69 on marginal farms to ₹ 54405.55 on large farms. The overall input-output ratio on Cost C₂ was about 1:1.64 and it was highest on large farms (1:1.75) and lowest on marginal farms (1:1.20). Looking to the cost, return and input-output ratio, it is concluded that cauliflower cultivation was profitable vegetables crop in Middle Gujarat condition.

In order to find out the efficiency of resources used by cauliflower growers, Cobb Douglas production function was employed; taking gross income as dependent variable. This analysis indicates that only cost of bullock labour, plant protection chemical and irrigation were found highly significant influence on the yield. The value of co-efficient of multiple determinations (R^2) was 0.96 which showed that 96 per cent variation in the yield was accounted for the independent variables included in the function. The

sum of regression co-efficient was (1.071) indicating increasing return to scale therefore more rational use of the inputs leading to get higher returns.

As cauliflower is a market oriented crop, on an average about 93 per cent of production was marketed, while negligible portion was utilized for other purposes. The producer to wholesaler-cum-commission agent to retailer to consumer was the major marketing channel as more than 50 per cent of cauliflower moved through this route. The total cost in marketing of cauliflower per quintal was ₹ 337.85 which was 43.19 per cent of the consumers' rupee. Amongst it the highest marketing cost was observed in retailers which accounted for as (₹ 129.25) followed by wholesaler-cum-commission agent (₹ 70.63) and growers (₹ 19.35) per quintal. Results also indicated that commission was the major marketing cost possessed by wholesaler-cum-commission agent while retailer possessed damage cost. The margins in cauliflower marketing amounted to ₹ 224.99 per quintal which was 28.76 per cent of consumers' rupee. The producer's share in consumer's rupee was 43.19 per cent. The marketing efficiency was lower than unity (0.77).

The major production, marketing and economic constraints faced by the cauliflower growers were non availability of fertilizer and labour in time, lack of irrigation facility, fluctuation in market price and long distance market. Further, they also faced the problems of high cost of fertilizers, planting material and pesticides.

Dr. R. S. PUNDIR
Associate Professor and head
Agribusiness Economics & policies
International Agribusiness Management Institute
Anand Agricultural University
Anand - 388 110 Gujarat (India)




C E R T I F I C A T E

This is to certify that the thesis entitled "**AN ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF CAULIFLOWER (BRASSICA OLERACEAE VAR. BOTRYTIS.) IN MIDDLE GUJARAT**" submitted by **Ms. PATEL PALAKBEN HASMUKHBHAI (Reg. No. 04-1621-2011)** in partial fulfilment of the requirements for the award of the degree of **Master of Science (Agriculture)** in the subject of **Agricultural Economics** of the Anand Agricultural University is a record of bonafide research work carried out by him under my guidance and supervision and the thesis has not previously formed the basis for the award of any degree, diploma or any other similar title.

Place : Anand

Date : 29/10/2013



(R. S. Pundir)

Major Guide

DECLARATION

This is to declare that the whole of research work reported herein the thesis for partial fulfilment of the requirement for the degree of **Master of Science (Agriculture)** in the subject of **Agricultural Economics** by the undersigned is a result of investigation done by me under direct guidance and supervision of **Dr. R. S. Pundir**, Associate Professor and head, Agribusiness Economics & Policies, International Agribusiness management Institute, Anand Agricultural University, Anand - 388 110 and no part of work has been submitted for any other degree so far.

Place : Anand

Date : 29/10/2013



(PATEL PALAKBEN H.)

Counter signed by



(R. S. PUNDIR)

Major Guide

Associate Professor & head

Agribusiness Economics & Policies

International Agribusiness Management Institute

Anand Agricultural University

Anand - 388 110

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“God does not work for you but God work with you”

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Place : Anand

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(Patel Palak H.)

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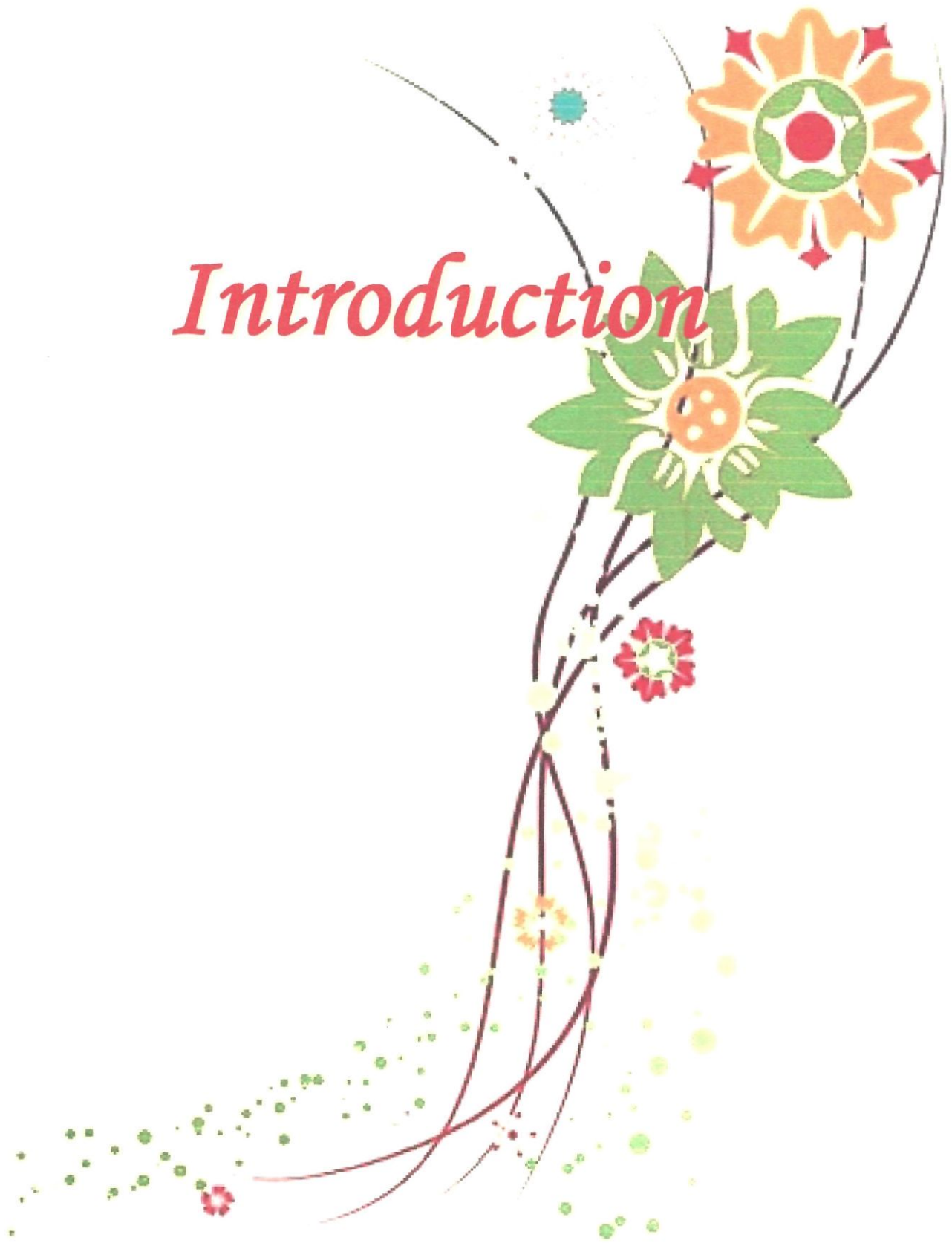
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Introduction



Chapter – I

INTRODUCTION

Agriculture sector plays a pivotal role in Indian economy. Although its contribution to gross domestic product (GDP) has come down to 14.5 per cent. Also, the forward and backward linkage effects of agriculture growth increase the income in non agriculture sector. The growth of some commercial crops may lead to significant potential for promoting exports of agricultural commodities and bring about faster development of agro based industries. Since 1950, the productivity gain is nearly 3.3 times in food grain, 1.6 times in fruits, 2.1 times in vegetables, 5.6 times in fish, 1.8 times in milk and 4.8 times in eggs (Sagar, 2012). (Economic Survey 2012-13).

Horticulture is an important industry among the land based agricultural systems. Horticultural industry is fast emerging as the most remunerative sector for changing the age old subsistence farming specially in the rainfed, dry lands, hills, arid and coastal agro ecosystems. Horticultural crops are characterized by high productivity, higher returns, and higher potential for employment generation and exports. The input-output ratio in most horticultural crops is much higher than that in the field crops. Their role in improving environment is an added advantage.

The horticulture sector includes a wide range of crops, such as fruits, vegetables, root and tuber crops, flowers, aromatics and medicinal plants, spices and plantation crops which facilitate diversification in agriculture. It has been recognized that growing horticulture crops is now an ideal option to improve livelihood security, enhance employment generation, attain food and nutritional security and increase

income through value addition. Cultivation of vegetables is a very important factor contributing to the property of Nation. Fruits and vegetables are the prime source of vitamins and minerals which are useful in resisting the diseases in human.

1.1 SCENARIO OF AREA AND PRODUCTION

World Scenario

Table1.1: Major Cauliflower Producing Countries of World during 2010-11

(Area in hectares; Production in MT; Productivity in MT/ha)

Country	Area	Production	Productivity
India	369000	6745000	18.3
Spain	29000	511100	17.6
Italy	17867	427407	23.9
France	26056	370968	14.2
Pakistan	12637	313414	24.8
U.S.A.	14710	284900	19.4
Poland	15650	252325	16.1
United Kingdom	16496	188300	11.4
Bangladesh	16677	160040	9.6
OTHERS	209498	2122804	10.1
World + (Total)	1118593	18931500	16.9

Source: Indian Horticulture Database 2011

Globally 10125.24 lakh tonnes of vegetables are produced from an area of 539.77 lakh hectares. India is the second largest producer of vegetables in the world with 15.73 per cent and 14.47 per cent of the total world's vegetable crops area and production, respectively. In case of cauliflower, India occupies first position in the production in the world which contributed about 35.63 per cent in production and 32.98 per cent in area during the year 2010-11 in the world. (Yadav, 2012). Other major countries are Spain (2.69 per cent), Italy (2.25 per cent) and France (1.95 per cent) (Anonymous, 2011).

Indian Scenario

India is a country with varied agro climatic condition for growing large number of vegetable crops. It's fortunate to have a wide range of vegetable crops grown in different agro climatic zones and has a pride of place in the production of vegetables.

Table 1.2: Area and Production of Total Vegetables Crops and Cauliflower in India

(Area in '000 hectares; Production in '000 MT)

Year	Total Vegetables Crops		Cauliflower	
	Area	Production	Area	Production
1990-91	5593	58532	202.8	2998.1
2001-02	6156	88622	268.9	4890.5
2002-03	6092	84815	254.6	4444.1
2003-04	6082	88334	267.9	4940.2
2004-05	6744	101246	238.5	4514.8
2005-06	7213	111399	288.6	5323.1
2006-07	7581	114993	302.0	5538.0
2007-08	7848	128449	312.0	5777.0
2008-09	7981	129077	349.0	6532.0
2009-10	7985	133738	347.9	6569.0
2010-11	8495	146554	369.0	6545.0

Source: Indian Horticulture Database 2011

The vegetables were grown on around 84.95 lakh hectares with an annual production of 1465.54 lakh tonnes in the year 2010-11 (Anonymous, 2011). The major vegetable crops grown in India are cauliflower, cabbage, potato, onion, brinjal, tomato, okra, and green peas. (Table 1.2 and Figure 1.1).

Fig. 1.1: Area and Production of Cauliflower in India

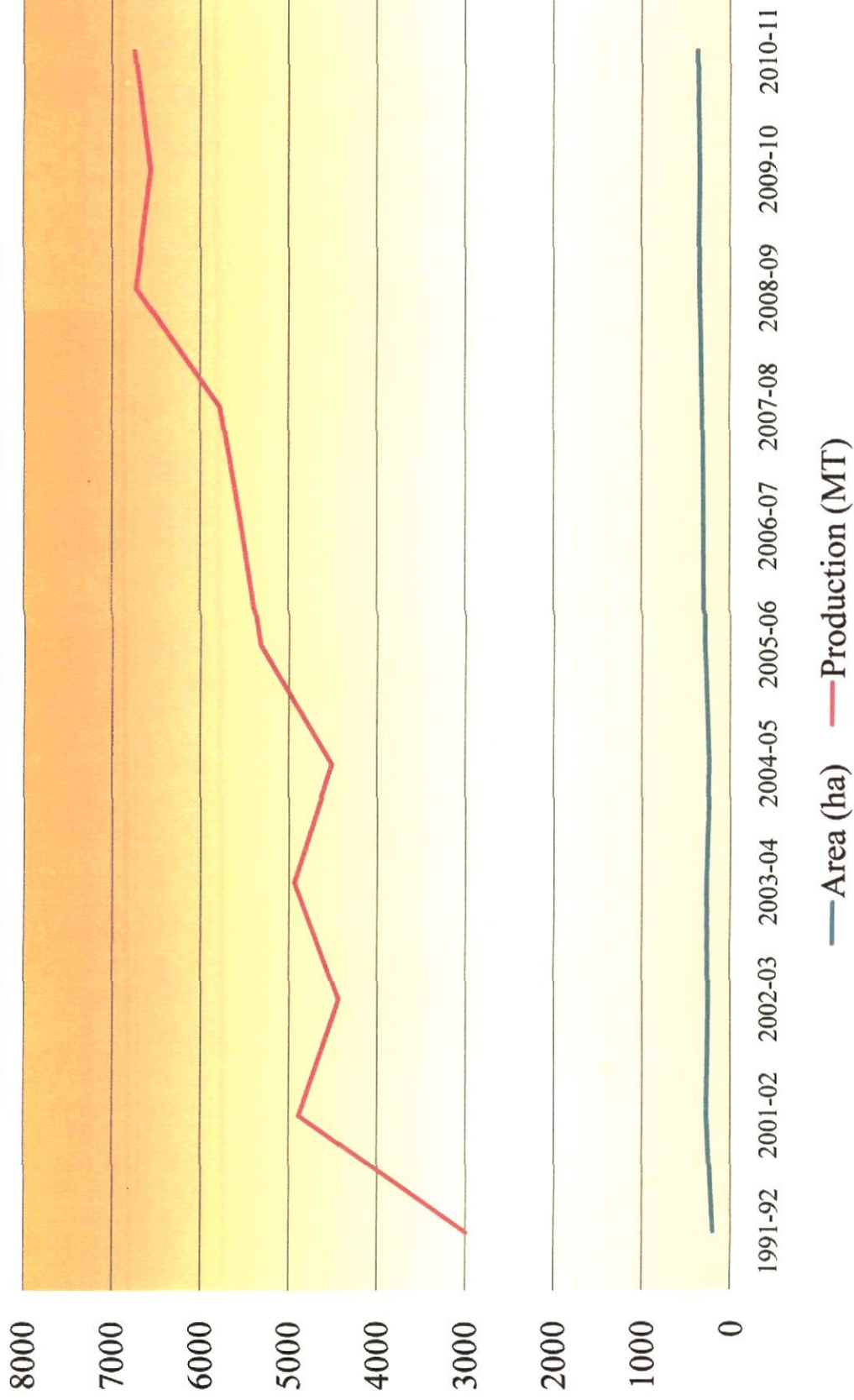


Table 1.3: State wise Area and Production of Cauliflower in India

(Area in '000 hectares, Production in '000 MT)

Sr. No.	State	2008-2009		2009-2010		2010-2011		Average	
		A	P	A	P	A	P	A	P
1.	West Bengal	68.8	1743.8	69.2	1754.1	70.0	1777.2	69.3 (19.51)	1758.36 (26.58)
2.	Orissa	46.1	663.5	46.5	675.4	45.1	677.3	45.9 (12.92)	672.06 (10.15)
3.	Haryana	25.9	500.3	25.7	487.7	30.3	531.9	27.3 (7.68)	506.63 (7.65)
4.	Gujarat	18.5	321.1	19.8	356.7	21.1	387.4	19.8 (5.57)	355.06 (5.36)
5.	Jharkhand	27.3	436.9	20.6	329.8	22.2	355.4	23.3 (6.56)	374.03 (5.66)
6.	Assam	19.8	282.9	20.5	351.3	20.9	328.8	20.4 (5.74)	321 (4.86)
7.	Chhattisgarh	16.1	241.4	16.1	268.9	18.4	306.0	16.86 (4.74)	272.1 (4.11)
8.	Others	52.5	969.1	18.5	1106.5	56.6	877.8	42.5 (11.96)	984.46 (14.88)
Total:		348.9	6531.9	347.9	6569.0	368.7	6744.9	355.1 (100.00)	6615.26 (100.00)

A=Area, P=Production,

Note: Figures in the parenthesis indicate the percentages by the total.

Source: Indian Horticulture Database 2011

Among various vegetables grown in India, cauliflower (*Brassica oleraceae var. botrytis*) belongs to family *cruciferae* and its native of Cyprus. In India cauliflower occupies 3.69 lakh hectares area with a production of 67.45 lakh tonnes accounting for 4.3 per cent and 4.6 per cent of the total vegetables crop area and production, in the year 2010-11, respectively (Table 1.2).

The important cauliflower growing states in the country are West Bengal, Bihar, Orissa, Haryana, Gujarat, Jharkhand, Assam, Chhattisgarh and Madhya Pradesh which together accounted for about 79 per cent of total cauliflower production in the country. Gujarat has accounted for about 5.36 per cent of total

Cauliflower production, from 5.57 per cent area of the country. Gujarat ranks fourth in production of cauliflower among different states in the country (Table: 1.3).

Gujarat Scenario

The important vegetables grown in Gujarat are cauliflower, potato, tomato, cabbage, brinjal, onion and chilies. Looking to the scenario of area and production of vegetable crops in Gujarat, it was increased by 401.3 thousand hectares and 7712.0 thousand metric tonnes, respectively in the year 2010-11 over 1991-92. The area and production of cauliflower was about 16140 hectares and 277788 metric tonnes, respectively during the year 2005-06 (*GoG 2006*). This increased to 21108 hectares and 390205 tonnes during the year 2011-12 (*GoG 2012*). This shows an increase of 4968 hectares in area and of 112417 metric tonnes in production of cauliflower during the period of 2005-06 to 2011-12.

Table 1.4: Area and Production of Cauliflower in Gujarat for Last Six Years

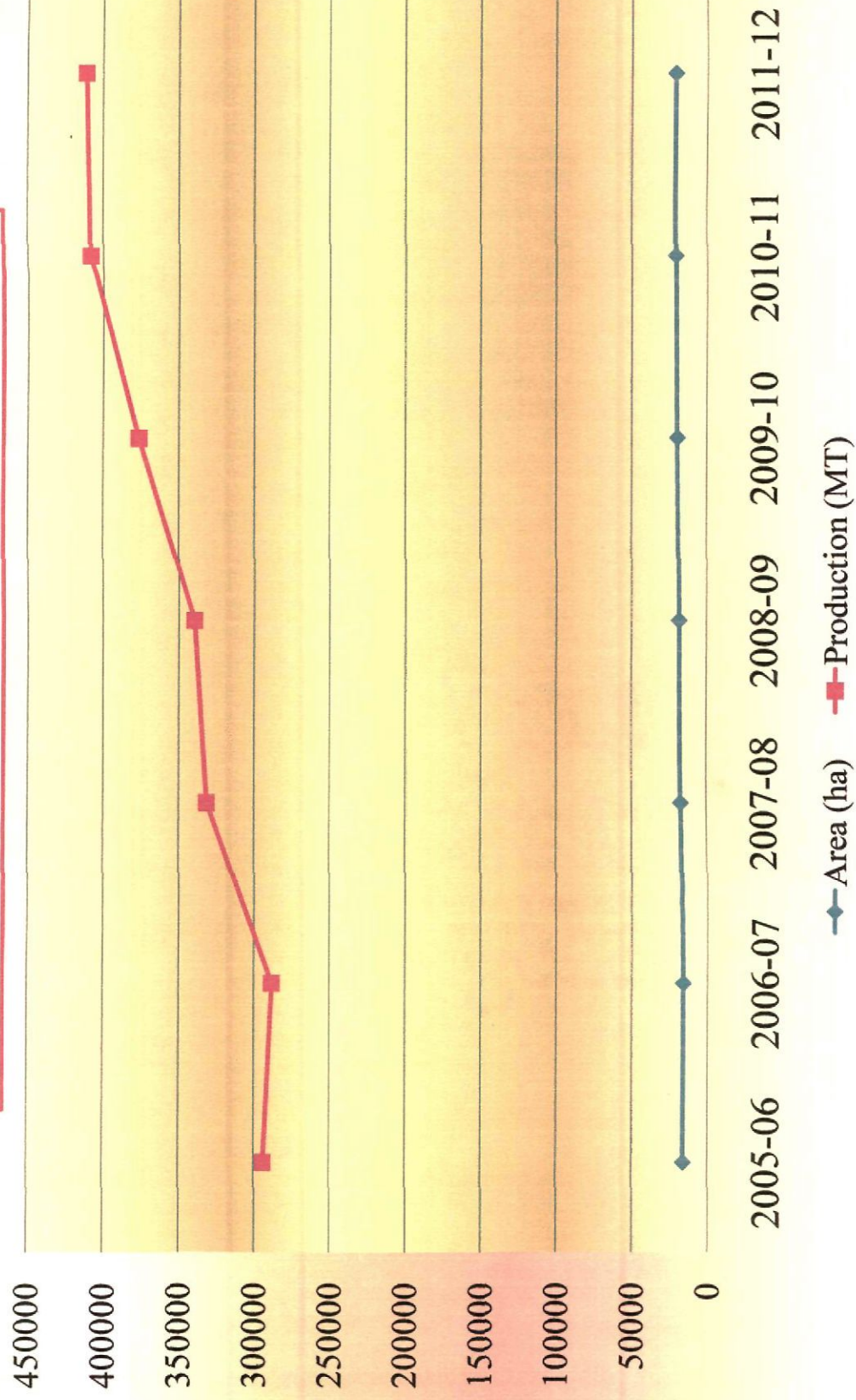
(Area in hectares, Production in MT, Productivity in MT/Hectare)

Year	Area	Production	Productivity
2005-2006	16140	277788.63	17.21
2006-2007	16098	272260	16.91
2007-2008	17383	314206	18.07
2008-2009	18491	321147	17.36
2009-2010	19815	356747	18.0
2010-2011	21104	387413	18.36
2011-2012	21108	390205	18.48

Source: Directorate of Horticulture, Gandhinagar, Gujarat. (*GoG (Government of Gujarat)*, 2006 to 2011)

The data presented in Table 1.4 and Figure 1.2 show that area, production and productivity of cauliflower have increased during the last seven years in the state.

Fig 1.2: Area and Production of Cauliflower in Gujarat



Spread of cauliflower in different districts of Gujarat

The data presented in Table 1.5 indicate that the cultivation of cauliflower is not uniformly spread in all the districts of Gujarat. The major cauliflower producing districts are Anand, Baroda, Kheda, Rajkot, Sabarkantha, Banaskantha, Ahmadabad, Bhavnagar, Mehsana and Surat which together contribute about 77.34 and 82.28 per cent of total area and total production under cauliflower cultivation in the state, respectively. It is also noteworthy that in Gujarat, middle Gujarat districts contribute highest area *i.e.* 6349 hectares (30.07 per cent) under cauliflower cultivation with 103439 tonnes (26.50 per cent) of production. District wise area and production of cauliflower during 2009-10 to 2011-12 given in the table below reveal the inter district differences.

Table 1.5: District wise Area and Production of Cauliflower in Gujarat

(Area in '00 hectares, Production in '00 MT)

District	2009-2010		2010-2011		2011-2012		Average	
	A	P	A	P	A	P	A	P
Sabarkantha	41.5	1062.75	48.1	1275.71	38.04	1027.08	42.54	1121.84
Banaskantha	30.5	457.5	31.0	496.00	32.9	529.85	31.46	494.45
Kheda	15.2	274.14	16.3	293.40	15.8	284.58	15.76	284.01
Anand	13.7	254.38	13.7	254.38	14.0	259.00	13.8	255.92
Rajkot	10.8	217.60	12.9	259.00	11.2	224.22	11.63	233.60
Baroda	8.1	153.75	11.5	178.25	12.2	189.25	10.6	173.75
Surat	8.0	141.75	9.8	68.95	10.7	191.00	9.5	387.98
Bhavnagar	8.0	184.00	8.2	188.60	8.6	197.80	8.2	190.1
Ahmadabad	6.5	105.62	7.2	117.85	12.2	199.50	8.6	140.9
Mehsana	7.0	100.31	7.2	103.17	7.58	108.62	7.2	104.0
Other	48.85	615.7	45.14	638.82	47.86	691.15	47.28	648.5
	198.15	3567.47	211.04	3874.13	211.08	3902.05	206.74	3781.21

A=Area, P=Production,

Note: Figures in the parenthesis indicate the percentages to the total.

Source: Directorate of Agriculture, Gandhinagar. GoG (*Government of Gujarat*), 2009 to 2012

Cauliflower is one of the most important cruciferous winter vegetable crops grown extensively in tropical and temperate regions of the world. Cultivation of the crop has been found to be highly remunerative under irrigated condition during *rabi* season and hence gaining popularity among the vegetable growing farmers of India

Vegetable growing is the most remunerative enterprise as it is adopted by small and marginal holders with high production in short duration. Being a source of farm income it creates impact on the agricultural development and economy of the country. Vegetables are cheap source of minerals, vitamins and high calorie. There is a lot of demand for fresh vegetables and their processed products both in domestic as well as in export markets which can earn valuable exchange for India.

Cauliflower is one of the most valuable vegetable crops in India because of its nutritional value and wide spread production. Among the different groups of vegetables the Cole crops occupy special importance from their nutritional point of view. Cauliflower belongs to family cruciferae and is one of the important vegetable crops of India. It contains a good amount of vitamin A and B, protein (2.7%), fat (0.2%), and carbohydrate (5.2%) and some amount of minerals.

Some of the popular varieties of cauliflower grown in India are Early Kunwari, Pant Gobhi 3, Pusa Early Synthetic, Pusa Deepali, Pusa Katki, Hisar 1, IIHR 101, IIHR 105, Improved Japanese, Panth Gobhi 2, PG 26, PG 35, Pusa Hybrid 2, and Pusa Sharad, Pusa Himjyoti, Pusa Shubhra, Pusa Synthetic Snowball-1, Pusa Snowball K-1 Snowball-16 (NHB 2011).

1.2 RATIONALE OF THE PROBLEM

The cost of production is a changing phenomenon and changes with the cost of component studies on production. Marketing of cauliflower provides basic information regarding the efficiency of business, input output relationship and returns which are important aspects for the policy makers in making rational policy as well as for identifying the ways and means to bring down its costs. It will also help credit institutions decide the scale of finance for crop loans and schedule of repayment. The information on cost of cultivation/production as well as the efficiency of resources will be useful to the government for addressing policy related issues for cauliflower growers. The results of the study will also be helpful to the cauliflower growers in reallocation of their resources in order to improve the productivity and eventually to increase the profitability.

Furthermore, factors like seasonality, bulkiness and perishability associated with cauliflower crop make its market more complicated. Hence an efficient marketing system ensuring remunerative price motivates the farmers for higher investment and production like other vegetable. Various marketing function are involved in the movement of cauliflower from the point of production to point of its ultimate consumption.

Marketing costs and margins assume particular importance in predominating agricultural country like India where agricultural price policy aims at safeguarding interest of both farmers and consumers. In this regard, economic analysis of horticultural produces assumes great significance. Thus, the present study covers the economics of cauliflower production and marketing to identify the problems faced by the cauliflower cultivators.

The present study entitled, “**An Economic Analysis of Production and Marketing of Cauliflower (*Brassica oleraceae* var. *botrytis*.) in Middle Gujarat**” has been under taken with the following specific objectives:

1.3 OBJECTIVES

1. To estimate cost of cultivation and returns per hectare for cauliflower crop.
2. To estimate the cost of production per quintal and input-output ratio of cauliflower.
3. To work out the resources use efficiency in production system of cauliflower.
4. To compute marketing cost and price spread in cauliflower.
5. To identify production, marketing and economic constraints faced by cauliflower growers.

1.4 LIMITATIONS OF THE STUDY

1. Due to limited time and resources available with investigator, the study was confined only to Anand and Kheda districts of middle Gujarat.
2. The study is based on primary data. So limitations regarding primary data obviously apply.
3. In this study, information was collected by interviewing the individual cauliflower producers. It is necessary to be noted that the data provided by respondents are only broad entities, as they are not based on actual accounting records but based only on individual perception and expressed opinion of the respondents.
4. A few studies are available to direct cauliflower crop, therefore another vegetable crops related studies were considered as cross reference to support the results.

1.5 PRESENTATION OF STUDY

The study is presented in five chapters. The Chapter-1 deals with the introduction to the topic specifying objectives of the study, highlighting the rationale of the study, limitations and presentation of the study while Chapter-2 represents the reviews of the studies made in the past, that are relevant to the objectives of the present investigation. Chapter-3 explains the methodology adopted in the study, sampling framework, the nature and sources of data and the tools and techniques of analysis adopted for evaluating the objectives. The terms and concepts used in the study are also outlined. Chapter-4 presents the results and discussion of the study. The summary and conclusions are given in Chapter-5.

*Review
of
Literature*



Chapter – II

REVIEW OF LITERATURE

A comprehensive review of literature is an essential part of any scientific investigation. The review of literature helps researcher comparing his findings with reference to past studies as also understanding and using appropriate methodology available. As the literature having direct bearing on different aspects of the present study is limited, the references having little or indirect bearings are also reviewed.

A review of the work done in the field of the objectives of this study is presented in this chapter. The studies available on cauliflower are very few; however the economic analysis of most of the vegetable crops is almost similar therefore reviews pertinent to the present study are presented from various comparable vegetable crops under following broad heads.

- 2.1 Costs and Returns in the cultivation/production of vegetable crops
- 2.2 Resource use efficiency in vegetable crops cultivation
- 2.3 Marketing costs and price spread
- 2.4 Problems in production and marketing of vegetable crops

2.1 Costs and Returns in the Cultivation/Production of Vegetables Crops

Madan *et al.* (1999) studied the economics of production and marketing of cauliflower in Ranchi district of Bihar. The study showed that the cost of cultivation per hectare was ₹ 17198. Labour cost (28.49 per cent), farm yard manure (30.53 per cent), and fertilizer (10.88 per cent) and irrigation

(10.47 per cent) were observed to be the major components of the total cost. The per hectare gross returns and net returns of cauliflower was observed to be ₹ 30510.58 and ₹ 25610.58, respectively. The benefit cost ratio was calculated to be in proportion of 1:2.5.

Radha and Prasad (2001) studied the economics of production and marketing of vegetable in Karimnagar district of Andhra Pradesh. The cost of cultivation for cauliflower was observed ₹ 17088 per hectare and farmers got on an average gross return of ₹ 75000 per hectare with a benefit – cost ratio of 1:290.

Tripathi *et al.* (2005) reported from their study on economics of vegetable (Brinjal) in Virdhyan and Bundelkhand region of Utter Pradesh that the per hectare overall cost of cultivation and gross return were ₹ 26199.68 and ₹ 53081.25, respectively, resulting in net return of ₹ 26881.57. The input output ratio was found to be 1: 2.01. However the cost, return and input output ratio varied significantly on different size of holding. The input output ratio varied from 1: 1.9 on large size of holding to 1: 2.06 on marginal size of holdings in the study area. The cost of production of brinjal was ₹137.26 per quintal on sample farms but it varied from ₹ 165.34 to Rs. 142.76 on marginal farm to large farm, respectively.

Joshi *et al.* (2006) observed that small holders allocated approximately one third of the area to food grain crops while large farmers allocated more than half of the total area under food grain crops. Vegetables area on small farms was 55.4 per cent and on large farms it was about 28 per

cent. Further, the study revealed that cost of cultivation (Cost C_2) of brinjal per tonnes was higher in case of large farms (₹ 3220) compared to small farms (₹ 2160). In case of potato also Cost C_2 per quintal was higher (₹ 1650) on large farms than small farms (₹ 1380) in Western part of Uttar Pradesh during 2002-03. Moreover the researchers observed higher net revenue (₹13094) over Cost A_2 from brinjal compared to potato (₹ 7765) and other vegetables.

Pundit *et al.* (2006) studied the production and marketing of potato in Barpeta district of Assam. The result showed that the potato cultivation per hectare needed around ₹ 54000 investment. Among various cost components, seed alone accounted for more than 31 per cent of the total cost, followed by labour (23.57 per cent), mulching cost (19.90 per cent), fertilizers and FYM (10.96 per cent) and machinery cost (10.43 per cent). Cost of production was found to be about ₹ 248 per quintal. Potato growers could get a net return of ₹ 35406 per ha and the gross return received by the growers was found ₹ 89675.55.

Sidhu *et al.* (2010) conducted a study on supply chain analysis of cauliflower in Punjab. The result shows that the cost of cultivation was accounted for ₹ 34840 per hectare. Within variable cost of cultivation, the share of human labour exceeded 35 per cent. The per hectare gross return and net return of cauliflower was observed ₹ 72912 and ₹ 38072, respectively. The benefit cost ratio was calculated to be in proportion of 1: 2.09.

Bala *et al.* (2011) studied the cost and returns structure for the promising enterprise of off season vegetables in Himachal Pradesh. The result

revealed that the per hectare cost of cultivation of cauliflower was ₹ 33400. The cost of plant protection chemicals accounted for 43.4 per cent of the total cost while the cost of seed/seedling was observed 23 per cent and fertilizer manure 21.4 per cent. The study further revealed that only 3.11 per cent of the total cost was spent on hired human labour and ploughing and land preparation was estimated to be 4.32 per cent. The per hectare gross return and net return of cauliflower was found ₹ 1, 69,900 and ₹ 1, 36,500 respectively. The per quintal average price received by the producer was ₹ 1048.

The study conducted by department of Agril. Economics, GAU, Junagadh (2003) showed that the average total cost per hectare of potato cultivation was to the tune of ₹ 57142. The share of operating cost in the total cost of cultivation was as high as 80.73 per cent. The break up operating cost indicated that among the different items of each expenditure, seed ranked first with 41.77 per cent of the total cost, followed by chemical fertilizer (5.98 per cent), miscellaneous (3.54 per cent) and bullock labour (2.74 per cent). It also apparent from the study that the yield per hectare of potato during the year of study was 183.40 quintals. The average gross returns accounted for ₹ 85296 per hectare. The input-output ratio worked out for the potato was 1:1.49 and average total cost of producing one quintal of potato came to ₹ 311.57.

The study on contract farming in tomato: an economic analysis was carried out by Dileep *et al.* (2002) and their result focused that, among different gropes of farmers, large farmers obtained higher net returns (₹ 25, 676.61), followed by small (₹ 23, 388.75) and medium (₹ 31, 899.37) farmers

with an overall per quintal cost of cultivation of ₹ 114.79 and per hectare variables costs of ₹ 25000.

Singh (2002) studied economics of efficiency in vegetables business system in M.P and analysis revealed that cost of cultivation for tomato was estimated ₹ 12599 and about 95.00 per cent of the cost consist of human labour and working capital.

2.2 Resource Use Efficiency in Vegetables Crops Cultivation.

Kumar and Arora (1999) examined the resource use efficiency of chili in their study on economic issues in vegetable production in Uttar Pradesh. The co-efficient of multiple determinations (R^2) was 0.318 indicating that about 32 per cent of variation in chili production was explained by the variables included in the model. The regression co-efficient of human labour and expenditure on chemical fertilizers turned out to be positive with statistically significant impact on the yield of chili.

Singh and Vashist (1999) studied the production and marketing system of vegetable in Himachal Pradesh. The regression analysis showed that labour charges, investment on manures and fertilizers and season contributed significantly to variation in the yield with direct bearing and explained 55 per cent variation in the yield of cauliflower.

Singh *et al.* (2000) worked out resource use efficiency of brinjal in Madhya Pradesh during 1994-95. The study revealed that all the variables included in Cobb-Douglas function viz., rental value of own land, human labour, irrigation, manures and fertilizers & plant protection had a significant

influence on increasing the gross value of produce. The value of regression coefficient ranged from 0.1099 (manures and fertilizers) to 0.6839 (human labour). In case of potato the coefficient for irrigation was (-) 0.9876 indicating thereby excessive use of irrigation water by the farmers. Human labour (0.8695), plant protection (0.5375) & manures and fertilizers (0.2949) were other variables, which exhibited positive and significant influence on gross value of the produce. The value of coefficient of multiple determinations (R^2) was 0.88. This indicated that 88 per cent of variation in gross value of produce in cases of brinjal and potato was explained by the variables included in the function.

Wadhvani and Bhogal (2001) in western region of Uttar Pradesh measured resource use efficiency in production of potato using Cobb- Douglas production function the value coefficient of multiple determinations (R^2) was 0.63 indicating that about 63 per cent of variation in potato production was explained by the variables included in the model. The cost of farm yard manure, expenditure on chemical fertilizer and plant protection and irrigation had a positive and significant influence on increasing the yield per hectare. The value of regression coefficient ranged from (-) 1.1237 for land to 0.2931 for irrigation.

Dileep *et al.* (2002) conducted a study on an economic analysis of contract farming on tomato. The study revealed that among various categories of farmers large contract farmers obtained higher net return followed by small and medium farmers. The functional analysis further revealed that

there existed a substantial scope to increase the tomato production through making judicious use of critical input particularly fertilizer, irrigation, and plant protection chemical. Price received by farmers directly selling to the consumer was the highest followed by retailer and wholesaler in case of non contract farmers. Transportation charge was found to be the major component of marketing cost in the study.

Thilagavati and Siddeswaran (2004) ascertained resource use efficiency of rainfed chili in Tamilnadu and concluded that 82 per cent of variation in chili production was explained by variable (X_1) bullock labour was found to be relatively non significant in the output level of rainfed chilies; this may be attributed to reduction of bullock power and its non availability in time. like- wise machine power did not increases the output level. Seed (X_4) was found to be negative and significant at 5 per cent level of probability on chili farms indicating excessive usage of it.

Kale *et al.* (2005) analyzed the resource use efficiency of chili cultivation in thane district of Kankan region and observed that the human labour and number of irrigations had significant influence on the value of output while fertilizer was observed to have non significant effect. The MVP-MC ratio showed efficient utilization of resources which was greater than unity for land variable denoting higher efficiency, while fertilizer had negative impact showing reduction in its use.

2.3 Marketing Costs and Price Spread

Shelke and Kalyankar (2000) studied the price spread in marketing of selected vegetables in Parbhani. The result showed that in case of

cauliflower transportation cost and commission charges constituted 67.45 per cent of the total marketing cost and the per quintal cost of marketing was ₹ 29.80. The price spread which includes producer's net share and retailer's was 41.72 per cent and 40.72 per cent, respectively.

Baruah and Barman (2001) studied the marketing margin, price spread and marketing efficiency of cauliflower in Assam. The study revealed that the major items of marketing cost at producer's level were transportation, loading and unloading and personal expenses which together accounted for 75.56 per cent of the total marketing cost. The marketing cost borne by the primary wholesaler and secondary wholesaler were 6.95 per cent and 5.58 per cent of the consumer's price, respectively. The retailer's marketing cost was 5.62 per cent of the consumer's price. Price spread and producer's share in consumer rupee were found to be 60.38 per cent and 39.62 per cent, respectively.

Prasad (2001) studied the vegetable production and marketing in Bihar. The finding of the study indicated that in case of cauliflower the marketing cost accounted for 17.40 per cent. The total marketing cost incurred by the wholesaler and retailer was 6.16 per cent and 19.68 per cent, respectively. Net price received by the grower was 47.67 per cent.

Nikam *et al.* (2007) studied the marketing of potato in Maharashtra. The result showed that the average per quintal cost of marketing was ₹ 88.70 of the total marketing cost, the component of commission, transport cost and packing cost accounted for 44.60, 27.36, and 16.72 per cent.

respectively. These items together constituted 88.68 per cent of the per quintal marketing cost. Remaining 11.32 per cent of marketing cost was shared by grading wages, Hamali, weighing and market fee which accounted for 5.35, 2.63, 2.15 and 1.19 per cent, respectively.

Singh and Chauhan (2004) studied the marketing of vegetable in Himachal Pradesh. The result showed that producer's share in consumer's rupee was observed in case of cauliflower was 54.09 per cent. Marketing costs on grading (0.25 per cent), packing (1.50 per cent), transportation (2.00 per cent), loading/unloading (0.59 per cent) and commission charges (4.06 per cent) in wholesale market, incurred by producers were observed to be ₹ 67.25 (8.41 per cent) and the market efficiency was found to be 1.18.

Zala *et al.* (2007) conducted a study on Cost of Marketing of Potatoes Borne by Growers in Middle Gujarat and observed that marketing cost incurred by the farmers was to ₹ 38.45 per quintal when the potato was sold without storage. The analysis revealed that grading & packaging charges accounted for the highest share (56.35 per cent) followed by transportation (17.53 per cent), spoilage (16.81 per cent) and loading- unloading and weighing (9.31 per cent). Not much difference was observed across the two districts regarding per quintal cost of potato marketing

Kumar *et al.* (2008) studied the marketing of vegetables in Vaishali District of Bihar. In case of cauliflower the result showed that the producer's share in consumer rupee and price spread were 57.01 per cent and 42.99 per cent, respectively and on an average price paid by the consumer was

₹ 10.36 per Kg of cauliflower. Since the marketing cost and marketing margin in relation to consumer's price were higher and the Shepherd Index of marketing efficiency was also higher in cauliflower.

Jadav *et al.* (2011) studied the marketing cost, margin and price spread in marketing of potato in middle Gujarat. The study indicated that the marketing cost incurred by different functionaries was ₹ 188.19 per quintal of potato accounting for 26.28 per cent of consumer's price. Further it was observed that producer's share was 47.40 per cent of the price paid by potato consumers.

2.4 Problems in Production and Marketing of Vegetables Crops

Kumar and Arora (1999) studied the post harvest management of vegetables in U.P. Hills. The study identified the inadequate infrastructure, inadequate availability of good quality seeds, unorganized marketing, poor post harvest facilities and lack of quality equipments and inputs.

Lal *et al.* (2000) studied the vegetables marketing in Himachal Pradesh: constraints and opportunities. The opinion survey of the producer revealed that the most emerging problem regarding the marketing of vegetables relate to grading and standardization of produce, as reported by 60 per cent of the farmers. Further, 32 per cent of the farmers faced the problem of high transportation cost. Other major problems included lack of reliable source and inadequate and misleading information regarding the market prices.

Singh *et al.* (2000) conducted a study on Technological Changes in Marketing of Hill Farm Products in Himachal Pradesh; the researchers

observed that majority of the growers faced the problem of lack of price information which accounted for 80 per cent followed by lack of storage in market yard (64 per cent) and transportation and malpractices by traders (61 per cent).

Verma (2004) studied the marketing of vegetables in Himachal Pradesh. The study revealed that major problems of the farmer consisted of improper transport facilities, improper storage facilities malpractices by traders, inadequate market information, and multiplicity of charges on producer in the process of selling his produce and high marketing cost.

Hatai and Baig (2007) in a study on economics of production and marketing constraints faced by sample potato growers found that about 85 per cent of the farmers faced the problems of infestation of potato crop by *Epilachna* beetle and Late Blight diseases followed by high cost of input (60 per cent), poor quality of pesticides (42 per cent) and scarcity of labour (10 per cent) in Orissa.

Jadav *et al.* (2011) studied the various problems faced by the potato growers in middle Gujarat. The study revealed that the higher price fluctuation (92.31 and 98.59 per cent), low price due to poor quantity (78.21 and 67.61 per cent) and lack of market information (65.38 and 69.05 per cent) were the major marketing constraints realized by marginal and small farmers. The higher price fluctuation and lack of labour for transportation were the major problems faced by 97.14 per cent and 74.29 per cent of medium category farmers, respectively. Problems of higher price fluctuation (100 per cent), lack of labour transportation (68.75 per cent) and low price due to poor quality (62.50 per cent) were the major marketing constraint faced by large size farmers.

METHODOLOGY



Chapter – III

METHODOLOGY

This chapter deals with the brief description of the selection of area of cauliflower crop, sampling technique for the selection of respondents, nature and sources of the data and statistical methods adopted for analysis of data. Methodology used to carry out the study entitled “An Economic Analysis of Production and Marketing of Cauliflower (*Brassica oleraceae* var. *botrytis*.) in Middle Gujarat” is discussed under the following heads.

- 3.1 Coverage of the study
- 3.2 Sources of data
- 3.3 Reference period
- 3.4 Designing and pre-testing of survey schedule
- 3.5 Methods of analysis

3.1 COVERAGE OF THE STUDY

3.1.1 Selection of Study Area

Gujarat state comprises 26 districts. Among them Ahmedabad, Anand, Dahod, Kheda, Panchmahal and Vadodara are covered under Middle Gujarat region. Middle Gujarat region of the state was purposively selected for the study as it contributed 27.37 per cent to the total area under cauliflower cultivation in 2010-11(*GoG 2011*). A multistage random sampling design was followed to select the ultimate sampling units.

3.1.2 Selection of Districts

Among the six districts of middle Gujarat, Anand and Vadodara districts have fertile land with good irrigation facility. Moreover, these districts are well connected by road and rail with other parts of the state and the country. All these provide an opportunity to the farmers of this area for production of cauliflower. Anand and Kheda districts constituted 23.59 per cent and 26.91 per cent area of cauliflower cultivation in tri annam average of the years 2009-10, 2010-11 and 2011-12 in middle Gujarat zone, respectively (*GoG. 2009, GoG. 2010 and GoG 2011*). Thus, Anand and Kheda districts together covered 52.37 per cent area under cauliflower in middle Gujarat (Table 3.1 and Figure 3.1). Therefore, these two districts were considered for the study.

Table 3.1: District wise Area under Cauliflower Crop in Middle Gujarat

(Area in hectares)

Name of District	2009-10	2010-11	2011-12	Average	Per cent of Total
Ahmedabad	652	723	1223	866	14.77
Kheda*	1523	1630	1581	1578	26.91
Anand*	1375	1375	1400	1383.3	23.59
Panchmahal	215	250	300	255	4.34
Dahod	670	650	625	648.3	11.05
Vadodara	1025	1150	1220	1131.6	19.30
Total	5460	5778	6349	5862.2	100.00

* Considered for the study.

3.1.3 Selection of Talukas

All the talukas in Anand and Kheda districts were listed along with their area of cauliflower crop. The details are given in Table 3.2.

Fig. 3.1: Map of Kheda and Anand Districts of Gujarat State

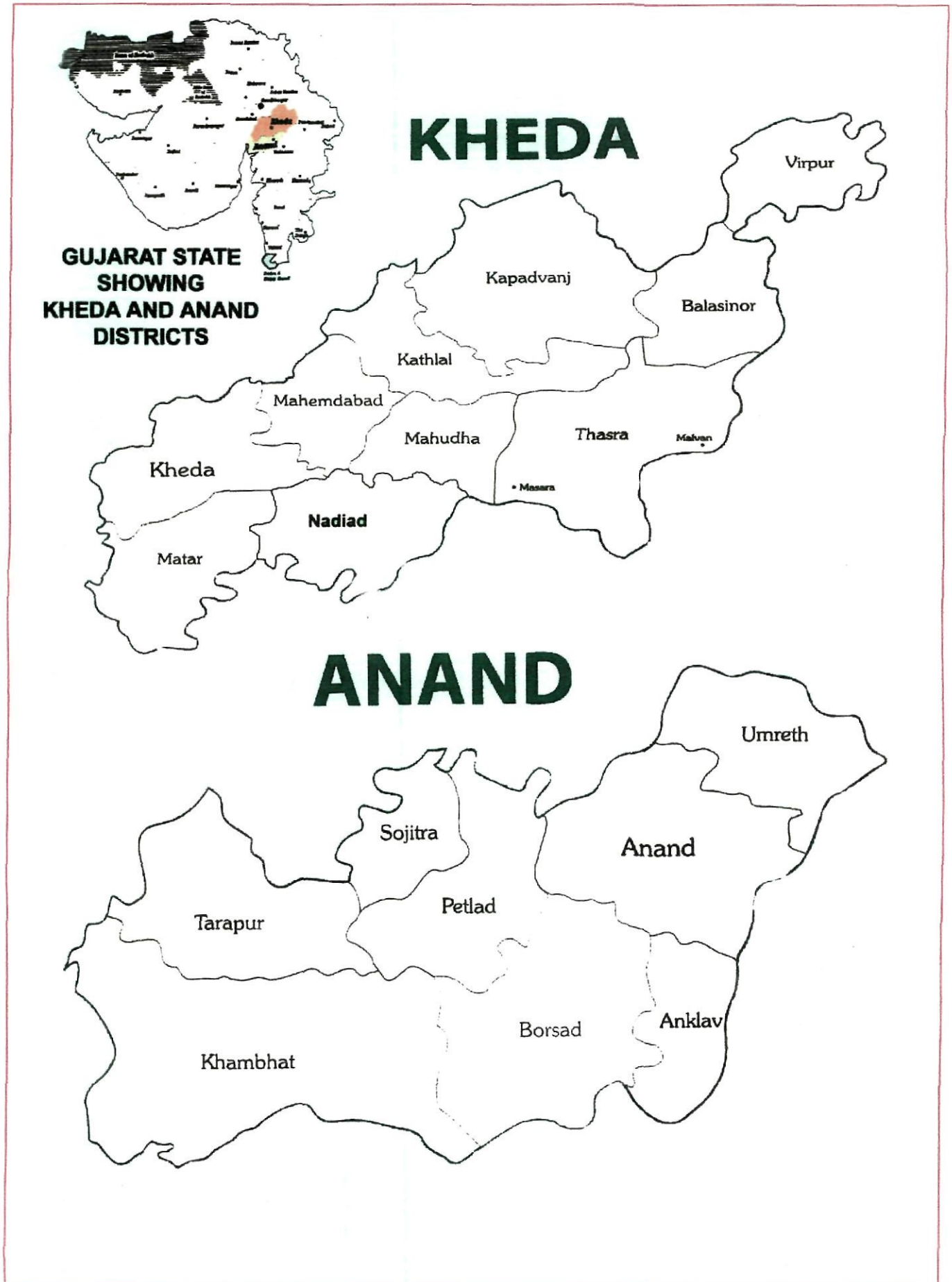


Table 3.2: Taluka wise Area under Cauliflower in Anand and Kheda

District		(Area in hectares)				
Sr No.	Name of Taluka	2007-08	2008-09	2009-10	Average	Per cent of Total
Anand District						
1.	Anand*	447	450	455	450.66	32.57
2.	Umreth	125	120	127	124	8.96
3.	Petlad	165	160	168	164.33	11.87
4.	Sojitra	95	96	97	96	6.93
5.	Borsad	128	130	130	129.33	9.34
6.	Anklav	103	108	105	105.33	7.61
7.	Khambhat*	277	278	282	279	20.16
8.	Tarapur	35	33	36	34.66	2.50
Total		1375	1375	1400	1383.31	100
Kheda District						
1.	Nadiyad*	326	343	343	337.33	21.37
2.	Thasra	150	160	158	156	9.88
3.	Mahudha	140	150	145	145	9.18
4.	Maatar	135	145	143	141	8.93
5.	Kheda	110	120	120	116.66	7.39
6.	Mahedavad	185	195	190	190	12.04
7.	Kathlal	180	190	190	186.66	11.82
8.	Kapadvanj*	245	255	220	240	15.2
9.	Balasinor	30	40	40	36.66	2.32
10.	Virpur	22	32	32	28.66	1.81
Total		1523	1630	1581	1578	100

* Considered for the study.

The relative share of each taluka to the total area of cauliflower crop in the districts was worked out. Two talukas having highest area under cauliflower from each district *i.e.* Anand and Khambhat talukas from Anand district and Nadiyad and Kapadvanj talukas from Kheda district were selected. From Anand district both Anand and Khambhat talukas together constituted about 52.73 per cent of the total cauliflower area of Anand district and from

Kheda district both Nadiyad and Kapadvanj talukas together contributed about 36.57 per cent to the total cauliflower area of the district.

3.1.4 Selection of Villages

In order to select the villages, the staff of taluka development officers was contacted and the various objectives of the study discussed. Then a list of the villages growing cauliflower was prepared. From the prepared list three villages were selected randomly from each selected taluka. Thus, total 12 villages were selected for the study.

3.1.5 Selection of Cultivators

A List of the farmers growing cauliflower in each of the selected villages was prepared. For the purpose of framing the size groups, farmers from each of the lists were arranged in an ascending order on the basis of their land holdings.

Table 3.3: Details Regarding Sample Villages and Cauliflower Growers

District	Taluka	Village	Farm Size Groups				Total
			Marginal	Small	Medium	Large	
Anand	Anand	Navli	2	3	2	3	10
		Vadod	2	2	2	4	10
		Zankhariya	1	3	5	1	10
	Khambhat	Undel	3	4	1	2	10
		Popat pura	3	5	1	1	10
		Nana kalodra	2	4	2	2	10
Kheda	Nadiyad	Alindra	3	3	2	2	10
		Rajnagar	2	2	3	3	10
		chaklasi	3	2	2	3	10
	Kapadvanj	Kevadia	2	3	3	2	10
		Jasvant pura	2	4	3	1	10
		Aproli	2	3	3	2	10
Total			27	38	29	26	120

They were then stratified in to four size groups viz., marginal (up to 1.00 hectare), small (>1.00 to 2.00 hectares), medium (>2.00 to 4 hectares) and large (above 4.00 hectares). Then the sample of 10 cauliflower growers was selected at random from each of the selected villages ensuring proportionate representation of the four strata. Thus, in all 120 growers (27 marginal, 38 small, 29 medium and 26 large) were selected for the study. The details of the same are given in Table 3.3 and Figure 3.2.

3.1.6 Selection of Market Functionaries

For the study of marketing aspects of cauliflower, Anand and Kheda markets were selected. An estimate of marketing cost and price spread in marketing of the cauliflower was made after analyzing the possible marketing channels. From these marketing channels, five market functionaries from each category were selected for both Anand and Kheda markets. Thus, 10 functionaries each of wholesaler and retailers were selected.

3.2 SOURCES OF DATA

Both primary as well as secondary data were used to meet the specified objectives of the study.

3.2.1 Primary data

The data regarding socio-economic characteristics, land holdings, cropping pattern, inventory of implements and machinery, cost of cultivation, constraints faced by cultivators during production and marketing were collected by interviewing cauliflower growers. Further, the data on disposal pattern of total output, marketable and marketed surplus, farm harvest prices

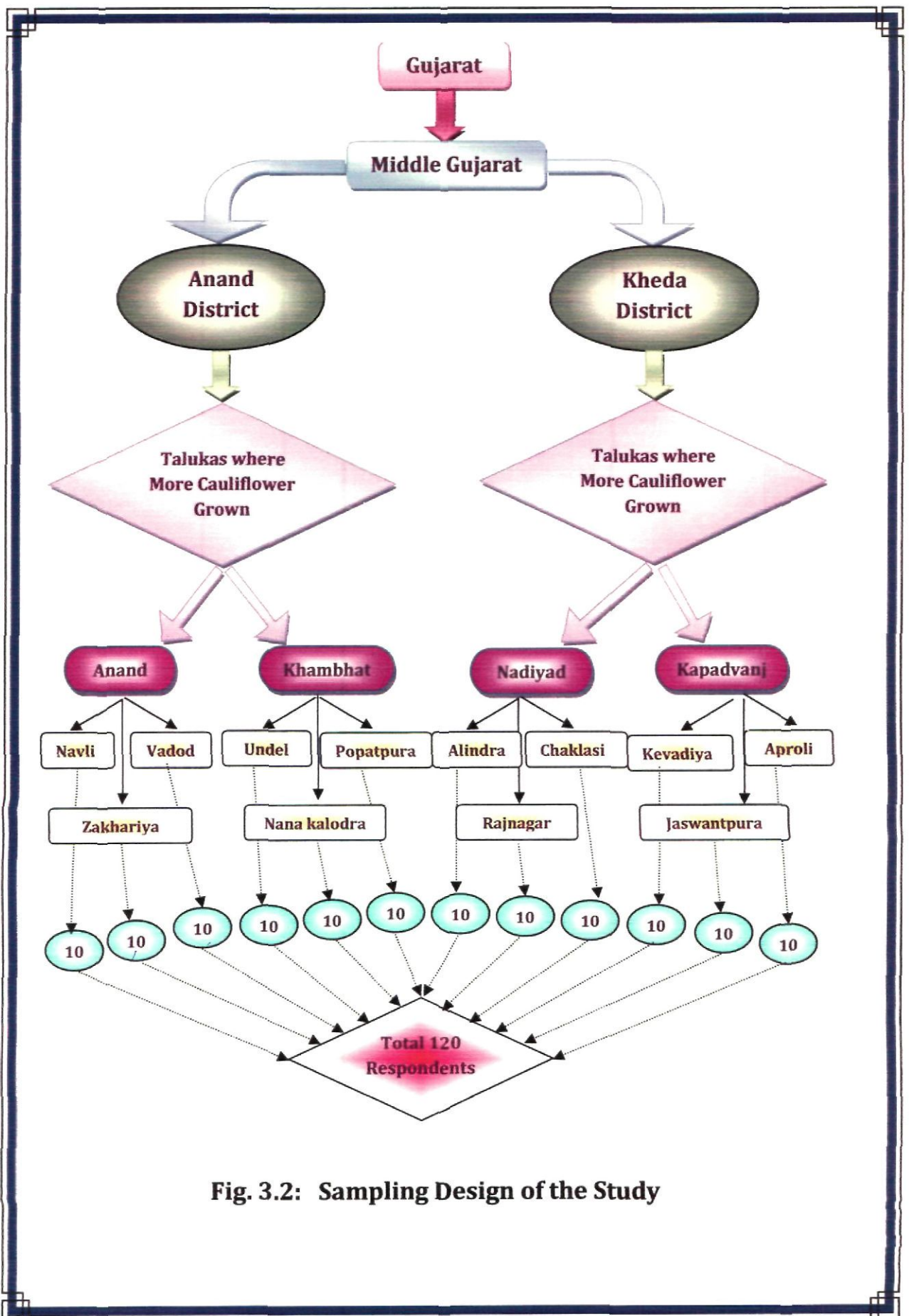


Fig. 3.2: Sampling Design of the Study

and marketing expenditure were also collected from the respective respondents. For this purpose a specially designed pre tested schedule/ questionnaire was used.

3.2.2 Secondary data

The ancillary data on area under cauliflower for the selected talukas and districts were compiled from the records of Directorate of Horticulture, Government of Gujarat.

3.3 REFERENCE PERIOD

To study the production and marketing from farmers of cauliflower, required information were collected from the farmers for the months of February-April 2013 and for market functionaries for the months of April-May-2013.

3.4 DESIGNING AND PRE-TESTING OF SURVEY SCHEDULE

Considering the nature of the study and for obtaining correct and perfect information from the respondents, it was decided to collect information through personal interview using the interview schedule. While preparing the interview schedule, the available related literature and research reports were referred. Some ambiguous points were clarified through discussing with experts and knowledgeable persons in the area. On the basis of their suggestions, the interview schedules were revised and before finalizing the interview schedule, it was pre tested with ten actual cauliflower growers of the study area.

3.5 METHODS OF ANALYSIS

The primary data on cost of production, marketing, socio-economic characteristics and time series data were compiled and analyzed systematically keeping in view the stipulated objectives of the study. The major analytical tools employed for the study included tabular analysis and production function analysis. The details of each of these tools are narrated as under.

3.5.1 Tabular Analysis

Tabular analysis was employed to work out the cost of cultivation per hectare, per quintal cost of production, gross and net returns and marketing cost according to size of farm. The socio-economic indicators of different categories of households were also studied by the tabular method of analysis.

3.5.1.1 Percentages and Ratios

Simple comparisons were made on the basis of percentage. Besides, wherever necessary cumulative percentages were calculated. Ratios were also calculated for the interpretation of data.

3.5.2 Economics of Cauliflower Cultivation/ Production

These two concepts are often used in economic analysis of crops. Cost of cultivation refers to the economic valuation of variable inputs and fixed inputs per unit area say per hectare, while the cost of production for the crop is computed in terms of output per unit of weight say per quintal.

3.5.2.1 Cost Concepts

The cost concepts used in the present analysis are those laid down in the farm management study.

Cost A: The following items are included in cost A

- (i) Cost of hired human labour,
- (ii) Cost of hired and owned bullock labour,
- (iii) Tractor charges,
- (iv) Cost of planting materials,
- (v) Cost of manures (owned and purchased),
- (vi) Cost of fertilizers,
- (vii) Cost of plant protection chemicals,
- (viii) Irrigation charges,
- (ix) Depreciation
- (x) Interest on working capital
- (xi) Miscellaneous

However, Cost A can be divided into two parts *viz.*, Cost A₁ and Cost A₂, if tenant farmers are there in the study. But in the present study, Cost A was considered without dividing into cost A₁ and Cost A₂ as there was no tenant farmer in the list of selected respondents. The expenses incurred towards land revenue, transport charges, charges to contract work *etc.*, were included under the head of other paid out expenses.

Cost B:

Cost A + Imputed rental value of owned land + Imputed interest on owned fixed capital (excluding land).

Cost C₁:

Cost B + Imputed value of family labour.

Cost C₂:

Cost C₁ + 10 per cent of cost C₁ as managerial charges.

Cost of Production per Quintal:

Total Cost (cost C₂) / Yield of main product in quintal

Cost of Production on different cost:

Different cost *viz*; Cost A, Cost B, Cost C₁ and Cost C₂ / Yield of main product in quintal

3.5.2.2 Imputation Procedure for Owned Inputs

The value of purchased inputs was recorded as reported by the farmers after its verification, while some of the inputs used in the production process came from the family resources. In computing the cost of cultivation, it is necessary to compute value of these owned inputs. The procedures used for the computation of values are indicated below.

- (a) Family labour was valued at the rate of casual labour prevailing for different operations in the sample villages.
- (b) Owned bullock labour was valued at the prevailing marketing rate.
- (c) The value of farm produced manure and seeds were computed at the market price.
- (d) The cost of irrigation and tractor was considered at the prevailing market rate.

- (e) Interest on working capital was charged at the rate of 12 per cent per annum for the duration of the crop. The economic production from cauliflower should be received up to three months. Therefore, interest on working capital was worked out considering the crop period of individual respondents.
- (f) Depreciation on buildings used for the storage purpose was calculated at the rate of 5 per cent on Kachcha and 2 per cent on Pakka buildings, considering economic productive period of crop.
- (g) Rental value of farmers owned land was charged at the prevailing rate in the villages for total cultivation period of crop.
- (h) Interest on owned fixed capital was calculated at the rate of 10 per cent per annum, considering the cultivation period of crop.
- (i) Management charge was taken as 10 per cent of the cost C_1 .

3.5.2.3 Income Measures

The various income measures used in the present study are shown as under.

(i) Value of Gross Output (Gross Income)

It is calculated by considering the total production of cauliflower in quintal and price prevailing of product per quintal.

(ii) Farm Business Income

Gross Income minus Cost A

(iii) Family Labour Income

Gross Income minus Cost B

(iv) Farm Investment Income

Net Income + Rental value of owned land + Interest on owned fixed Capital.

(v) Net Income (profit or loss)

Value of gross output minus Cost C_2

3.5.3 Production function analysis

Production function shows the technical relationship between output and inputs used in the production process. In order to determine the efficiency of resources used in the production of cauliflower, the following form of Cobb-Douglas production function was fitted. The analysis was carried out on per hectare basis using the SPSS software. Gross income was considered as dependent variable and other variables as independent variables. The variables included and functional form of fitted equation is given below.

$$Y = a \cdot x_1^{b_1} \cdot x_2^{b_2} \cdot x_3^{b_3} \cdot x_4^{b_4} \cdot x_5^{b_5} \cdot x_6^{b_6} \cdot x_7^{b_7} \cdot U_t \dots\dots(1)$$

The original equation (1) was converted into log linear form and the parameters were estimated by using the ordinary least square method.

$$\log Y = \log a + b_1 \log x_1 + b_2 \log x_2 + b_3 \log x_3 + b_4 \log x_4 + b_5 \log x_5 + b_6 \log x_6 + b_7 \log x_7 + U_t$$

Where,

- Y = Gross income of cauliflower (₹),
- X₁ = Cost of human labour (Man days),
- X₂ = Cost of bullock labour (Pair days),
- X₃ = Cost of manures (₹),

X_4 = Cost of planting materials (₹),

X_5 = Cost of fertilizers (₹),

X_6 = Cost of plant protection chemicals (₹),

X_7 = Irrigation charges (₹),

a = Intercept ,

$b_1, b_2 \dots b_8$ = Regression co-efficient (output elasticity of respective inputs (X_i 's))

n

$\sum_{i=1}^n b_i$ = Returns to scale (sum of regression co-efficient), and

$i=1$

U_t = Error term with usual assumptions

3.5.4 Marketing Analysis

3.5.4.1 Price spread

The producer's share, marketing costs and margins of middleman in marketing of cauliflower were worked out by using the formulas given by Acharya and Agarwal (2003).

(i) Producer's share in consumer's rupee

$$P_S = \frac{P_F}{P_C} \times 100$$

Where,

P_S = Producer's share in consumer's rupee,

P_F = Price of the produce received by the farmer, and

P_C = Price of the produce paid by the consumer.

(ii) Marketing margins of middlemen

The absolute and percentage margin of middlemen involved in marketing were estimated as under:

$$\text{Absolute margin of } i^{\text{th}} \text{ middleman} = P_{Ri} - (P_{Pi} + C_{mi})$$

Percentage margin of i^{th} middleman

$$= \frac{P_{Ri} - (P_{Pi} + C_{mi})}{P_{Ri}} \times 100$$

Where,

P_{Ri} = Sale price of the i^{th} middleman,

P_{Pi} = Purchase price of the i^{th} middleman, and

C_{mi} = Cost incurred on marketing by the i^{th} middleman.

(iii) Total cost of marketing

The total cost incurred on marketing of cauliflower by the farmers and intermediaries involved in the process of marketing was computed as:

$$C = C_F + C_{m1} + C_{m2} + \dots \dots \dots C_{mn}$$

Where,

C = Total cost of marketing

C_F = Cost incurred by the producer in marketing of cauliflower, and

C_{mn} = Cost incurred by the i^{th} middleman in marketing of cauliflower.

Marketing margin for the adopted marketing channel was worked out by comparing the prices prevailing at successive stages of marketing. Since

used prices were related to a particular point of time and as such concurrent margins were worked out.

(iv) Modified measure of marketing efficiency

It was computed by employing the following formula suggested by Acharya (2003).

$$\text{MME} = [\text{RP} / (\text{MC} + \text{MM})] - 1$$

$$\text{RP} = \text{FP} + \text{MC} + \text{MM}.$$

Where,

MME = Modified measure of marketing efficiency,

RP = Prices paid by the consumer,

MC = Total marketing costs,

MM = Net marketing margins, and

FP = Pieces received by the farmer.

The higher the ratio, more will be the marketing efficiency and vice-versa.

*Results
And
Discussion*



Chapter – IV

RESULTS AND DISCUSSION

This chapter deals with the findings of the present investigation in conformity with the stipulated objectives laid down. The findings of the study are discussed under following five heads.

- 4.1 Socio-Economic Characteristics
- 4.2 Costs and Return Analysis
- 4.3 Production Function Analysis
- 4.4 Marketing Cost and Price Spread
- 4.5 Production, Marketing and Economic Constraints

4.1 SOCIO-ECONOMIC CHARACTERISTICS

The socio-economic characteristics consisting of, the size of family, educational status, institutional participation, operational size, irrigation facility *etc.*, affect the economy of the farm family and also the adoption of improved technology to a great extent. The size of family has a bearing on the supply of labour force on the farm as well as the family consumption needs. Educational status affects farmer's response to adopt improved technology. The detailed socio-economic characteristics for sample cultivators have been analyzed using field survey method and presented as under.

4.1.1 Age of Respondents

The selected farmers were categorized into three age groups *viz.*, young (up to 35 years), middle (35 to 50 years) and old (above 50 years). The distribution of respondents according to their age is given in Table 4.1.1.

Table 4.1.1: Distribution of Respondents according to age groups (Years)

Category of Farm	Age of the head of the family			Total	Average age
	Young (Up to 35)	Middle (35 to 50)	Old (Above 50)		
Marginal	3 (11.12)	14 (51.85)	10 (37.03)	27 (100.00)	47.48
Small	6 (15.78)	15 (39.47)	17 (44.73)	38 (100.00)	47.52
Medium	5 (19.23)	13 (44.82)	11 (37.93)	29 (100.00)	46.17
Large	7 (26.92)	11 (42.30)	8 (30.76)	26 (100.00)	45.11
Overall	21 (17.50)	53 (44.16)	46 (38.34)	120 (100.00)	46.57

Note : Figures in parenthesis indicate percentages to total.

The average age of the head of the farm family was about 46 years. Out of 120 farmers surveyed, only 21 farmers (17.50 per cent) were found from young age group while 53 farmers (44.16 per cent) and 46 farmers (38.34 per cent) belonged to old age group and middle age group, respectively. Further, it was also observed from data that majority of the farmers of marginal, medium and large category belonged to middle age group except small farmers who belonged to old age group.

4.1.2 Compositions of Family and Labour Force

The details regarding the composition of vegetables growing families are given in the Table 4.1.2.

Table 4.1.2: Compositions of Family and Labour Force

Category of farm	Average size of the family				Average labour force
	Up to 18 Years	18-60 Years	Above 60 Years	Total	
Marginal	2.00	2.50	0.70	5.25 (100.00)	3.92 (74.66)
Small	2.10	3.71	0.92	6.73 (100.00)	3.13 (46.50)
Medium	2.10	3.44	1.03	6.58 (100.00)	3.37 (51.21)
Large	2.15	3.76	1.03	6.96 (100.00)	2.03 (29.11)
Overall	2.09	3.40	0.92	6.41 (100.00)	3.13 (48.82)

Note : Figures in parenthesis indicate percentages to total.

The data presented in Table 4.1.2 indicated that the average size of the family for the cauliflower cultivators was 6.41. The average family size for marginal, small, medium and large farm groups was 5.25, 6.73, 6.58 and 6.96, respectively. At the overall level, average numbers of up to 18 years old, 18 to 60 years old and above 60 years old persons were 2.09, 3.40 and 0.92, respectively. The data presented in Table 4.1.2 also shown that about 48.82 per cent of the family members were in labour force on the sample farms. It was 74.66 per cent, 46.50 per cent, 51.21 per cent and 29.11 per cent in case of marginal, small, medium and large farm size group, respectively. The family members in labour force in large size farm group were lowest because they adopted mechanization in most of the activities as well as less preferred to work in agriculture and majority of them were engaged in other activities.

4.1.3 Educational Status

Educational level of head of family is supposed to play a pivotal role in adoption of new innovations in vegetable crops cultivation which is presented in Table 4.1.3.

Table 4.1.3: Educational level of the Head of the Family

Category of farm	Educational level				Total
	Illiterate	Primary (Up to VII Std.)	Secondary (VIII to XII Std.)	College	
Marginal	4 (14.81)	7 (25.92)	11 (40.74)	5 (18.53)	27 (100.00)
Small	6 (15.78)	8 (21.05)	14 (36.85)	10 (26.32)	38 (100.00)
Medium	3 (10.38)	6 (20.68)	13 (44.82)	7 (24.12)	29 (100.00)
Large	3 (11.53)	2 (7.70)	12 (46.15)	9 (34.62)	26 (100.00)
Overall	16 (13.34)	23 (19.16)	50 (41.66)	31 (25.84)	120 (100.00)

Note : Figures in parenthesis indicate percentage to total.

The table 4.1.3 indicated that about 86.66 per cent of the sample cultivators were found literate and remaining 13.34 per cent were found illiterate. Among the selected farmers only 19.16 per cent had education up to primary school, where as 41.66 per cent had education up to secondary school and 25.84 per cent had college education. Literacy percentage was the highest on medium farms (89.62 per cent) and the lowest on small farms (84.22 per cent). The college level education was comparatively higher among the large sized cultivators as compared to other category of farms. A more or less positive relation was noted between education and size of farm which is in line with the common observation.

4.1.4 Association with Institutions

Farmers' association with village level institutions and other institutions are an indication of their widened horizons. Table 4.1.4 gives an account of the cauliflower growers' association with different institutions.

Table 4.1.4: Association of Cauliflower Growers with Institutions

Institutions	Category of farm				
	Marginal 27	Small 38	Medium 29	Large 26	Total 120
Village Panchayat	10 (37.03)	12 (31.57)	9 (31.03)	7 (26.92)	38 (31.66)
Milk Co-op. society	5 (18.51)	7 (18.42)	5 (17.24)	6 (23.07)	23 (19.16)
Seva Sahkari	3 (11.12)	4 (10.52)	2 (6.89)	3 (11.53)	12 (10.00)
Youth club	1 (3.70)	2 (5.26)	1 (3.44)	1 (3.84)	5 (4.17)
Not associated	8 (29.62)	13 (34.21)	12 (41.37)	9 (34.61)	42 (35.00)

Note : Figures in parenthesis indicate percentages to total farm in each category

It can be seen from the above table that the marginal, small, medium and large farmers showed higher participation in Village Panchayat institutions, which was accounted for about 37.03 per cent, 31.57 per cent, 31.03 per cent and 26.92 per cent, respectively. On an overall among the different institutions the highest participation was observed in Village Panchayat (31.66 per cent) followed by Milk Co-op. Society (19.16 per cent), Seva Sahkari (10.00 per cent) and lowest with Youth Club (4.17 per cent). For cauliflower growers there was no special village level organization found in the study area.

4.1.5 Average Operational Size of Holdings

The average operational size of holdings and area under cauliflower crop are presented in Table 4.1.5.

Table 4.1.5: Operational size of Land Holding

(Area in hectares)

Category of farm	Average of total land holding	Area under cauliflower crop
Marginal	0.73	0.31 (42.46)
Small	1.63	0.50 (30.67)
Medium	3.50	0.79 (22.57)
Large	5.34	1.52 (28.57)
Overall	2.56	0.74 (28.90)

Note: Figures in parenthesis indicate percentage to average of total land holding.

Table 4.1.5 showed that overall average size of holding was found 2.56 hectare and it varied from 0.73 hectare for marginal farms to 5.34 hectares for large farms. The average area under cauliflower crop was 0.74 hectare (28.90 per cent). Looking to the case orientation characteristics of cauliflower crop, proportion of land allocation under cauliflower crop was found highest by marginal farm size group farmers, followed by small, medium and large category of farms.

4.1.6 Occupation

The source-wise occupation of cauliflower growers on sample farms are presented in Table 4.1.6. It can be seen from the table that more than 40 per cent each in small, marginal and large, while more than 50 per cent medium category of cauliflower growers adopted farming as a main occupation.

Overall 46.66 per cent of the cauliflower growers has adopted farming alone while 33.34 per cent has adopted farming as well as animal husbandry, 15.83 per cent has adopted farming, animal husbandry and business and 4.17 per cent has adopted farming, animal husbandry and service.

Table 4.1.6: Distribution of Cauliflower Growers according to Occupation

Category of farm	Occupation				Total
	F	F + AH	F + AH + B	F + AH + S	
Marginal	11 (40.74)	10 (37.03)	5 (18.51)	1 (3.72)	27 (100.00)
Small	18 (47.36)	14 (36.84)	4 (10.53)	2 (5.27)	38 (100.00)
Medium	15 (51.72)	10 (34.48)	3 (10.35)	1 (3.45)	29 (100.00)
Large	12 (46.15)	6 (23.07)	7 (26.93)	1 (3.85)	26 (100.00)
Overall	56 (46.66)	40 (33.34)	19 (15.83)	5 (4.17)	120 (100.00)

Note : F - Farming, AH - Animal Husbandry, B – Business and S - Service

Note : Figures in parenthesis indicate percentages to total.

4.1.7 Irrigation facilities

The details of method-wise irrigation facilities on sample farms are given in Table 4.1.7. The data presented in the table revealed that about 89.62 hectares of area was under irrigation on sample farms. Proportion of irrigated area varied from 8.50 hectares on marginal farms to 39.50 hectares on large farms. Further, it was also noted that among the different source of irrigation, tube well was the main source of irrigation which accounted for about 71.26 per cent of the total area followed by canal irrigation with 28.86 per cent on overall basis. Majority of large farmers (77.84 per cent) has adopted tube well irrigation method while the medium category farmers adopted well irrigation which was

found lowest (63.04 per cent). Canal irrigation method was adopted highest (36.95 per cent) on medium farms and lowest (22.15 per cent) on large farms.

Table 4.1.7: Irrigation Method wise Distribution of Area of the Cauliflower
(Area in hectares)

Category of farm	Total irrigated area	Proportion of cauliflower area under different irrigation method			
		Canal irrigation		Tube well	
		Area	Per cent	Area	Per cent
Marginal	8.50 (100.00)	2.87	33.76	5.50	64.70
Small	18.63 (100.00)	5.75	30.88	13.12	70.46
Medium	23.00 (100.00)	8.5	36.95	14.5	63.04
Large	39.50 (100.00)	8.75	22.15	30.75	77.84
Overall	89.62 (100.00)	25.87	28.86	63.87	71.26

Note : Figures in parenthesis indicate percentages to total irrigated area.

Furthermore, it was also found that as category of farms changed from marginal to large the allocation of area under canal irrigation method decreased whereas allocation of area under tube well irrigation method increased.

4.1.8 Variety Wise Area under Cauliflower

The varieties of cauliflower adopted for cultivation by sampled farmers are given in Table 4.1.8.

The selection of variety of the crop has significant influence on productivity, demand, price, quality etc. Scientists have recommended the varieties according to various agro-climatic zones. On cauliflower farms, highest per cent of total area (44.20) was under Snowball, followed by Anandi (34.44 per cent) and Girija (25.79 per cent). Among the different varieties of

cauliflower, Snowball variety of was found more popular among sampled farms due to its characteristics *i.e.* attractive color of curd, good keeping quality and thereby better market price than other varieties. Snowball, Anandi and Girija was shown highest in medium (45.65 per cent), small (44.28 per cent) and large (32.27 per cent) farm size group, respectively. The proportion of area under Girija variety was observed low on marginal, small and medium category of farmers compared to large farmers because of its costliest planting material.

**Table 4.1.8: Distribution of Area under Different Variety of Cauliflower
(Area in hectares)**

Category of farm	Variety						Total area
	Anandi		Girija		Snowball		
	Area	Per cent	Area	Per cent	Area	Per cent	
Marginal	3.62	42.58	1.5	17.64	3.37	39.64	8.50 (100.00)
Small	8.25	44.28	3.62	19.44	6.75	36.23	18.63 (100.00)
Medium	7.25	31.52	5.25	22.83	10.5	45.65	23.00 (100.00)
Large	11.75	29.74	12.75	32.27	16.50	42.27	39.50 (100.00)
Overall	30.87	34.44	23.12	25.79	35.62	44.20	89.62 (100.00)

Note : Figures in parenthesis indicate percentages to total

4.2 COSTS AND RETURN ANALYSIS

4.2.1 Cost Structure

Cauliflower is one of the major vegetable crops occupying a prominent place in the economy of cultivators and India is the leading country in the world for cauliflower production. Therefore, cost of cauliflower cultivation is of vital importance in determining the net income from it. The details about

component wise costs for cauliflower cultivation on different size of farms per hectare are studied and the results are furnished in Table 4.2.1. and Figure 4.1.

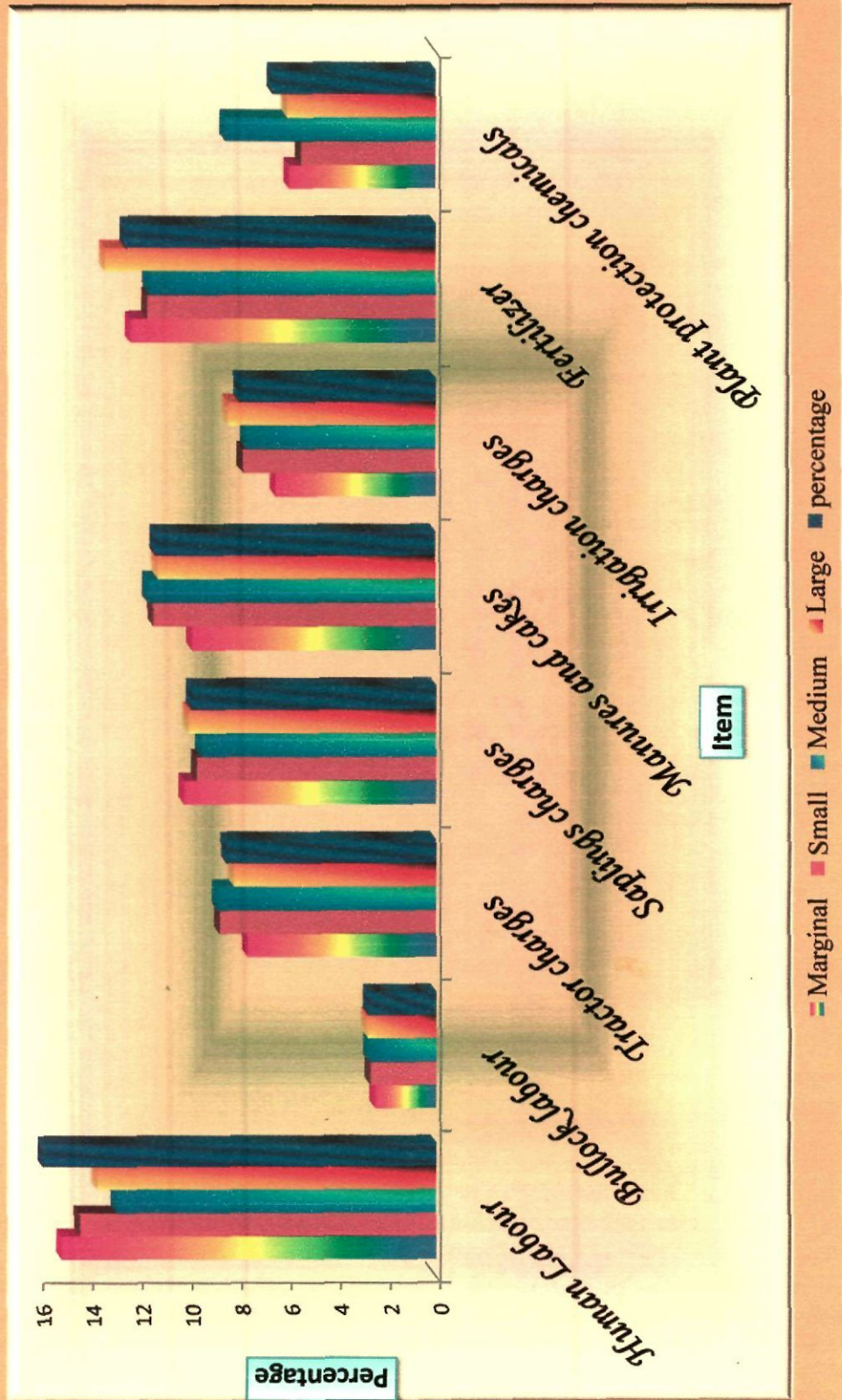
The table portray that the average total cost of cultivation per hectare of cauliflower farms was ₹ 73232.95. It was found the highest cost in medium ₹ 74577.4 followed by on marginal farms (₹ 74483.08), small farms (₹ 72551.24) and large farms (₹ 72622.81). This was mainly on account of more investment on human labour and bullock labour and also on depreciation and interest on fixed capital incurred by marginal farmers as compared to other categories of farms. On an overall basis among the different items of cash expenditure, the cost of human labour ranked first with 15.81 per cent of the total cost as cauliflower requires more number of labours for picking, weeding and also application of irrigation to the crop. The expenditure on other input was observed as follows; fertilizer (12.51 per cent), manures and cakes (11.29 per cent), sapling charges (9.86 per cent), tractor charges (8.45 per cent), irrigation charges (7.93 per cent), plant protection chemicals (6.57 per cent), bullock labour (2.71 per cent), miscellaneous (1.40 per cent) and depreciation (1.24 per cent). The highest not payable but accounted expenditure was rental value of owned land (9.27 per cent) followed by managerial costs (9.09 per cent), interest on fixed capital (4.33 per cent) and interest on working capital (2.29 per cent).

Table 4.2.1: Break-up of the Total Cost of Cultivation for Cauliflower
(₹/hectare)

Sr. No.	Item	Category of farm				
		Marginal	Small	Medium	Large	Overall
1	Human Labour	11223.53 (15.06)	10417.29 (14.35)	9593.04 (12.86)	9854.18 (13.64)	10034.05 (15.81)
	(a) Family	4915.29 (6.60)	4041.88 (5.57)	3241.30 (4.34)	3109.62 (4.30)	3508.40 (4.83)
	(b) Hired	6308.24 (8.46)	6375.41 (8.78)	6351.74 (8.51)	6744.56 (9.33)	6525.66 (8.98)
2	Bullock labour	1823.53 (2.44)	1916.78 (2.64)	2028.26 (2.71)	1997.47 (2.76)	1972.11 (2.71)
3	Tractor charges	5670.59 (7.61)	6319.46 (8.71)	6576.09 (8.81)	5902.53 (8.17)	6140.03 (8.45)
4	Saplings charges	7574.12 (10.16)	7011.01 (9.66)	7062.61 (9.47)	7206.33 (9.97)	7163.74 (9.86)
5	Manures and cakes	7336.47 (9.84)	8273.83 (11.40)	8646.09 (11.60)	8101.27 (11.21)	8204.41 (11.29)
6	Irrigation charges	4817.41 (6.46)	5644.13 (7.77)	5697.91 (7.64)	6055.80 (8.38)	5760.96 (7.93)
7	Fertilizer	9166.71 (12.30)	8456.38 (11.65)	8637.22 (11.58)	9632.38 (13.33)	9088.45 (12.51)
8	Plant protection chemicals	4396.47 (5.90)	3945.50 (5.43)	6341.74 (8.50)	4343.29 (6.01)	4778.52 (6.57)
9	Miscellaneous	1093.53 (1.46)	993.29 (1.36)	1362.17 (1.82)	825.32 (1.14)	1023.43 (1.40)
10	Depreciation	1253.96 (1.68)	935.93 (1.29)	671.68 (0.90)	971.57 (1.33)	913.96 (1.24)
11	Interest on working capital	1663.99 (2.23)	1651.16 (2.27)	1770.52 (2.37)	1645.84 (2.27)	1666.47 (2.29)
12	Interest on fixed capital	2760.21 (3.70)	3678.38 (5.07)	2771.72 (3.71)	3194.79 (4.42)	3145.50 (4.33)
13	Rental value of owned land	8931.37 (11.99)	6712.53 (9.25)	6638.59 (8.90)	6327.00 (8.76)	6738.73 (9.27)
14	Managerial cost	6771.19 (9.09)	6595.57 (9.09)	6779.76 (9.09)	6565.08 (9.09)	6602.59 (9.09)
15	Total	74483.08 (100.00)	72551.24 (100.00)	74577.4 (100.00)	72622.81 (100.00)	73232.95 (100.00)

Note : Figures in parentheses indicate percentage to total.

Fig. 4.1: Breck up of the Total Cost of Cultivation



4.2.2 Estimates of Different Costs

Estimates of different costs such as cost A, Cost B, Cost C₁ and Cost C₂ were calculated and presented in Table 4.2.2 and Figure 4.2.

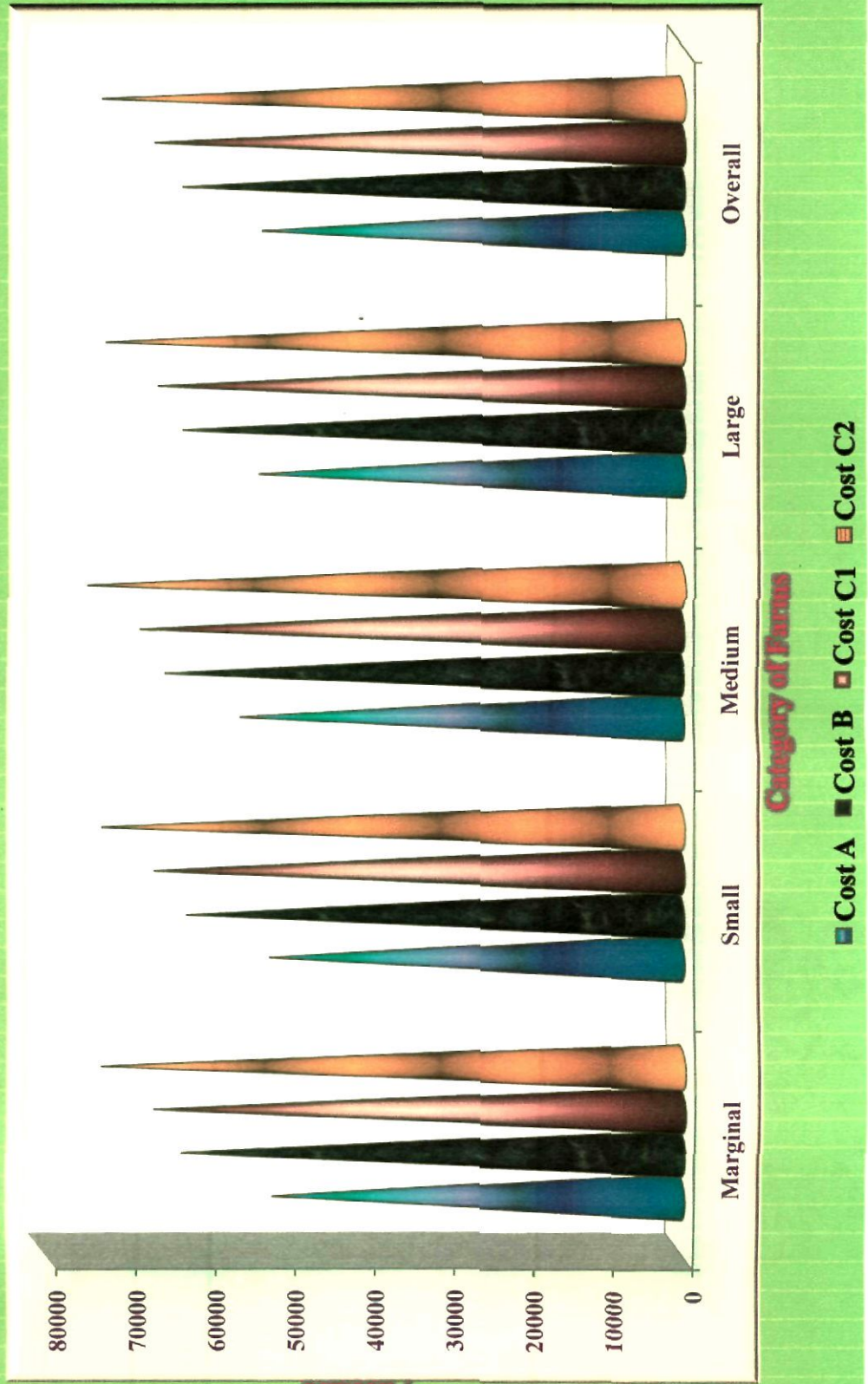
Table 4.2.2: Estimation of Different Costs

Category of farm	Different costs (₹ per hectare)			
	Cost A	Cost B	Cost C ₁	Cost C ₂
Marginal	51105.01 (70.36)	62517.45 (86.07)	66025.85 (90.90)	72628.44 (100.00)
Small	51522.87 (71.01)	61913.78 (85.33)	65955.66 (90.90)	72551.22 (100.00)
Medium	55146.03 (73.94)	64556.34 (86.56)	67797.64 (90.90)	74577.41 (100.00)
Large	53019.35 (73.41)	62541.15 (86.60)	65650.77 (90.90)	72215.84 (100.00)
Overall	52633.23 (72.46)	62517.45 (86.07)	66025.85 (90.90)	72628.44 (100.00)

Figure in parenthesis indicate percentages to Cost-C₂

It could be inferred from the above table that overall per hectare Cost A was found to be ₹ 52633.23. The highest per hectare Cost A was ₹ 55146.03 on medium farms and lowest ₹ 51105.01 on marginal farms. Further, the study also showed that Cost B and Cost C₁ accounted for about 86.07 and 90.90 per cent of the Cost C₂. Overall, Cost C₂ was observed to be ₹ 72628.44 per hectare which was highest on medium farms (₹ 74577.41 per hectare) and lowest on large farms (₹ 72215.84 per hectare). Higher costs on medium farms are associated with intensive use of human labour and bullock labour and also on depreciation and interest on fixed capital as compared to other categories of farms. Decreasing trend was observed as category of farms increased from marginal to large in total cost (Cost C₂) except medium category of cauliflower cultivators. It was might be due to adoption of new technical knowledge.

Fig 4.2: Cost of Cultivation on the basis of Different Cost Concept



4.2.3 Yield, Price, Gross Income and Net Gains

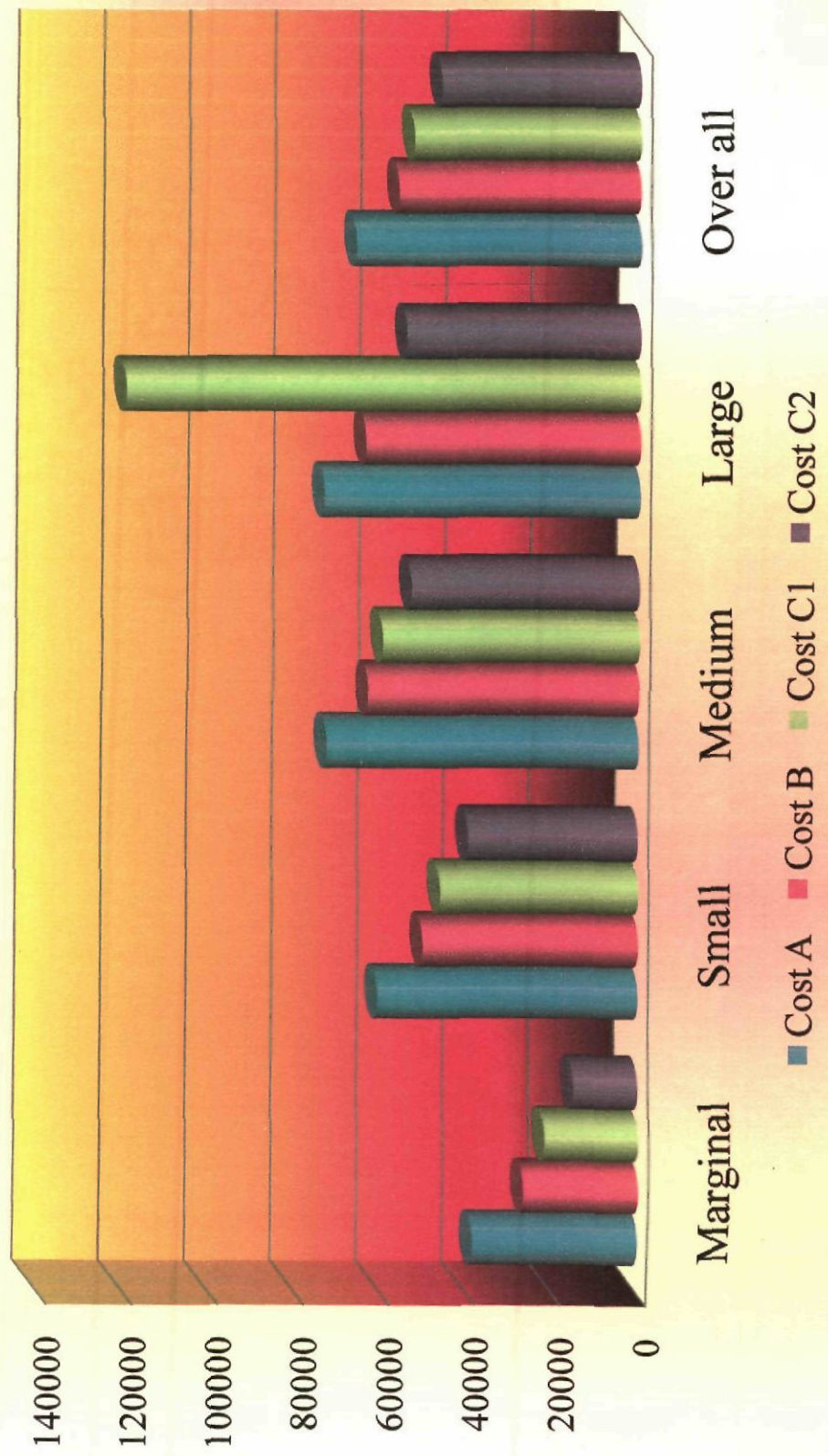
Yield, farm harvest price and value of gross output from cauliflower production on different farm size groups are presented in Table 4.2.3 and Figure 4.3.

A perusal of the table revealed that the average yield of cauliflower was ₹ 333.13 quintals per hectare. It ranged from ₹ 286.24 quintals on marginal farms to ₹ 348.00 quintals on medium farms. Higher yield level on medium farms may be due to optimum level of inputs utilized by them along with timely weeding operations and proper selection of varieties of cauliflower, which affect the output to a greater extent, as compared to other farms. The variation in the yield might be due to the different time of sowing, types of land and use of hybrid variety *etc.*

Table 4.2.3: Yield Level, Farm Harvest Price and Gross Income per Hectare

Category of farm	Yield (quintal)	Harvest price (₹/quintal)	Value of gross output (₹)
Marginal	286.24	312.41	89422.77
Small	316.51	354.34	112152.18
Medium	348.00	367.24	127799.52
Large	342.41	369.80	126621.39
Overall	333.13	357.20	118994.93

Fig 4.3: Net Gains Over Different Costs per Hectare



As can be seen from Table 4.2.3 per quintal average farm harvest price received by the cauliflower growers was ₹ 357.20. The large size growers realized higher prices per quintal *i.e.* (₹ 369.80) followed by medium (₹ 367.24), small (₹ 354.34) and on marginal (₹ 312.4) category of farms. Generally, large and medium farm growers sell their produce at higher prices compared to small and marginal farms, which was mainly due to time of sale and agencies to which the produce was sold.

The overall average gross returns per hectare on cauliflower farms amounted to ₹ 118994.93 and it varied from ₹ 89422.77 on marginal farms to ₹ 127799.52 on medium farms. Thus gross income increased with an increase in size of the farms, except medium farms.

A perusal of Table 4.2.4 shows that per hectare net returns over operational cost (Cost A) was the highest (₹ 73602.04) on large farms and the lowest (₹ 38317.16) on marginal farms with on an average of ₹ 66361.70 on sample farms. Net returns from cauliflower farms on the basis of Cost B, Cost C₁ and cost C₂ was ₹ 56477.47, ₹ 52969.08 and ₹ 46366.49 per hectare, respectively. It is apparent from the analysis that per hectare net returns on cauliflower farms over Cost C₂ ranged from ₹ 14939.69 on marginal farms to ₹ 54405.55 on large farms with an average of ₹ 46366.49. Net income over different costs on cauliflower farms increased with increase in the size of farms.

Table 4.2.4: Net gains over different costs per hectare

Category of farm	Net gains over different costs (₹/hectare)			
	Cost A	Cost B	Cost C ₁	Cost C ₂
Marginal	38317.76	26626.17	21710.88	14939.69
Small	60629.31	50238.40	46196.52	39600.95
Medium	72653.49	63243.18	60001.88	53222.11
Large	73602.04	64080.25	120056.32	54405.55
Overall	66361.70	56477.47	52969.08	46366.49

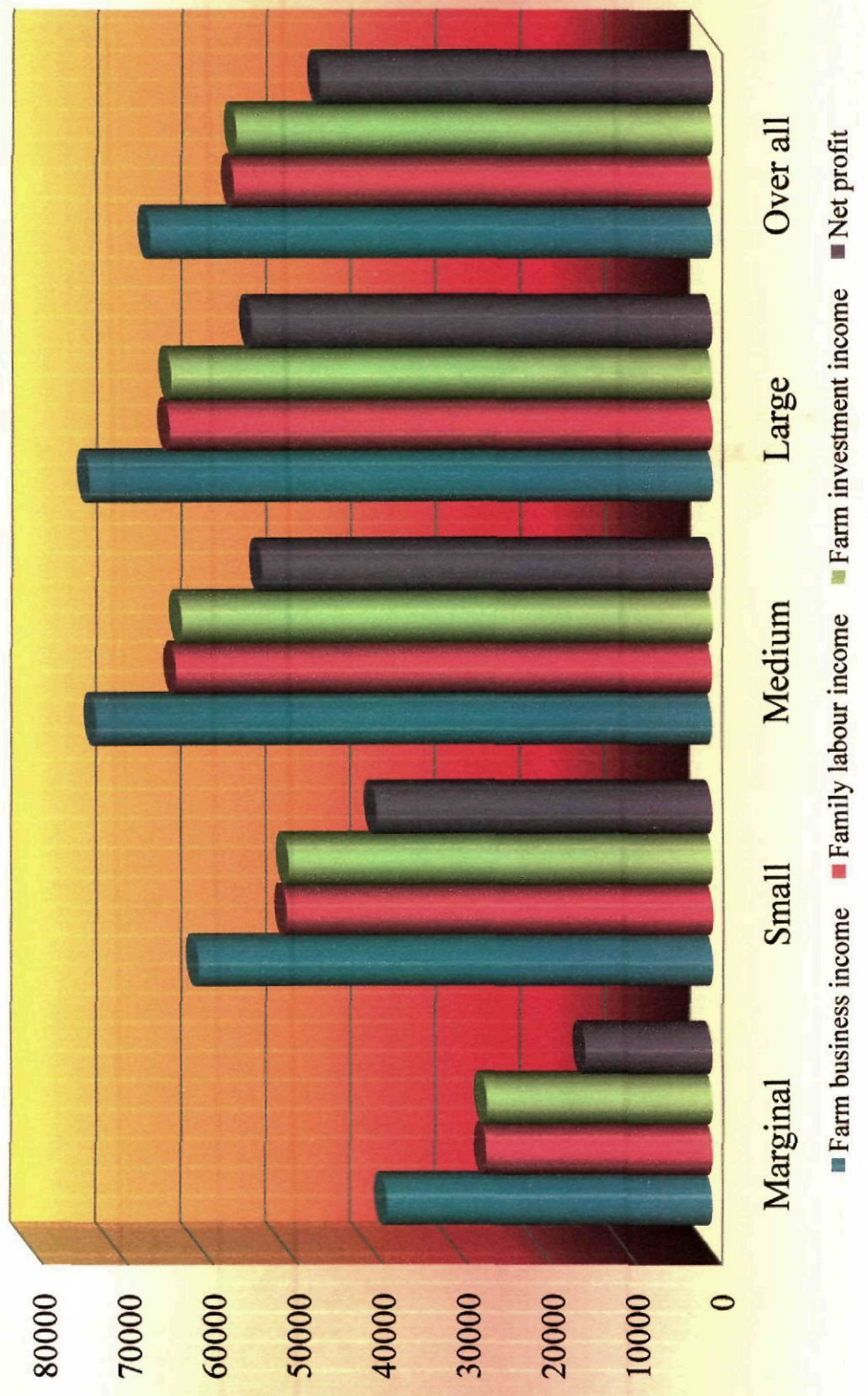
The overall per hectare farm business income, family labour income and farm investment income as given in Table 4.2.5 and Fig 4.4 were found to be ₹ 66361.70, ₹ 56477.47 and ₹ 56250.72, respectively. The net profit per hectare (over Cost C₂) was ₹ 46366.49 for all farms. The analysis also brought to the fore that farm business income, family labour income and farm investment as well as net profit increased as the category of farm changed from marginal to large.

Table 4.2.5: Farm Business Income, Family Labour Income, Farm Investment Income and Net Profit over Cost-C₂

(₹/hectare)

Particulars	Category of farm				
	Marginal	Small	Medium	Large	Overall
Farm business income	38317.76	60629.31	72653.49	73602.04	66361.70
Family labour income	26626.17	50238.40	63243.18	64080.25	56477.47
Farm investment income	26631.27	49991.86	62632.42	63927.35	56250.72
Net profit	14939.69	39600.95	53222.11	54405.55	46366.49

Fig. 4.4: Per Hactare Net Income From Cauliflower



4.2.6 Cost per Quintal

Cost-price relationship generally decides the economic prosperity and the degree of commercialization on these farms. Given the price, offered by the market mechanism to a unit of output, the farmers' prosperity depends upon his capacity to produce his output at a lesser cost than the market price.

The estimated cost of production per quintal of cauliflower is given in Table 4.2.6. The overall paid out cost (cost A) per quintal was ₹ 157.99, which was 72.46 per cent of the total cost. The overall cost B came to ₹ 187.67 per quintal which was 86.07 per cent of total cost. The overall total cost of production (cost C₂) per quintal of cauliflower was about ₹ 218.02. It was highest on marginal farms (₹ 260.22), followed by small farms (₹ 229.22), medium farms (₹ 214.30) and large category of farms (₹ 210.91). As the category of farm increased the total cost per quintal was declined. It was mainly due to the higher productivity seen in cauliflower on higher category of farms.

Table 4.2.6: Cost of Production per Quintal on the Basis of Different Cost Concepts

Category of farm	Different costs (₹ per quintal)			
	Cost A	Cost B	Cost C ₁	Cost C ₂
Marginal	178.54 (68.61)	219.39 (84.30)	236.56 (90.90)	260.22 (100.00)
Small	162.78 (71.01)	195.61 (85.33)	208.38 (90.90)	229.22 (100.00)
Medium	158.47 (73.94)	185.51 (86.56)	194.82 (90.90)	214.30 (100.00)
Large	154.84 (73.41)	182.65 (86.60)	191.73 (90.90)	210.91 (100.00)
Overall	157.99 (72.46)	187.67 (86.07)	198.20 (90.90)	218.02 (100.00)

Note : Figures in parentheses indicate the percentages to Cost-C₂

The market price of cauliflower was observed ranging from ₹ 300 to ₹ 400 per quintal in the study area. So, it can be considered as quite considerable price. Therefore, it can be concluded that the cauliflower cultivation was quite remunerative even if the lowest market price is considered.

Fig. (4.5)

4.2.7 Input-Output Ratio

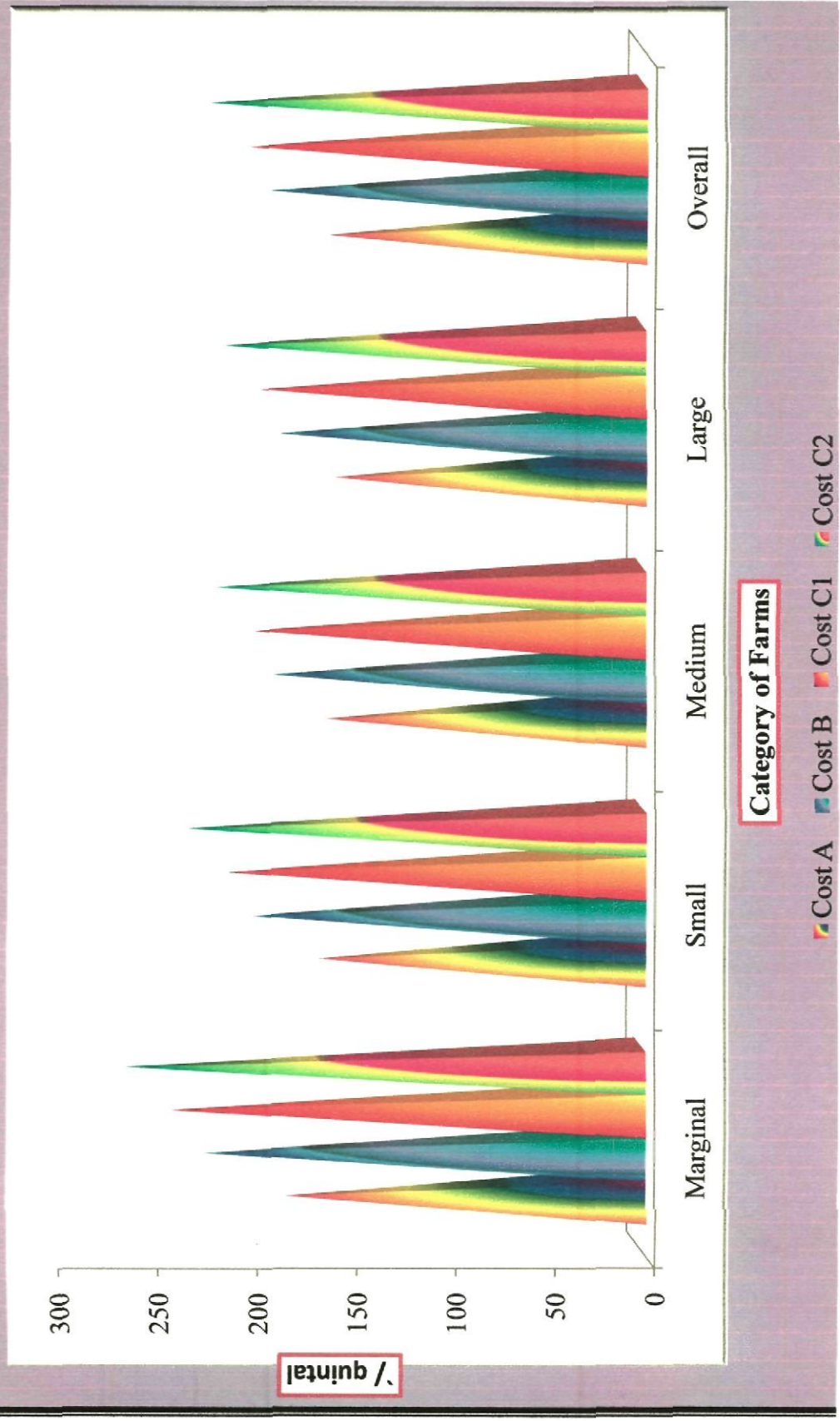
The input-output ratio reflects the criteria for economic viability of the crop based on return per rupee invested. The input-output ratios were worked out on the basis of different cost concepts and the same are presented in Table 4.2.7.

Table 4.2.7: Input-Output Ratio

Category of farm	Cost A	Cost B	Cost C ₁	Cost C ₂
Marginal	1:1.75	1:1.42	1:1.32	1:1.20
Small	1:2.18	1:1.81	1:1.70	1:1.55
Medium	1:2.32	1:1.98	1:1.89	1:1.71
Large	1:2.39	1:2.02	1:1.93	1:1.75
Overall	1:2.26	1:1.90	1:1.80	1:1.64

The overall input output ratio which was found to be 1: 1.64 on the basis of cost C₂ indicated that an investment worth ₹ 1 on all the inputs used in the cultivation of cauliflower yielded an output worth ₹ 1.64. The input output

Fig 4.5: Cost of Production on the basis of Different Cost Concept



large farms. This may be attributed to the low level of awareness and education background of the marginal farmers.

Further, it was observed that the input output ratio on the basis of cost A *i.e.* paid out cost, was highest (1:2.39) on large farms followed by small medium farms (1:2.32), small farms (1:2.18) and lowest on marginal farms (1:1.75). The input-output ratio over cost A, cost B, cost C₁ and cost C₂ were 2.26, 1.90, 1.80 and 1.64, respectively. Results indicated that on an average the farmers detained ₹ 2.26 as total returns per rupee invested.

4.3 PRODUCTION FUNCTION ANALYSIS

To achieve the objective of measuring the resource use efficiency on the cauliflower farms, Cobb-Douglas production function was used. Gross profit considered as dependent variable and other variables *i.e.* the human labour, bullock labour, manure, cost of seeds, chemical fertilizers, irrigation and plant protection chemicals taken as independent variables.

The Elasticities of production with its standard errors are presented in the Table 4.3.1. From the table it can be seen that the co-efficient of multiple determinations was 0.96 which showed that 96 per cent of the variation in the yield was accounted for by the independent variables included in the function.

The conspicuous observation from the table is that the variables *viz*, bullock labour, plant protection chemical, and irrigation exert highly significant influence on the yield. It implies that 1 per cent increase in the use of these inputs will result in increase of 0.432, 0.192 and 0.187 per cent in the yield of crop respectively.

Table 4.3.1: Estimated Production Function for Cauliflower

Sr. No.	Variables	Production Elasticity (bi)
1.	X ₁ = Human Labour (Man Days)	0.184 (0.158)
2.	X ₂ = Bullock Labour (Pair Days)	0.432*** (0.159)
3.	X ₃ = Manures (Trolley)	-0.331 (0.601)
4.	X ₄ = Cost of Seeds (Rs.)	0.487 (0.431)
5.	X ₅ = Cost of Fertilizers (Rs.)	-0.080 (0.310)
6.	X ₆ = Cost of Plant Protection Chemicals (Rs.)	0.192*** (0.054)
7.	X ₇ = Irrigation Charges (Rs.)	0.187*** (0.049)
8.	a = Constant	0.265
9.	R ² = Co-efficient of Multiple Determination	0.96
10.	Σ bi's = Sum of Elasticities	1.071
11.	N = Number of Farms	120

Note: Figures in parentheses indicate standard error of corresponding elasticity
 *** Significant at 1 per cent level of significance

The sum of regression co-efficient ($\Sigma bi's$) was 1.071 indicating increasing returns to scale in other words sample farmers were observed operating in first zone of production. Looking to the elasticities, coefficient of multiple determination on and returns to scale it can be concluded that gross income from cauliflower crop increasing proportionally with an increasing in the valuable factors except fertilizer and manure. Further, these two variable i.e.

on bullock labour, plant protection chemical and irrigation. The results reported by Singh & Vashist (1999), and Singh (2000) were closer to these findings.

4.4 MARKETING COST AND PRICE SPREAD

Considering the perishable nature, bulkiness and seasonal nature of cauliflower, the profitability depends upon how marketing of these vegetable is undertaken by the producers. Therefore, different aspects of marketing viz., disposal pattern, marketable surplus, and agency through whom sold, place of sale, time of sale, marketing costs and margins *etc.* were analyzed and the results are presented here.

4.4.1 Utilization pattern

Total production, utilization and marketable surplus of cauliflower on different sized farms are presented in Table 4.4.1

Table 4.4.1: Pattern of utilization of Cauliflower on the sample farms

(Qty. in quintal)

Sr. No	Particulars	Category of farm				Total
		Marginal	Small	Medium	Large	
1.	Total production	2433.00 (100)	5895.00 (100)	8004.00 (100)	13525.00 (100)	29857.00 (100)
2.	On farm Utilization					
	(a) Home Consumption	37.60 (1.54)	57.60 (0.97)	40.30 (0.37)	51.00 (0.38)	185.50 (0.62)
	(b) Wage Purpose	26.75 (1.09)	74.00 (1.25)	68.10 (0.63)	108.50 (0.80)	277.35 (0.92)
	(c) Damage	35.45 (1.45)	86.70 (1.47)	130.00 (1.22)	165.50 (1.23)	415.65 (1.40)
	(d) Other	116.20 (4.77)	241.20 (4.09)	238.90 (2.24)	345.00 (2.55)	941.30 (3.15)
	Total (a to d)	216.00 (0.87)	459.50 (7.79)	477.30 (4.48)	670.00 (4.95)	1822.80 (6.10)
3.	Marketable Surplus	2217.00 (91.12)	5435.50 (92.20)	7526.70 (94.03)	12855.00 (95.05)	28034.20 (93.89)

Note : Figure in parenthesis indicate per cent to total production

It is evident from the table that the total production of cauliflower on sampled farms was 29875.00 quintals. Of this; on farm utilization was 6.10 per cent. The quantity utilized as damaged accounted for 1.40 per cent, for relatives 3.15 per cent, wage purpose 0.92 per cent and home consumption was 0.62 per cent. The marketable surplus of cauliflower varied from 91.12 per cent on marginal farms to 95.05 per cent on large farms. As expected, the marketable surplus increased in absolute as well as in percentage terms with the increase in farm size. It was 91.12, 92.20, 94.03 and 95.05 per cent on marginal, small, medium, and large sized farms, respectively, with an average of 93.89 per cent on sample farms.

4.4.2 Agency-Wise Sale of Cauliflower

Like other crops, the profitability of vegetable crops depends upon how marketing is undertaken by the producers. Agency through whom it is sold, place of sale and time of sale are some of the important factors which influence the net price received by the farmers. The farmer's decisions with respect to agency for sale of cauliflower influenced by number of factors such as mode and transportation facilities available, distance and location of markets, price of the produce, transportation cost, marketable quantity and economic conditions of the farmers.

The agency-wise sale of total marketed surplus of cauliflower is presented in Table 4.4.2.

Table 4.4.2: Disposal Pattern of Cauliflower under Different Agencies
(Qty. in quintal)

Marketing Agency	Category of farm				
	Marginal	Small	Medium	Large	Total
Village Merchants	711.50 (32.09)	841.50 (15.48)	734.00 (9.76)	1173.50 (9.12)	3460.50 (12.34)
Wholesaler-cum-commission agent	1002.50 (45.21)	2719.00 (50.02)	4317.80 (57.36)	7482.40 (58.20)	15521.70 (55.36)
Wholesaler	503.00 (22.69)	1875.00 (34.49)	2474.40 (32.88)	4199.10 (32.66)	9051.50 (32.28)
Total Marketed Surplus	2217 (100)	5435.50 (92.20)	7526.20 (94.03)	12855.00 (95.05)	28033.70 (93.89)

Note : Figure in parentheses indicate per cent to total marketed surplus.

The total marketed surplus of cauliflower was observed to be 28033.70 quintals. Out of this, the major share of 55.36 per cent was sold through wholesalers-cum-commission agents, followed by wholesalers (32.28 per cent) and village merchants (12.34 per cent) by sample cauliflower growers. So, details of cost, margin and price spread were studied for producer to wholesaler cum commission agent to the retailers to the consumer. The quantity sold to wholesaler-cum-commission agents ranged from 58.20 per cent on large farms to 45.21 per cent on marginal size cauliflower farms.

4.4.3 Marketing Cost Incurred by the cauliflower Growers

Marketing charges paid by the cauliflower growers for different components are furnished in Table 4.4.3.

Table 4.4.3: Marketing Cost Incurred by the Cauliflower Growers
(₹ / Quintal)

Particular	Category of Farm				
	Marginal	Small	Medium	Large	Overall
Weighing Cost	2.00 (11.82)	1.87 (9.90)	1.90 (10.30)	1.96 (9.52)	1.93 (9.98)
Cleaning and Grading	0.94 (5.56)	1.48 (7.84)	1.50 (8.14)	1.47 (7.14)	1.44 (7.45)
Packing Charges	4.00 (23.68)	3.81 (20.16)	3.79 (20.57)	4.90 (23.82)	4.32 (22.32)
Loading and Unloading Charges	3.86 (22.85)	4.00 (21.16)	3.82 (20.72)	4.86 (23.62)	4.17 (21.55)
Transportation Cost	6.53 (38.66)	6.31 (33.39)	6.29 (34.12)	6.38 (31.01)	6.35 (32.82)
Damage and other cost	1.56 (9.23)	1.41 (7.46)	1.13 (6.13)	1.00 (6.36)	1.15 (5.94)
Total Marketing Cost	16.91 (100.00)	18.90 (100.00)	18.43 (100.00)	20.57 (100.00)	19.35 (100.00)

Figures in parentheses indicate percentage to total.

The per quintal marketing cost of cauliflower ranged from ₹ 16.91 on marginal farms to ₹ 20.57 on large sized farms. It was ₹ 18.90 on small and ₹ 18.90 on medium sized farms. Thus, the marketing cost was relatively more on larger group of farms compared to smaller farms. Moreover, overall marketing cost for cauliflower was ₹ 19.35 per quintal. Among the various marketing costs, transportation cost ranked first with 32.82 per cent. The next important cost components were packing charges, loading and unloading cost and weighing

charge, cleaning charge and damage and other cost which accounted for about 22.32 per cent , 21.55 per cent, 9.93 per cent, 7.45 per cent and 5.94 per cent respectively. Total marketing cost per quintal was found more on large farm (₹ 20.57) as compared to marginal size farms (₹ 19.57) due to variation in the quantum of marketed surplus on various categories of farm.

4.4.4 Marketing cost incurred by wholesaler-cum-commission agent

The details about marketing cost incurred by wholesaler-cum-commission agent in the marketing of cauliflower are depicted in Table 4.4.4. The table brought to the fore that the total marketing cost borne by wholesaler-cum-commission agent for cauliflower was ₹ 70.63 per quintal. Among the various cost components, commission charges accounted for about 41.57 per cent of total marketing cost, followed by spoilage (19.94 per cent), loading and unloading cost (14.16 per cent), cleaning and grading and cost (8.49 per cent), packing cost (5.66 per cent), market fee (5.54 per cent), weighing charges (2.83 per cent) and other cost (1.81 per cent). The higher marketing cost might be due to higher commission charges incurred by wholesaler as a buyer while buying from distance markets.

Table 4.4.4: Marketing cost incurred by wholesaler-cum-commission agent

Sr. No.	Particulars	Cost (₹/qtl.)	Per cent to total cost
1	Cleaning and Grading	6.00	8.49
2	Weighing Charges	2.00	2.83
3	Loading and unloading Charges	10.00	14.16
4	Packing charges	4.00	5.66
5	Market fee	3.91	5.54
6	Commission	29.36	41.57
6	Damage/Spoilage	14.08	19.94
7	Others	1.28	1.81
Total marketing cost		70.63	100.00

4.4.5 Marketing cost incurred by retailers.

Generally, retailers operating in selected APMCs market area purchase vegetables from wholesaler-cum-commission agents as well as from wholesalers and sell to consumers through their retail shops. The results on costs incurred by retailers in the marketing of cauliflower are presented in Table 4.4.5. Retailers incurred ₹ 129.27 as total marketing cost per quintal.

Table 4.4.5 Marketing cost incurred by retailers.

Sr. No.	Particulars	Cost (₹/qtl.)	Per cent to total cost
1	Loading and unloading Charges	5.00	3.88
2	Transportation cost	23.33	18.11
3	Packing cost	15	11.64
4	Damage/Spoilage	53.62	41.62
5	Others	31.88	24.75
Total marketing cost		129.27	100.00

Among different items of expenditure, the maximum share was noticed for spoilage (41.62 per cent to total marketing cost). The other important components were the cost of transportation (18.11 per cent), packing (11.64 per cent) and the cost of loading and unloading (3.88 per cent to total cost).

4.4.6 Cost of Production, Marketing Cost and Net Returns from Cauliflower

The cost of production, marketing, sale price and net returns from cauliflower are presented in Table 4.4.6

Table 4.4.6: Cost of Production, Marketing Cost and Net Returns from Cauliflower

Sr. No.	Category of Farm	Total cost of Production	Marketing cost	Total cost*	Sale price	Net return
1	Marginal	260.22	16.91	277.13	312.41	35.28
2	Small	229.22	18.90	248.12	354.34	106.22
3	Medium	214.30	18.43	232.73	367.24	134.51
4	Large	210.91	20.57	231.48	369.80	138.32
5	All Farm	218.02	19.35	237.37	357.20	119.83

*Total cost is the sum of cost of production and marketing cost.

The per quintal average cost of production of cauliflower was observed to be ₹ 218.0. It ranged from ₹ 260.22 per quintal on marginal farm size groups to ₹ 210.91 on large size group of the sampled farms. Thus, on an average total cost (cost of production plus cost of marketing) incurred by cauliflower producers was ₹ 237.37 per quintal.

The average price received by sample cauliflower growers was ₹ 357.20 per quintal. Among the various categories of vegetable growers, large farmers received higher price as compared to other farm groups. The reason for it was large farmers sold their marketable surplus in distance markets, where they fetched higher prices. Further, it was also found that on an average net return per quintal of cauliflower growers was ₹ 119.83 per quintal. Increasing trend was observed on different category of farms when the comparison was made on the basis of net return from cauliflower production.

4.4.7 Cost, margin and price spread in marketing of Cauliflower

Price spread includes cost of performing various marketing functions and margins of different agencies associated in the marketing process of the commodity. The extent of price spread helps policy makers in devising suitable policies for increasing marketing efficiency either by way of reducing the marketing costs or eliminating unwanted middlemen from the marketing process by both. The marketing costs, margins and price spread in marketing of cauliflower through major channel have been presented based on the data collected from farmers and market functionaries. The channels identified in the study area were

Channel I: Producer– Local Merchants–Consumers

Channel II: Producer- Wholesaler–cum-Commission Agent–
Retailer – Consumer

Channel III: Producer–Wholesaler–Retailer–Consumer

On an average about 55.36, 32.28 and 12.34 per cent of total cauliflower moved in studied area through Channel II, III and I, respectively. Thus, more than 50 per cent of cauliflower moved through producer to wholesaler-cum-commission agent to retailers to consumer. As such, details of cost, margin and price spread were studied for channel II only. The costs incurred and margins earned by various market functionaries as well as price spread in marketing of cauliflower through Channel II are given in Table 4.4.7.

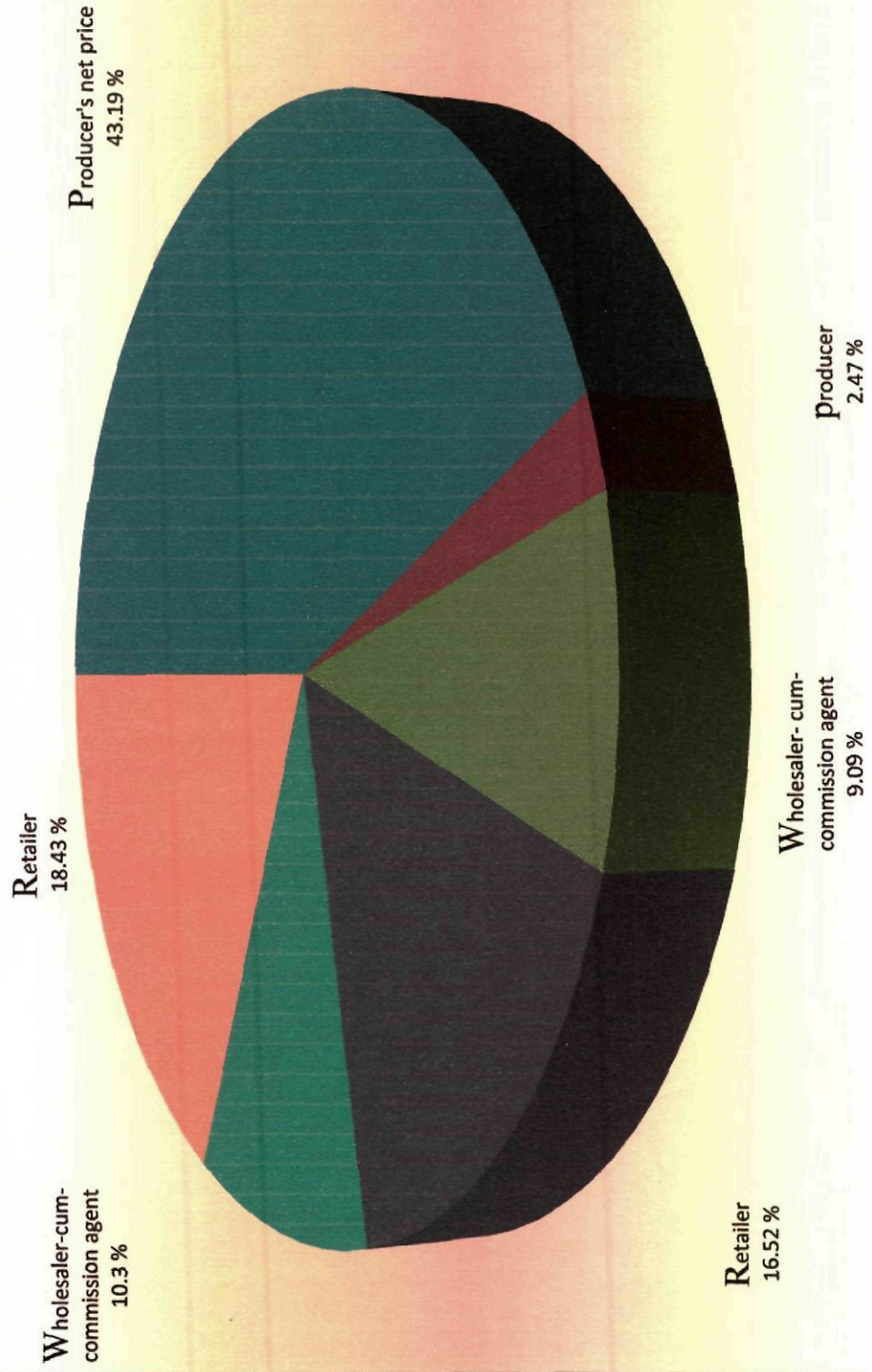
The total margin earned by different functionaries was ₹ 224.99 per quintal of cauliflower. It was higher at retailers' level (₹ 144.14 per quintal) compared to wholesaler (₹ 80.85 per quintal), constituting 10.33 per cent and 18.44 per cent of consumer's price, respectively. The marketing cost incurred by different functionaries was ₹ 219.23 per quintal of cauliflower, accounting for 28.03 per cent of the consumers' price. Out of total marketing cost, the highest cost (16.52 per cent) was incurred by retailers, followed by wholesaler-cum-commission agent (9.09 per cent) and producer (2.47 per cent). Further, it was observed from the table that producer's share was 43.19 per cent of the price paid by cauliflower consumers.

Table 4.4.7: Cost, margin and price spread in marketing of Cauliflower

Sr. No.	Particulars	₹/qtl.	Per cent to Consumer's Price
1	Producer's net price	337.85	43.19
2	Cost incurred by		
	(a) Producer	19.35	2.47
	(b) Wholesaler-cum-commission agent	70.63	9.09
	(c) Retailer	129.27	16.52
	Total	219.23	28.03
3	Margins of		
	(b) Wholesaler-cum-commission agent	80.85	10.33
	(c) Retailer	144.14	18.44
	Total	224.99	28.76
4	Price spread (cost + margins)	444.22	56.80
5	Retailer's sale price/ consumer's purchase price	782.07	100.00
6	Producer's share in consumer's rupee (Per cent)	43.19	

Table 4.4.7 and Figure 4.6 indicates that the price spread (marketing cost + marketing margins) was higher (56.80 per cent) compared to producer's share in consumer's price in the marketing of cauliflower (43.19 per cent). It can be inferred from the study that the perishable nature of vegetables, lack of proper storage facilities at reasonable charges and unorganized marketing system in the study area resulted into lion's share of retailer's margin and higher proportion of marketing cost. The results of this study are in corroboration with

Fig 4.7: Price Spread in Marketing of Cauliflower



4.4.8 Marketing Efficiency

Efficiency of marketing for an agricultural produce in general is assessed by the size of share which producer-farmer obtains in the price paid by the consumer. These results were further substantiated by working out market efficiency as suggested by Acharya (2003).

The marketing efficiency for cauliflower has been worked out by considering Acharya's modified formula and the results are presented in Table 4.4.8.

Table 4.4.8: Marketing efficiency of cauliflower

SR. NO.	PARTICULARS	CAULIFLOWER
1	Consumer's price (₹ /qtl.)	782.07
2	Producer's net price (₹ /qtl.)	337.85
3	Marketing cost (₹ /qtl.)	219.23
4	Marketing margin (₹ /qtl.)	224.99
5	Marketing efficiency	0.77

In case of cauliflower the total marketing cost and marketing margins involved in the selected marketing channel (Channel II) was ₹ 444.22 per quintal. Considering this with producer's net price per quintal, the modified marketing efficiency was lower than unity (0.77). This was due to higher marketing costs and margins incurred by wholesalers and retailers. The marketing cost was found to be ₹ 219.23/qtl and margins ₹ 224.99/ qtl.

4.5 Production, Marketing, And Economic Constraints

Due to perishable, seasonal and bulky nature of cauliflower, there are number of constraints opined by the sample cauliflower growers in adoption of cauliflower production technology and marketing.

The cauliflower growers were asked to state the production, marketing and economic constraints faced by them. Their responses were collected and intensity of particular constraint was computed by calculating percentage according to their frequency and they were assigned rank on the basis of percentage.

4.5.1 Production, Marketing, And Economic Constraints

Production, marketing and economic constraints faced by cauliflower growers are presented in Table 4.5.1.

It can be observed from the table that the non availability of labour in time (53.33 per cent), lack of irrigation facility (50.83 per cent), non availability of fertilizer in time (40.43 per cent) and high yielding variety seed of cauliflower (35.00 per cent) were the major constraints faced by the sampled farmers.

Table 4.5.1: Production, Marketing, And Economic Constraints

Sr. No.	Problem/Constraints	Marginal 27	Small 38	Medium 29	Large 26	Total 120
Production Constraints						
1	Non availability of planting material in time	7 (25.92)	4 (10.52)	3 (10.34)	3 (11.54)	17 (14.17)
2	Non availability of High Yielding variety of cauliflower	11 (40.74)	12 (31.57)	9 (31.03)	10 (38.46)	42 (35.00)
3	Non availability of fertilizer in time	10 (37.03)	14 (36.84)	13 (44.83)	12 (46.15)	49 (40.83)
4	Lack of irrigation facility	15 (55.55)	17 (44.73)	15 (51.72)	14 (53.85)	61 (50.83)
5	Non availability of labour in time	14 (51.85)	18 (47.36)	17 (58.62)	15 (57.69)	64 (53.33)
Marketing Constraint						
1	Lack of Transportation facilities	7 (25.92)	12 (31.57)	9 (31.03)	8 (30.77)	36 (30.00)
2	Fluctuation in market prices	21 (77.77)	25 (65.78)	21 (72.41)	17 (65.38)	84 (70.00)
3	Long distance of market	17 (62.92)	21 (55.26)	18 (62.07)	16 (61.54)	72 (60.00)
4	Un even payment for sale	6 (22.23)	7 (18.42)	6 (20.69)	4 (15.38)	23 (19.17)
Economic Constraint						
1	High cost of planting material	16 (59.25)	22 (57.89)	16 (55.17)	15 (57.69)	69 (57.50)
2	High cost of pesticides	10 (37.03)	16 (42.11)	12 (41.38)	12 (46.15)	50 (41.67)
3	High cost of labour	9 (33.33)	15 (39.47)	11 (37.93)	10 (38.46)	45 (37.50)
4	Non-availability of credit in time	3 (11.11)	4 (10.53)	3 (10.34)	2 (7.69)	12 (10.00)
6	High cost of fertilizer	18 (66.66)	22 (57.89)	18 (62.07)	16 (61.54)	74 (61.67)

Note : Figure in parentheses indicate per cent to total respondents in each Category

As far as marketing constraints were concerned about 70 per cent of cauliflower cultivators felt the problem of absence of regulated markets. It might be due non availability of regulated vegetables markets by government. Other major marketing problems faced by sample cauliflower growers on overall basis were fluctuation in market prices (70.00 per cent), lack of long distance market (60.00 per cent) lack of transportation facility (30.00 per cent) and Uneven payment for sale (19.17 per cent). Further, the results indicated that fluctuation in market prices, long distant of market and lack of transportation facility were the major marketing constraints realized by marginal, large and small farmers.

As for the economic constraints, the table revealed that the high cost of fertilizer (61.67 per cent), high cost of planting material (57.50 per cent) and high cost of pesticides (41.67 per cent) were the major economic constraints encountered by the sampled farmers. The results of this study are in corroboration with the findings of Jadav *et al.* (2011), Hatai and Baig (2007) and Verma (2004).

*Summary
and
Conclusion*



Chapter – V

SUMMARY AND CONCLUSION

Cauliflower is one of the most valuable vegetable crops in India because of its nutritional value and wide spread production. Cauliflower belongs to the family cruciferae. It contains a good amount of vitamin A and B, protein (2.7%), fat (0.2%), and carbohydrate (5.2%) and some amount of minerals.

The cost of production is a changing phenomenon and changes with the cost of component studies on production and marketing of cauliflower provide basic information regarding the efficiency of business, input output relationship and returns earned which is an important aspect for the policy makers in making rational policy as well as for identify the way and means to bring down its costs. It will also help the scale of finance for crop loans. The information on cost of cultivation/production as well as the efficiency of resources will be useful to the government for devising appropriate policies for cauliflower growers. It will be useful to credit institution in deciding the scale of finance for crop loans and schedule of repayment. The results of the study will also be helpful to the cauliflower growers in reallocation of their resources in order to improve the productivity.

Furthermore factor like seasonality bulkiness and perishability associated with cauliflower crop make their market mare complicated. Hence

an efficient marketing system ensuring remunerative price motivates the farmers for higher investment and production like other vegetable.

Marketing costs and margins assume particular importance in predominating agricultural country like India where agricultural price policy aims at safeguarding interest of both farmers (producers) and consumers. In this regard, economic analysis of horticultural produces assumes great significance. Thus, the present study covers the economics of cauliflower production and marketing to identify the problems faced by the cauliflower cultivators.

Keeping this view in mind the present study entitled, "**An Economic Analysis of Production and Marketing of Cauliflower (*Brassica oleraceae* var. *botrytis*.) in Middle Gujarat**" is under taken with following specific objectives:

5.1 Objectives:

1. To estimate/ha the cost of cultivation and returns per hectare for cauliflower crop
2. To estimate the cost of production per quintal and input-output ratio of cauliflower
3. To work out the resources use efficiency in production system of cauliflower
4. To compute marketing cost and price spread in marketing of cauliflower
5. To identify production, marketing and economic constraints faced by cauliflower growers

5.2 METHODOLOGY

Middle Gujarat agro-climatic zone is known for production of varieties of vegetables in the state. Therefore, this zone was selected purposively for this study. Among the six districts of this zone, Anand and Kheda district together constitutes highest percentage as it collectively covers about 53.37 per cent of cauliflower cultivation in tri annam average of the year 2008-09, 2009-10 and 2010-11(*GOG 2009-2012*). Two talukas having highest areas under cauliflower from each district were selected *i.e.* Anand, Khambhat, Nadiyad and Kapadvanj. Hence, total four talukas were selected. Twelve villages comprising three villages each of Anand, Khambhat, Nadiyad and Kapadvanj talukas were chosen randomly.

A list of cultivators growing cauliflower in each selected villages was prepared and arranged in ascending order of the size of their operational holding. They were classified into four categories *viz.*, marginal (up to 1 hectare), small (>1.00 to 2 hectares), medium (>2.00 to 4 hectares) and large (above 4 hectares). The relative share of total of each category to the total cauliflower cultivators of all the 12 selected villages was worked out. Considering size of population and resources, 120 cultivators (27 marginal, 38 small, 29 medium and 26 large) were selected randomly with proportional allocation from the selected villages. For studying the price spread in marketing of cauliflower, 5 functionaries of each type from Anand and Kheda market were selected. The primary data required for the study was collected through personal interview with the help of pre-tested comprehensive

schedule for the study during the year August-2010 to January-2013 for farmers and during April-2013 for market functionaries through survey method.

Following techniques were employed for the analysis of data: Percentage and ratios, Cost concepts *i.e.*, cost-A, B, C₁, and C₂, Per cent of production with the help of table and graph and Cobb-Douglas production function.

5.3 MAJOR FINDING

The major findings of the study are summarized as under.

5.3.1 Socio-economic characteristics

- 5.3.1.1 Majority of the cauliflower growers (44.16 per cent) were middle aged group (35-50 years) while about 38.34 per cent of the growers were belonged to old age group (above 50 years).
- 5.3.1.2 The average family size of the cauliflower growers was 6.41.
- 5.3.1.3 About 86.66 per cent of the sample cultivators were literate and remaining 13.34 per cent were illiterate.
- 5.3.1.4 On an overall basis, about 31.66 per cent of cauliflower growers were the members of the Village Panchayat.
- 5.3.1.5 The average operated area per farm was 2.56 hectare and it varied from 0.73 hectare for marginal farms to 5.34 hectare for large farms. The average of total area under cauliflower crop was 0.74 hectare (28.90 per cent).

- 5.3.1.6 Among the different Occupation, more than 40 per cent adopted Farming, followed jointly by F+AH (33.34 per cent), F+AH+B (15.83 per cent) and F+AH+S (4.17 per cent).
- 5.3.1.7 On sample farms, about 89.62 hectares of area was under irrigation. Of them 71.26 per cent and 28.86 per cent area covered under tube well and canal irrigation, respectively.
- 5.3.1.8 About 44.20 per cent of total area was under Snowball variety, followed by Anandi (34.44 per cent) and Girija (25.79 per cent). Among the different varieties of cauliflower, Snowball was found more popular among sampled farms.

5.3.2 Cost and Return Analysis

- 5.3.2.1 on an average cauliflower cultivation activity completed within 3 months in the study area. The average total cost of cultivation of cauliflower was ₹ 73232.95. It was the highest (₹ 74577.4) on medium farm farms followed by ₹ 74483.08 on marginal farms, ₹ 72551.24 on small farms and ₹ 72622.81 on large farms. On an average Cost A (paid out cost) formed 72.46 per cent of total cost, while Cost B accounted for 86.07 per cent of total cost.

Further the break-up of total cost on sample farms indicated that per hectare expenditure on cost of human labour ranked first with 15.81 per cent of the total cost because of cauliflower requires more number of labours for picking, weeding and also application of irrigation to the crop.

5.3.2.2 The other per hectare expenditure were fertilizer (12.51 per cent), manures and cakes (11.29 per cent), sapling charges (9.86 per cent), tractor charges (8.45 per cent), irrigation charges (7.93 per cent), plant protection chemicals (6.57 per cent), bullock labour (2.71 per cent), miscellaneous (1.40 per cent) and depreciation (0.42 per cent).

5.3.2.3 The average yield of cauliflower was 333.13 quintals per hectare. It was highest (348.00 quintals) on medium size farms and lowest (286.24 quintals) on marginal size farms.

The average farm harvest price received by the cauliflower growers was ₹ 357.20 per quintal. It varied from ₹ 369.80 on large farms to ₹ 312.41 on marginal farms. The gross income per hectare was highest i.e. ₹ 127799.52 on medium farms and lowest ₹ 89422.77 on marginal farms with an average of ₹ 118994.93 on sample farms.

On an average net return per hectare from cauliflower farms on Cost A, B, C₁ and Cost C₂ was ₹ 66361.70, ₹ 56477.47, ₹ 52969.08 and ₹ 46366.49, respectively.

5.3.2.4 The average net profit was increased as the size of farm increases. The average per hectare farm business income, family labour income and farm investment income were ₹ 66361.70, ₹ 56477.47 and ₹ 56250.72, respectively on the sample farms.

5.3.2.5 The input-output ratio was 1:1.64 on the basis of cost C_2 and it was found increasing with increase in the farm size.

5.3.2.6 The average cost of production (cost C_2) was ₹ 218.02 per quintal and it varied from ₹ 260.22 on marginal farms to ₹ 210.91 on large farms.

5.3.3 Production Function Analysis

5.3.3.1 The production function analysis indicated that, cost of bullock labour (0.432), cost of plant protection (0.193) and irrigation (0.187) exerted highly significant influence on the yield. It implies that 1 per cent increase in the use of these inputs will result in increase of 0.432, 0.192 and 0.187 per cent in the yield of crop respectively.

5.3.3.2 The value of coefficient of multiple determinations (R^2) showed that about 96 per cent of variation in gross income from cauliflower from cultivation was explained by the independent variable included in the function.

5.3.3.3 The sum of the value of regression coefficients of variables (Σb_i 's) was 1.071 which indicated increasing return to scale and more rational use of the inputs leading to get higher returns.

5.3.4 Marketing Cost and Price Spread

5.3.4.1 On an average marketable surplus on sample farms was 93.89 per cent of total cauliflower production and, as expected, its proportion increased with the increase in size of farms. While the

quantity damaged accounted for 1.40 per cent, wage purpose 0.92 per cent and home consumption was 0.62 per cent.

5.3.4.2 About 55 per cent of cauliflower was moved through Wholesaler-cum-commission agent to retailers to consumers. It was major channel for cauliflower.

5.3.4.3 The total marketing cost incurred by cauliflower growers amounted to ₹ 19.35 per quintal. Of this the major share was of transportation cost (32.82 per cent), followed by the cost of packing (22.32 per cent), loading and unloading cost (21.55 per cent) and weighing cost (9.98 per cent).

5.3.4.4 The share of marketing cost and margins of intermediaries in consumer's price was 28.03 per cent and 28.76 per cent, respectively. The percentage of price spread in consumer's price was 56.80 per cent. Thus, the producer's share in consumer's rupee was 43.19 per cent only.

5.3.5 Production, Marketing, Economic and Technical Constraints

5.3.5.1 Majority of the cauliflower growers faced the constraints of non availability of labour in time, lack of irrigation facility, non availability of fertilizer in time, non availability of high yielding variety of cauliflower and non availability of planting material in time.

As regard marketing constraints majority of the cauliflower cultivators felt the problem of fluctuation in market

prices of cauliflower. Other major marketing problems faced by sample cauliflower growers on overall basis were distance between the production point and market, Lack of Transportation facilities and un-even payment tendency of buyers. Higher cost of planting material, pesticides and labour were the major economic constraints encountered by the sampled farmers.

5.4 SUGGESTIONS

5.4.1 There is an ample potentiality of raising cauliflower production on sample farms through adoption of improved technologies along with optimum utilization of resources like plant protection chemical, irrigation, HYD seeds and bullock labour with better management.

5.4.2 During the study medium level of education was found among the cauliflower growers. As the level of education contributes in extent of knowledge, adoption, socio-techno economic change and overall modernization, priority should be accorded to improve the existing level of education.

5.4.3 Market information and provision of logistic support need to be made available to the cauliflower growers to improve existing market system. The necessary arrangement for farmers to transportation of produce at processing centre should be developed. *i.e.* market information and provision of logistic support should be made available to the cauliflower growers to

improve existing market system. This apart, as the cauliflower market is still unregulated appropriate step should be taken to regulate the vegetables trade so that the dominance of middlemen can be reduced.

5.4.4 Production and marketing techniques for cauliflower production need integrated to reduce the losses.

5.4.5 As the fluctuations in the market price was the main problem of the majority of the cauliflower cultivators in the study area, encouraging contract farming may go a long way in addressing this problem.

5.4.6 Vegetables cooperatives or cauliflower producer's cooperatives need to be promoted to make the exiting marketing system of cauliflowers more efficient and farmers centric.



BIBLIOGRAPHY

BIBLIOGRAPHY

- Acharya, S.S. and Agrawal, N.L. (2003). Agricultural Marketing in India. Oxford and IBH Publishing Co., New Delhi. Third Edition : 299-336
- Anonymous (2012-13). Economic Survey.
- Anonymous (2011). Indian Horticulture Database, [Online]: <http://nhb.gov.in/database-2011.pdf>
- Anonymous (2002-03). Research Report for the thirty second Meeting of Agril. Economics, Agril. Statistics and Extension Education sub Committee of the Research council. Department of Agriculture Economics., GAU, Junagadh: 10-51
- Bala, B.; Sharma, N and Sharma, R. K. (2011). Cost and return structure for the promising enterprice of off season vegetables in Himachal Pradesh, *Agricultural economics research review*, **24**(1): 141-148.
- Baruah, P. and Barman, R. N. (2001). An analysis of marketing margin, price spread and marketing efficiency of cauliflower in Barpeta district, Assam, *Bihar journal of agricultural marketing*, **9**(2); 150-260.
- Dileep, B. K.; Grover. R. K., and Rai, K. N. (2002) Contract farming in tomato: An economic analysis, *Indian Journal of Agriculture Economics*, **57**(2):197-210.
- GoG (*Government of Gujarat*) (1991, 2006 to 2012). District wise area, production and yield of Horticultural crops in Gujarat state. *Directorate of Horticulture*, Gujarat State, Gandhinagar. <http://agri.gujarat.gov.in/hods/dir-horticulture.htm>.

- Hatai, L. D. and Baig, M. A. A. (2007). Economics of production and marketing strategies of potato in Orissa, *Indian Journal of Agriculture Marketing*, **21**(2): 46-57.
- Jadav, K. S.; Leua, A. K. and Darji, V. B. (2011). Economics of supply chain of fresh potato in middle Gujarat, *Indian Journal of Agriculture Research*, **45**(4):266-274.
- Joshi, P. K.; Joshi, L.; Pratap; Brithal, S. (2006) Diversification and its impact on small holders: Evidence from a study on vegetable production, *Agricultural economics research review*, **(19)**: 219-236
- Kale, N. K.; Navadkar, A. V.; and Sale, D. L. (2005). Resource use efficiency in chili cultivation in Thane District of Kankan region, *Indian Journal of Agricultural Economics*, **60**(3): 529-530
- Kumar, A. and Arora, V. P. S. (1999). Post harvest management of vegetables in U.P Hills, *Indian Journal of Agricultural Marketing*, **13**(2): 6-15.
- Kumar, S.; Kumar, V. and Jha A. K. (2008). Marketing of vegetable in Vaishali District of Bihar, *Indian journal of Agriculture Marketing*, **22**(3): 80-87.
- Lal, H.; Sharma, K. D. and Thakur, D. S. (2000). Vegetable marketing in Himachal Pradesh: Constraints and Opportunities, *Bihar Journal of Agricultural Marketing*, **8**(4): 406-415.
- Madan, M. S.; Singh, R. V. and Singh, M. L. (1999). Economics of production and marketing of cauliflower in Ranchi district of Bihar, *Biha Journal of Agricultural Marketing*, **7**(1): 28-35.
- Nikam, A. V.; Shendage, P. N.; Jadhav, K. L. and Deokate, T. B. (2007). Marketing of kharif potato in Satara district Maharashtra, *Indian Journal of Agricultural Marketing*, **21**(2): 188-196.

- Pandit, A.; Pandey, N. K.; Rana, R. K.; Kumar, N. R. and Deka, C. K. (2006). Production and marketing of potato in Barpeta district of Assam, *Indian Journal of Agricultural Marketing*, **20**(1): 100-110.
- Prasad, J (2001). Vegetables production and marketing in Bihar: A farm level study, *Bihar Journal of Agricultural Marketing*, **9**(3): 225-260
- Radha, Y and Prasad, Y. (2001). Economics of production and marketing of vegetables in Karimnagar district, Andhra Pradesh, *Indian Journal of Agricultural Marketing*, **15**(1): 55-58.
- Shelke, R. C. and Kalyankar, S. P. (2000). Price Spreads in Marketing of Selected vegetables in New Mota Market, Parbhani, *Indian Journal of Agriculture Marketing*, **14**(1): 54-59.
- Sidhu, R. S.; Kumar, S; Vatta, K and Singh, P. (2010). Supply chain analysis of onion and cauliflower in Punjab, *Agricultural Economics Research Review*, **23**(conf spl): 445-453.
- Singh, K. and Vashist, G. D. (1999). An analysis of production and marketing of vegetables in lambagaon block of district Kangra of Himachal Pradesh, *Bihar Journal of Agricultural Marketing*, **7**(4): 376-389.
- Singh, R.; Ratan, R. S. and Bhati, J. P. (2000). Technological Changes in Marketing of Hill Farm Products: A Study in Himachal Pradesh, *Indian Journal of Agriculture Marketing, (Conf.Spl.)*, 63-71.
- Sagar, S. B. (2012). An economic analysis of production and marketing of papaya (*carica papaya* l.) In middle Gujarat, An Unpublished *M.Sc. (Agri) Thesis*, Univ. Agric. Sci., Anand (India).
- Singh, S. and Chauhan, S. K. (2004). Marketing of vegetables in Himachal Pradesh. *Agriculture Marketing*, **47**(3): 5-10

- Thilagavathi, M. and Siddeswaram, K. (2004) Resource use efficiency of rainfed chilies in Southern Tamilnadu, *Indian Economic Panorama*, **43**(2): 59-60
- Tripathi, B. N.; Sharma, B; and Singh, G. (2005). Economics of vegetables (Brinjal) including the problems of vegetable growers at various level in Virdhyan and Bundelkhand region of Utter Pradesh, *New Agriculturist*, **16**(1,2);51-55
- Verma, L. R. (2004), Marketing of Vegetable and Vegetables in Himachal Pradesh, *Indian Journal of Agriculture Marketing*, (Conf.Spl), **18**(3): 202-227.
- Wadhvani, M. K. and Bhogal, T. S. (2001). Price behavior of seasonal vegetables in Utter Pradesh; A comparative study of western (plain) and hill region SAARC, *Indian Journal of Agricultural Marketing*, **9**(4): 141-155.
- Yadav, D. B.; Sawant, S. R.; Choudhari, S. A.; and Amale, A. J. (2012). Economic analysis of marketing of major summer vegetables in satara district of western Maharashtra, *Indian Journal of Agricultural Marketing*, **26**(1): 103-115
- Zala, Y. C.; Patel, G. N.; Khatra, R. G. and Shaikh, A .S. (2005). National Seminar on Changing Dimensions of Marketing of Farm Commodity.

The background features a light cream color with vertical lines and faint floral patterns. A large, stylized golden scrollwork design is in the top left, and a brown floral vine with leaves is in the bottom right.

Appendix

APPENDIX

INTERVIEW SCHEDULE

Department of Agricultural Economics
B. A. College of Agriculture, AAU, ANAND

Schedule No. _____

An Economic Analysis of Production and Marketing of Cauliflower (*Brassica oleraceae* var. *botrytis*) in Middle Gujarat

1. Name of Farmer : _____
Village: _____ Taluka : _____ District : _____
Age: _____ Education : _____

2. Information regarding family :

Sr. No.	Age (Year)	NO. of person			No. of person working on farm			
					Regular		Casual	
		M	F	Total	M	F	M	F
1	Up to 18							
2	18 to 60							
3	Above 60							

3. Occupation

Sr. No.	Category	Remark
1	Farming	
2	Farming + A.H.	
3	Farming + A.H. + Business	
4	Farming + A.H. + Service	
5	Other	

A.H. = Animal Husbandry

4. Association with Organization :

Organization	Position	Organization	Position
Village Panchayat		Milk Co-op. Society	
Taluka Panchayat		Co-op. Credit Society	
District Panchayat		Seva Sahkari	
Service Co-op. Society		Youth Club	
Marketing Society		Other	

5. Details of Land-holdings :

Land	Area			Value (Rs)		
	Irrigated	Un-irrigated	Total	Irrigated	Un-irrigated	Total
Owned						
Leased-in						
Leased-out						
Total						
Cultivated						

6. Farm Building and Inventory :

Sr. No.	Items	No.	Value (Rs)	Sr. No.	Items	No.	Value (Rs)
1	Farm building (K/P)			12	Seed drill		
2	Cattle shed			13	Hoe		
3	Store room			14	Harrow		
4	Bullock cart			15	Rake		
5	Tube Well/Well			16	Plank		
6	Electric motor			17	Spade		
7	Tractor			18	Ridger		
8	Sprayer			19	Sickle		
9	Duster						
10	Desi plough						
11	Iron plough						

K - Kachcha, P - Pacca

7. Total Land : _____ Land under Cauliflower cultivation : _____

8. Experience of Cauliflower Cultivation : _____

9. Date/Week of sowing seed for own Farm : _____

10. Age of Cauliflower : _____

5. Economics of Cauliflower cultivation :

1.1. Practices of Farm:

1.1.1. Land Preparation:

Operation	Human labour				Bullock labour				Tractor Charges			Remainder R/F
	Family		Hired		Owned		Hired		Type of cultivation	Rate (Rs./ha)	Total cost	
	MD	C	MD	C	MD	C	MD	C				
Ploughing												
Harrowing												
Land Leveling												

R = Raised bed, F = Flat bed, MD = Man Days, C = Cost (Rs),

1.1.2. Manuring/Fertilizer/Other:

Items	Cost				Human labour				Bullock labour			
	Qty.	Value (Rs.)	Owned	Hired	Family		Hired		Owned		Hired	
					MD	C	MD	C	MD	C	MD	C
FYM												
Cake												
Chem. Fertilizer												

1.1.3. Sowing of seeds:

Seeds: Owned/Purchased? : _____

If purchased, purchasing agency of the Cauliflower seeds? _____

Sr. No.	Seeds		Spacing	Seed treatment			Human labour				
	Qty.	Cost (Rs.)		Chemical	Qty.	Cost (Rs.)	Family		Hired		
							MD	C	MD	C	

1.1.4. Irrigation:

Source	No. of Irrigation	Hours per Irrigation	Rate/hr	Total Cost (Rs.)	Human labour			
					Family		Hired	
					MD	C	MD	C

1.1.5. Weeding:

No. of Weeding	Human labour				Use of Weedicides			
	Family		Hired		Qty.	C	Spraying cost (Rs.)	Total cost (Rs.)
	MD	C	MD	C				

1.1.6. Plant Protection:

Name of Disease/Pest	Name of Chemical	Qty.	Cost (Rs.)	No. of Sprayings	Cost of application/Spraying				Total Cost (Rs.)
					Family		Hired		
					MD	C	MD	C	

1.1.7. Harvesting:

Year	Month	No. of Picking	Human labour				Quantity	Ave. Price Received	Total Value (Rs.)
			Family		Hired				
			MD	C	MD	C			
1									

1.1.8. Miscellaneous:

Particulars	Human labour			
	Family		Hired	
	MD	C	MD	C

6. Total production of cauliflower : _____

7. Disposal Pattern:

(Qty. in Kg.)

Particulars	qty
Home purpose	
Wage purpose	
Damage	
Relatives	
Other	
Total	
Marketable Surplus	

8. Have you sold Cauliflower directly to consumer? YES / NO

If YES, Qty. sold _____ Price received _____

9. Do you prefer a particular purchasing agency?

If YES, Why? _____

10. Agency wise Sale and Marketing Cost :
(Cost in Rs.)

Sr. No.	Particulars	Purchasing Agency				
		Village Merchant (at home)	Wholesaler (at Mkt. Yard)	Wholesaler cum commission agent	Retailer	Consumer
1	Qty. sold					
2	Price received					
3	Marketing cost (born by the farmer)					
	Cleaning					
	Grading					
	Packing					
	- Labour					
	-Packaging					
	Loading					
	Unloading					
	Transportation					
	Weighing					
	Damage/Spoilage					
	Commission					
	Other					
	TOTAL					
4	Net Price Received					

11. Constraints experienced by Cauliflower grower:

Sr. No.	Constraints	Remarks
A	Production Constraints	
1	Non availability of planting material in time	
2	Non availability of fertilizer in time	
3	Lack of irrigation facilities	
4	Non availability of labour in time	
5	Any others specify	
B	Marketing Constraints	
1	Lack of Transportation facilities	
2	Fluctuation in market prices	
3	Long distance of market	
4	Uneven payment for sale	

9	Any others specify	
C	Economic Constraints	
1	High cost of planting material	
2	High cost of pesticides	
3	High cost of labour	
4	Non-availability of credit in time	
6	High cost of fertilizers	
7	Any others specify	