A STUDY OF PRODUCTION AND MARKETING OF PINEAPPLE, ORANGE AND GUAVA IN NAGALAND

by

YHOME KEKHRIELETUO

(Reg. No. 95068)

A Thesis submitted to the

MAHATMA PHULE KRISHI VIDYAPEETH, RAHURI (M.S.)

In partial fulfilment of the requirements for the degree

of

MASTER OF SCIENCE (AGRICULTURE)

in

AGRICULTURAL ECONOMICS

DEPARTMENT OF AGRICULTURAL ECONOMICS

POST-GRADUATE INSTITUTE,
MAHATMA PHULE KRISHI VIDYAPEETH,
RAHURI - 413 722, DIST. AHMEDNAGAR (M.S.), INDIA

1999.

A STUDY OF PRODUCTION AND MARKETING OF PINEAPPLE, ORANGE AND GUAVA IN NAGALAND

by

YHOME KEKHRIELETUO

(Reg. No. 95068)

A Thesis submitted to the

MAHATMA PHULE KRISHI VIDYAPEETH, RAHURI (M.S.)

In partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE (AGRICULTURE)

in

AGRICULTURAL ECONOMICS

Approved by

Dr. Jg. R. Pawar
(Chairman & Research Guide)

Dr. D.L. Sale
(Committee Member)

Dr. D.B. Yadav
(Committee Member)

Dr. B.H. Khan
(Committee Member)

DEPARTMENT OF AGRICULTURAL ECONOMICS
POST-GRADUATE INSTITUTE,
MAHATMA PHULE KRISHI VIDYAPEETH,
RAHURI - 413 722, DIST. AHMEDNAGAR (M.S.), INDIA

1999.

CANDIDATE'S DECLARATION

I hereby declare that this thesis or part thereof has not been submitted by me or any other person to any other University or Institute for a Degree or Diploma.

Place : MPKV, Rahuri
Date : 4/5/1999.

(Yhome Kekhrieletuo)

Dr. Jg. R. PAWAR
M.Sc. (Agri.), P.M.A., Ph.D.,
Head,
Department of Agricultural Economics,
Mahatma Phule Krishi Vidyapeeth,
Rahuri - 413 722, Dist. Ahmednagar,
Maharashtra, India.

CERTIFICATE

This is to certify that the thesis entitled, "***ECONOMICS OF PRODUCTION AND MARKETING OF PINEAPPLE, ORANGE AND GUAVA IN NAGALAND***", submitted to the Faculty of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri in partial fulfilment of the requirements for the degree of ***MASTER OF SCIENCE (AGRICULTURE)*** in ***AGRICULTURAL ECONOMICS***, embodies the results of a piece of *bona fide* research work carried out by ***YHOME KEKHRIELETUO*** under my guidance and supervision and that no part of the thesis has been submitted to any other university for degree or diploma or publication.

The assistance and help rendered during the course of this investigation have been duly acknowledged.

Place : MPKV, Rahuri.
Date : 4 / 5 /1999.

Jg. R. Pawar
Research Guide

Dr. S.S. Kadam
Associate Dean,
Post-Graduate Institute,
Mahatma Phule Krishi Vidyapeeth,
Rahuri - 413 722, Dist. Ahmednagar,
Maharashtra, India.

CERTIFICATE

This is to certify that the thesis entitled, ***"ECONOMICS OF PRODUCTION AND MARKETING OF PINEAPPLE, ORANGE AND GUAVA IN NAGALAND"***, submitted to the Faculty of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri in partial fulfilment of the requirements for the degree of ***MASTER OF SCIENCE (AGRICULTURE)*** in ***AGRICULTURAL ECONOMICS,*** embodies the results of a piece of *bona fide* research work carried out by ***YHOME KEKHRIELETUO*** under the guidance and supervision of ***Dr. Jg. R. PAWAR***, Head, Department of Agricultural Economics, Mahatma Phule Krishi Vidyapeeth, Rahuri and that no part of the thesis has been submitted to any other university for degree or diploma or publication.

Place : MPKV, Rahuri.
Date : 4 / 5 /1999.

(S.S. Kadam)

ACKNOWLEDGEMENTS

I consider myself quite fortunate to have completed the research work under the dynamic and able guidance of Dr. Jg. R. Pawar, M.Sc. (Agri.), P.M.A., Ph.D., Head, Department of Agricultural Economics, Mahatma Phule Krishi Vidyapeeth, Rahuri. I wish to express my heartfelt and sincere gratitude to him for his constant encouragement, scholastic guidance, constructive criticism, sympathetic attitude right from the selection of the research problem till to final shaping of this thesis in the present form. He is more than a guide to me.

I wish to express my gratitude to Dr. D.L. Sale, Professor of Agril. Economics, Dr. D.B. Yadav Associate Professor of Agril. Economics and Dr. B.H. Khan, Associate Prof. Department of Mathematics and statistics, MPKV, Rahuri for being the members of my Advisory Committee, for their constant guidance, helpful comments and constructive criticism.

I also express my heartfelt thanks to Dr. S.D. Suryawanshi, Dr. V.R. Shete, Dr. S.B. Dangat, Dr. S.N. Tilekar, Dr. K.S. Birari and all other staff members of the Department of Agril. Economics, MPKV, Rahuri for their keen interest, cooperation and help during the present investigaion.

I am very much thankful to *Versatile Computer Media*, Rahuri for neat and tidy word processing of this thesis.

Acknowledgements Contd ...

I have no words to express my immense gratitude to my uncle Mr. Ako Whiso and close friends Azo Vizo, Promod Yelepanekar, Bendang and others for their constant encouragement.

I also wish to thank my parents for meeting all my needs, nurturing and moulding me to what I am today. I am proud of them.

I will be failing in my duties if I do not make a special mention of my wife Dziesebeinuo for her constant encouragement and assistance in completing this investigation. I express my heartfelt thanks to her.

I am also deeply obliged to the farmers who provided the valuable information, the Govt. of Nagaland for granting me study leave and all the authors, whose literature has been cited for completion of the study.

Place : MPKV, Rahuri
Date : 4 / 5 /1999.

(Yhome Kekhrieletuo)

CONTENTS

Contents Contd...

Contents Contd...

Contents Contd...

LIST OF TABLES

List of Table Contd...

LIST OF FIGURES

ABSTRACT

A STUDY OF PRODUCTION AND MARKETING OF PINEAPPLE, ORANGE AND GUAVA IN NAGALAND STATE

by

MR. YHOME KEKHRIELETUO

Mahatma Phule Krishi Vidyapeeth, Rahuri - 413 722, (M.S.)

1999.

Research guide	:	Dr. Jg. R. Pawar
Department	:	Agricultural Economics

The present investigation was intended to depict the picture of pineapple, orange and guava growing interprises in Nagaland State. The study was conducted to estimate per hectare operational cost of selected fruit crops, to examine the marketing methods, marketing cost, margins, price spread and the channels involved in marketing of the selected fruits and also to identify the problems involved in production and marketing of the selected fruits.

For this purpose, the primary data were collected from the randomly selected 30 fruit growers each of pineapple, orange and guava spread over nine villages under three major fruits producing districts in Nagaland. The three major fruits producing districts purposively selected for the study are Kohima, Mokokchung and Wokha. For estimating the resource use level and productivity of the sample farms, Cobb-Douglas type of production function was used. The data were related to the agricultural year 1994-95.

The finding of the study showed that the average per farm area under pineapple, orange and guava was 0.97, 0.77 and 0.52 hectare, respectively. The per hectare number of plants was 43,400, 270 and 268 for pineapple, orange and guava, respectively. The per hectare total cost of establishment for 14 months for pineapple was Rs. 37,479.69, while in the case of orange and guava the same cost for 6 years was Rs. 96,774.77 and 93,776.81, respectively. The annualised per hectare establishment cost of pineapple, orange and guava was worked out to Rs. 10,119.52, Rs. 10,645.25 and Rs. 10,315.45, respectively. The imputed rental value of land was the major item of cost in the total cost of establishment for all the fruit orchards. Amongst the variable cost, weeding operation was the major item of cost. The total cost of cultivation in the case of pineapple was Rs. 47,190.62 i.e., one and a half times higher than that of orange and guava. This was mainly due to higher inputs requirements such as hired labour, fertilizers and higher rental value of land, and imputed family labour cost. The total per hectare cost of cultivation for orange was Rs.29,969.20 and guava was Rs. 29,295.23. The various cost items for these two fruit crops remained almost the same in equal proportion. Rental value of land and annualised establishment cost are the two major cost items for all the three selected fruit orchards. The net profit realised by pineapple, orange and guava producers was Rs. 48,289.38, Rs. 23,669.01 and Rs. 24,658.53 per hectare, respectively. The quantity sold in different markets by pineapple, orange and guava producers was 90.63 per cent, 94.82 per cent and 92.74

per cent, respectively, of the total quantity produced. In all, four marketing channels were observed in the marketing of pineapple, orange and guava in Nagaland. The most important channel followed was the Producer → retailer → consumer. About 50 per cent of pineapple produce, 40 per cent of orange and 47 per cent of guava produce was sold through this channel. The producer's share in consumer's rupee for pineapple was 71.29 per cent, 58.40 per cent and 35.72 per cent, respectively, in channel I, II and IV respectively. The same in the case of orange was 94.58 per cent 74.13 per cent and 55.31 per cent in respective channels. While for guava growers the net share in consumer's rupee was 88.76 per cent in channel I, 73.19 per cent in channel II and 66.43 in channel IV. The major constraints faced by the selected fruit growers in production were the high labour wage rate, non-availability of quality seedling, fertilizers and pesticides, high incidence of pests and diseases infestations, lack of complete technical knowledge on different cultural practices. The marketing constraints included absence of grading and packing practices, advanced and packing material, absence of market intelligence and other constraints such as non-availability of loan, transporation facilities, high transportation charges, low and fluctuating price, etc.

The study therefore, suggested arangements for adequate credit facilities, supply of grafted quality seedling, use of chemical weedicides, better plant protection meaures, intercropping with vegetables and legumes

crops, setting up of processing industry and cold storage, processing pineapple leaves for fibre, adoption of co-operative marketing system, standardization and grading of produce, better packaging material for distance market, radio marketing intelligence service, setting up of regulated market and Agro-servicing centres in the fruit producing areas of Nagaland.

INTRODUCTION

1. INTRODUCTION

Fruits and vegetables play a unique role in the developing countries both in economic and social spheres for improving income and nutritional status of the people particularly of the rural masses. Cultivation of fruits contributes to the health and happiness of the people and prosperity of the Nation. It is often stated that the standard of living of the people can be judged by the production and consumption of fruit per capita.

Fruit culture is perhaps the oldest and one of the noblest professions of mankind. Fruit culture in India dates back to ancient times. Many delicious fruits like mango, banana, rough lemon, wild oranges, etc., are indigenous to our country. The moghals established many mango orchards all over the country. This art later on gradually civilized into skillful and intensive forms of land utilization. Fruits like apple, pear, plum, apricot, cherry, almond, litchi, peach, guava, pineapple, etc., have been introduced from other parts of the globe.

1.1 Importance of fruit culture

The economic aspects of fruit production are mani-fold. A well established and maintained orchards can offer better yields as compared to other crops. During non-bearing stage, it is possible to take inter crops which can compensate the expenses involved in establishment. The fruit culture offers fuller utilization of labour force round the year. It also helps in maintaining ecological balance and to some extent some fruit crops offer

better utilization of waste land in arid and semi-arid regions for getting higher income with minimum inputs.

Fruit crops occupy an important place in international trade. Fruits can earn handsome foreign exchange. Fruit trees affect the rain and drought and they bring improvement of soil and help in checking the soil erosion. Fruit orchards purify the air, decrease pollution, and they add to the aesthetic beauty of the environment.

Moreover, fruit growing is one of the important branches of diversified farming. Many ancillary industries obtain raw material from it, like processing, preservation, dehydration, essential oils, package, transport, refrigeration cashewnuts, wine, oil, etc. It helps in improvement in farmers' as well as nation's economy.

1.2 Importance of fruits in human life

Importance of fruits in the human diet is universally recognized. Fruits are the chief source of vitamins, minerals, salts, carbohydrates, proteins, fats and acids. The deficiency of any of it can lead to disturbances of metabolism resulting in ill-health. Fruits provide higher energy value per unit area as compared to cereals. Many fruits are also considered to possess specific medicinal value. For all these reasons, the use of fruits in our daily diet is imperative.

As compared to the developed countries, our diet is very poor and lacks in essential contents like vitamins and minerals. In addition to cereals, pulses, milk, vegetables, eggs, etc., nutritional experts advocate the

consumption of atleast 57 gms. of fruits per capita per day. In order to meet the demands of fruit resulting from rapid growth of population and to meet the nutritional need of our population, it will be in right perspective that protective foods like fruits and vegetables are given priority in our planned economic development programmes.

1.3 Fruits in India and Nagaland

It is well known fact that the diversity of the climate and soil variation in India practically make it possible to grow varieties of tropical and sub-tropical fruits such as apples, peaches, cherries, apricot, arecanut, coconut, cashewnut, mango, bananas, ber, grapes, limes, orange, guava, etc. In India, total area under fruit crops in the year 1992-93 was 32.06 lakh ha and production was 329.66 lakh M.T. The major fruits grown are mango, apple, bananas, citrus, guava, grapes, coconut and cashewnut.

In India, most of the area under fruits is occupied by mango constituting over 50 per cent of the total. The next important fruit is banana, followed by citrus, guava and papaya. In Nagaland, however, orange, pineapple, guava, banana are grown on commercial scale. The acreage under important commercial fruit crops in Nagaland is given in Table 1.1.

Out of total area under fruit crops, the highest area was under pineapple (1166 hectares) with a production of 28221 M.T. The next was banana (1249 ha) with a production of 17049 M.T. followed by orange (775 ha) and guava (359 ha) with a production of 2061 and 736 M.T respectively. The other important fruits are apple, pear, peach, plum, etc.

Table 1.1. Area under commercial fruits grown in Nagaland (1993-94)

	Name of the fruit	Area under fruit crop (ha)	Production (metric tonnes)
1.	Pineapple	1166.00	28,221
2.	Orange	775	2061
3.	Guava	359	736
4.	Banana	1249	17049
5.	Pear	262	908
6.	Plum	241	657
7.	Apple	38	87

Source : Directorate of Agriculture, Govt. of Nagaland.

In Nagaland, every year about two lakh hectares of cultivable land remains fallow due to practices of shifting cultivation. Most of the land in Nagaland is very fertile. Nagaland has a wide range of climate and soil combination where a variety of temperate, tropical and sub-tropical fruits flourish well. The topography being hilly, horticultural crops are best suited from economic view point of production. Cultivation of field crops is expensive due to high labour charges in the State and mechanization of field operation is difficult in hilly Terrain. Considering the importance of fruits, the State government has set up a separate Horticulture Department in the year 1995-96.

Pineapple, orange and guava are some of the important fruits grown in India. They occupy the most important position among the fruits in respect of area and production after mango and banana. According to Statewise area and production statistics (Table 1.2) of citrus, Andhra Pradesh ranks first among the Indian States covering 16.54 per cent of total area under this crop with a production share of 31.38 per cent followed by Maharashtra with 15.28 per cent share of the total area with 7.34 per cent share in production only. And Nagaland's share in the total area under this crop is just 0.32 per cent with just 0.05 per cent share in the total production.

In the case of pineapple fruit, Assam leads the other States with 19.67 per cent share in the total area and 21.15 per cent share in production followed by West Bengal with 16.12 per cent share in area and 27.84 per cent share in production and Nagaland's share in the acreage is 1.40 per cent with 0.22 per cent share in production.

Table 1.2. Proportionate shares of different States in the total area and production of pineapple, citrus and guava in India (1989-90)

(Per cent)

Name of the state	Pineapple		Citrus		Guava	
	Area share	Production share	Area share	Production share	Area share	Production share
Andhra Pradesh	-	-	16.54	31.38	4.33	5.25
Arunachal Pradesh	4.78	1.43	1.20	0.23	0.62	0.09
Assam	19.67	21.15	2.25	2.10	2.68	3.15
Bihar	4.57	6.34	4.51	6.60	22.17	22.39
Gujarat	-	-	2.09	5.29	3.80	8.45
Haryana	-	-	1.05	1.99	4.42	5.36
Himachal Pradesh	-	-	9.99	0.45	--	
Karnataka	7.05	9.53	10.37	12.57	10.85	10.46
Madhya Pradesh	-	-	3.57	7.58	7.35	14.87
Maharashtra	-	-	15.28	7.34	8.29	3.94
Manipur	11.36	6.36	0.48	0.22	0.49	10.18
Meghalaya	15.68	8.74	1.95	1.44	-	-
Mizoram	1.54	1.35	0.83	0.37	0.17	0.04
Orissa	0.58	0.64	3.02	1.81	-	-
Punjab	-	-	9.05	9.38	3.81	3.75
Rajasthan	-	-	2.47	1.07	2.08	0.29
Sikkim	-	-	1.86	0.60	1.46	0.22
Tamil Nadu	1.85	5.01	2.44	5.10	4.02	5.07
Tripura	6.13	4.27	3.10	1.44	0.78	0.23
Uttar Pradesh	-	-	5.88	1.51	18.10	12.25
West Bengal	16.12	27.84	1.58	1.48	4.39	4.00
Nagaland	1.40	0.22	0.32	0.05	0.19	0.01
Goa	0.81	0.84	-	-	-	-
Kerala	8.33	6.28	-	-	-	-
Andaman & Nikobar	0.13	-	-	-	-	-
India	100 [54587]	100 [786716]	100 [348824]	100 [2758187]	100 [102533]	100 [1015265]

(Figures in the parentheses are absolute area (ha) and production (metric tonne) for India.)

Source : Horticultural Statistics, National Horticultural Board, Ministry of Agriculture, Govt. of India.

Whereas in respect of guava, Bihar tops the most amongst the States with 22.17 per cent share of the total area and 22.39 share in production followed by Uttar Pradesh with 18.10 per cent share in area and 12.25 per cent share in production. The share of Nagaland in the total area is only 0.19 per cent with just 0.01 per cent share in the production.

1.4 The importance of pineapple, orange and guava

Fruits cultivation brings good income to farmer where other crops do not grow economically. Pineapple, orange and guava are some important crops grown by farmers in some regions of Nagaland where irrigation facilities are inadequate. Despite this, they excels in yield and nutrient status in fruit world. On an average the yield of orange is about 128 fruits/plant, pineapple about 40-50 tonnes from a plant population of 35,000-40,000 and guava yields about 90 kg/seedling tree or 350 kg/grafted tree.

The varieties commonly grown in the north-east region by the farmers are Khasi mandarin, Nagpur santra of orange, Giant kew and Queen of pineapples and Lucknow 49, Allahabad safeda, Sardar of guava. The cultivation of these fruits gives assured income to the grower even under marginal growing conditions and provides nutritious food at a very low cost. They contain many vitamins and essential minerals. Besides providing the nutritious fruits, they also provides certain commercial products like citric acid, pectin, citrus oils from citrus and fibre cattle feed, byproducts like alcohol, calcium citrate, citric acid and vinegar from pineapple. Their processed products include jam, juice, squash, slices in tins, tit-bits, jelly, etc.

1.5 The problem

Like any other perishable fruits especially guava, these fruits cannot be stored for longer period under ordinary conditions. Hence once harvesting begins, farmers try their best to dispose off their fruits which results in glut of fruits in the local market during peak harvesting period, which leads to low prices to the growers. In order to avoid this situation, the distribution of fruits to places away from producing centres and storage become imperative. In this way, regulation and distribution of fruits can be attained by proper storage and transportation.

Generally, these fruits are stored in open place at room temperature which again results in quantitative as well as qualitative losses. Therefore, there is a need to find out a suitable and cheap package to avoid the losses of these crops. Under normal conditions, the keeping quality of guava fruits is less than that of orange and pineapple. Without using the existing packaging system these fruits cannot be transported to distant places. Packages have played decisive role in reducing post-harvest losses. Parthasarathy (1990) observed that some farmers simply filled the truck without any packaging. For fruits and vegetables, therefore, there is an urgency for educating the growers, traders and consumers about the necessity and need of packaging to reduce post-harvest losses.

No doubt, the cultivation of fruits is profitable but requires initial investment in the form of capital, labour and skilled management. With the increase in the area under these crops, several problems of production and marketing have emerged which need careful investigation. Also, it is

necessary to know initial establishment cost, average cost of production and returns, cost of marketing pattern and constraints in production and marketing of the important fruits in Nagaland.

The cost of a cultivation of fruit orchard consist of two parts viz., capital costs and recurring expenditure. Recurring costs include all non-capital expenses required for the annual maintenance of trees. This includes wages of labour, cost of inputs such as manures, fertilizers, pesticides, irrigation, cost of training and pruning, weeding and interculturing, harvesting, maintenance and repair of capital items, etc.

Efficient marketing plays an important role in the development of any enterprise. Hence, it was felt necessary to investigate the prevalent marketing systems and channels, the marketing costs, margins and price spread and other general problems faced by these fruit growers in production and marketing. In this study, an attempt has been made to investigate the constraints in production and marketing of these fruits.

1.6 Objectives

The specific objectives of the study are ;

1. To estimate per hectare cost of cultivation of pineapple, orange and guava.
2. To study the marketing methods and channels involved in marketing of pineapple, orange and guava.
3. To study marketing cost, margins and price spread in the marketing of pineapple, orange and guava.

4. To analyse supply-price relationships in respect of pineapple, orange and guava.

5. To identify constraints and suggest strategies for increasing profitability of production and marketing of pineapple, orange and guava.

1.7 Scope and utility of the study

In order to understand the economics of production and marketing of these fruits, their marketing pattern and the constraints in production and marketing at farmers' level, it is imperative to have a micro level analysis. However, these aspects have not been studied systematically so far from the view point of working out details of costs and returns and formulating strategies to overcome constraints and problems of production and marketing of different fruits in Nagaland. This study will bring into sharp focus the important factors closely associated with economics, sales pattern, marketing cost and margins along with difficulties faced by fruit growers.

Though the study was conducted in Nagaland covering the three major fruit producing districts viz., Kohima, Wokha and Mokokchung it is hoped that the findings would be applicable to such other areas of Nagaland in particular, and in other States in general, with similar conditions. Since the fruit production activity is likely to get momentum in the near future it is expected that the results of the investigation would be useful to policy markers, agricultural extension workers, farmers, bankers, marketing agencies and agricultural scientists as well. Farmers would get an idea about the extent of profitability in the fruit production activities. Similarly, the study would be helpful in formulating and executing suitable policies conducive for increasing

production of fruits in the State. The results of the study would focus on adoption of appropriate measures to improve efficiency of marketing system. Moreover, information on cost and returns of these fruit crops would be useful to the lending institutions in evolving norms for credit distribution.

It is a students' research project with implied limitations and resources. The findings are based on the expressed responses of the farmers from their memory. Thus, the generalization of the findings in wider areas need to be done cautiously.

REVIEW OF LITERATURE

2. REVIEW OF LITERATURE

A good deal of research work has been carried out by different researchers in an efforts of working out economics of production and marketing of a variety of fruit crops across different States and regions of India. However, no systematic attempt has been made so far to study these aspects in case of pineapple, orange and guava produced in Nagaland. The cost studies are important to the individual farmers as well to the government. On the basis of cost data, the farmers can notice the differences in the unit cost of production and the prices they receive for the product. Similarly, the data on cost of production will be helpful in formulating and executing suitable policies conducive for increasing production of fruits in the State and adoption of appropriate measures to improve efficiency of marketing system.

2.1 Cost of production/costs and returns

Various studies on cost of production and marketing of various fruit crops have been conducted in India and abroad. A few available study references having relevance to the present study have been reviewed in this chapter.

Mehta and Singh (1970) examined the profitability of apple orchards in Kullu and Parbati valleys in Himachal Pradesh and revealed that the cultivation of apple orchard in Kullu valley was more profitable. The per hectare cost of cultivation of an orchard both in Kullu and Parbati valleys was estimated at Rs.4544 and Rs.4208, whereas, the net returns were Rs.25156 and Rs.14317, respectively. The factors responsible for higher profits in

Kullu valley were found to be availability of transport facilities, labour mobility and nearness to the market.

Kitsopenidis and Karkabouna (1972) worked out the economics of fruit crops. They have taken into account the whole production life of the tree i.e. viz., 20 years for peaches, 30 years for apples and 25 years for pears.

Gupta and George (1974) examined the profitability of Nagpur Santra (orange) cultivation and worked out with the help of conventional measures of investment worth, the data base for the study being a sample survey of 60 orange growers who had a total of 101 growers of different sizes. The study found that investment in orange cultivation has an average payback period of 7 years, with a net present value of Rs.6433 per acre (at a discount rate of 12 per cent), internal rate of returns of 39 per cent and a benefit-cost ratio of 2.50.

Funt (1975) analysed the economics of several apple orchard systems in Pennsylvania and examined the alternative production methods for a 40 acre fruit farm in 1974. Four orchard densities were chosen. The lowest had 66 trees per acre and the highest had 792 trees per acre. Both hand and mechanical harvesting were considered for two varieties. 'York Imperial' and 'Red Delicious' and 'Golden Delicious' for fresh fruit marketing. The costs and returns per acre were estimated for each combinations over a 36 years tree life. The high density system generally showed slightlyhigher internal rate of returns, being more advantageous with limited capital but adequate land.

Patil (1975) concluded that more labour force was utilized on smaller sized pomegranatge orchards as compared to that of medium and

large sized orchards. He noticed that the per hectare cost of cultivation of pomegranate decreased with increase in size of orchard. As size of orchard increased the net returns also increased. The output-input ratios showed increasing trend with the increase in the size of orchard.

Gohain (1977) examined the apple cultivation in Kameng district of Arunachal Pradesh and studied the problems and prospects of apple cultivation. The data were collected from 30 apple growers of an apple growing area in the district. The average size of the apple orchards owned by the sample farmers was only about 0.88 hectare and the average number of apple trees per orchard in 1975 was only 172. The average production was nearly 20 kg and net income was Rs.58.21 per bearing tree during the year under study. The study concluded that prospect for apple cultivation on a wider scale in the area appears to be bright.

Rothenburger (1977) attempted the benefit-cost analysis of social, environmental and economic efficiency of horticulture and found that the economic importance of the central core of horticulture i.e. the production of vegetables, fruit, ornamental plants and trees has suffered a decline in fully industrialized countries.

Gangwar *et al.* (1982) concluded that the capital cost of grape orchard was recovered in a period os seven years and grape provided regular net income of Rs.5000 per hectare. The benefit-cost ratio showed that an investment of Rs.1.00 in a grape orchard unit fetches a return of Rs.2.47.

Singh *et al.* (1982) analysed the costs and returns of ber orchard and revealed that the total establishment cost was Rs.2773.75 per hectare.

The orchard started yielding profit from 4th year of its plantation. The total operating costs and gross returns were Rs.3362.80 and Rs.112350 per hectare respectively in the 7th year of planting. At this age of orchard, the per hectare net income obtained was Rs.7887.20 indicating a net returns of Rs.2.34 per rupee of investment.

Rana (1984) studied fruit production and marketing in India and observed that the perennial horticultural crops differ very much from field crops in view of long term commitments of land, labour, and capital for cultivation. Although operating costs of well established orchards may not be very high than those of field crops, yet the initial capital requirement for establishing orchards are certainly on the higher side.

Sakia *et al.* (1984) reported the pattern of production and disposal of pineapple in Meghalaya State. The report assessed the marketable surplus, marketing channels and functionaries, role of public and private agencies and processing industries in the marketing of pineapple. The study showed that the area under the cultivation is limited and the cultivation is not so profitable due to low price received. The farmer receipt in the consumer price is quite low but the spoilage during stocking, grading, transportation is minimum.

Sikka *et al.* (1985) made an economic analysis of citrus production in Himachal Pradesh. The study examined the existing marketing system, the efficiency of grading and packaging and estimated the economic viability of citrus orchards. The study reported that orange orchards give significantly more incremental income than field or other citrus fruits. The

maximum payback period for orange was found to be six years. In addition to higher profitability, the orange orchards also generated additional employment. The rise or fall of the producer's share in the consumer's price is disproportionate to rise or fall in the price level because several cost components are not based on value.

Azad (1987) studied the economics of production, marketing cost and the problems of guava production mainly confined to the vicinity of Allahabad city. The study revealed the financial hardship faced by the growers to invest in their orchards to boost higher yields. There was neither fruit preservation centre available in the study area nor proper technology developed for increasing guava production. The growers also suffered from lack of assured irrigation facilities.

Sikka and Swarup (1988) studied the economics of fruits production in Himachal Pradesh and examined the production costs, the marketing system and the economic viability of stoned fruits and pear growing. The maintenance costs of all orchards were found to have a direct relationship with age of plants. The marketing channel of producer-forwarding agent - commission agents - wholesaler - retailer - consumer is most prevalent in the case of plum and peach. Pears were sold directly at village level. Lack of proper storage and transport facilities were the major problems faced by the growers.

Anonynous (1989) appraised economics of production and marketing of ber based on the data of 20 ber growers from Sangola tahsil of Solapur district. The study revealed that the average per hectare number of

plants were 496. The age of the ber orchards was upto 3 years. The per hectare establishment cost of ber orchard was Rs.14552. They had considered 25 years as the average economic life of ber orchards. The average per hectare total cost of cultivation was worked out to Rs.27221. The major items of cost were mansures and fertilizers (together 29 per cent) and the hired human labour (about 16 per cent). The imputed cost towards rental value of land was 37 per cent of the total cost. The average per hectare yield obtained was 91.46 quintals. The average per quintal price received was Rs.660. The average per hectare profit at cost 'A' and cost 'C' was Rs.44625 and Rs.33209, respectively. The per quintal cost of production of ber was Rs.594. The per quintal marketing cost incurred was Rs.296. The major items of the marketing costs were packing material, commission charges, transport charges and sangh fees which were 38, 18, 15 and 13 per cent of the total marketing cost, respectively.

Rayasikharam (1989) made economic analysis of pineapple production as intercropping in the first three years of rubber cultivation on small holding in Kerala. Total cost and gross income were estimated for the season ending June 1989 taking into account land rent and other factors related to pineapple cultivation such as capital productivity and marketing. Traders were found to meet harvesting cost, of which hired labour formed a larger share than family labour. The processing and marketing facility for pineapple, however, was inadequate. Special attention was drawn to the potential profitability of pineapple leaves as fibre.

Subrahmanyan (1989) made an economic analysis of pineapple production and reviewed the production status at State level in India. About 1

per cent of the total production was exported during the year. The study recommended special credit facilities to increase productivity, standardization of produce and a need to diversify the export market.

Malla Reddy and Kumar (1990) reported that oranges do well in the tropical and sub-tropical conditions in the South Indian States. They assessed the problems and prospects of sweet orange marketing in Prakasan district in Andhra Pradesh. The data from a sample of 50 growers and 10 pre-harvest contractors for the period 1986-87 revealed that there was lack of storage facilities, poor transport and absence of a co-operative marketing structure for the product. There were also unpredictable fluctuations in the price for oranges. The study recommended that steps be taken to ensure that contracts were honoured and adequate marketing facilities developed in the region.

Hugar *et al.* (1991) reported that guava is a valuable source of income and nutrition in India but the fruit has not fulfilled its potential profitability. They evaluated the perspective income from guava production on a commercial scale under scientific management in Karnataka. The data for the years 1973-74 to 1987-88 suggested that farmers can realise greater returns than they are earning at present by intercropping guava trees with vegetables. There are also other positive side effects from such strategy in the form of increased employment.

Mohan *et al.* (1991) studied the citrus fruits cultivation in Andhra Pradesh State, which enjoys a monopoly over the rest of India in the production. The study focussed on the contribution of citurs to the State's

gross income. The data were provided for the year 1980-81 to 1984-85 on acreage, production level, productivity and income. While taking in account of planned projections, it believed that the government is neglecting this sector which has considerable potential.

Aparna and Bansal (1993) explained the land tenure system in Nagaland. The study reported that land ownership is vested in the village community and not the State. The violent movement for self-determination by the Nagas are contributory factors in their demands for special constitutional safeguards to protect their traditional rights and ways of life. The recent emergence of share cropping system in the Jalukie valley plain is an aberation from the traditional land relations. The traditional way of life of the Nagas is one of shifting cultivation, and a complete change over to terraced or settled cultivation is not desirable.

2.2 Cost of marketing, marketing channels, problems encountered and suggestions thereof

Hayes (1953) studied the grading of guava and citrus fruits. The study revealed that at a station in Allahabad district in 1940-41, 179 moulds of guava were graded and dispatched to market. They were sold at a premium of 51 paise per mould over ungraded fruits in the same market leaving a net gain of about 11 per cent for the grower. During four years, citrus fruits valued at Rs.2,03,272 were graded and sold at a premium of 5.6 to 37 per cent.

Kahlon and Randhawa (1956) studied the marketing of horticultural products. They reported that the solution of marketing problems

starts at production stage. The seasonal fluctuations in the prices of horticultural products were not only due to over production but more due to bad distribution. They suggested that the cultivation of early or late varieties, processing of horticultural products, development of cold storages and freezing industry could play a tremendous role in the orderly marketing and distribution of fruits.

Pannu and Sidhu (1963) studied the economics of grading of sweet oranges and found that the graded fruits fetched a premium of 12.9 per cent over the ungraded fruits.

Siddapa (1967) explained the scope for development of preservation of fruits and vegetables in India. He suggested an integrated approach for the industry as a whole and explored the possibilities of export promotion by which India could earn a lot of foreign exchange and thus help the economic development of the country.

Thakur (1971) in his study reported that producers get less than 50 per cent of the consumer's price of apple. More than 40 per cent of the marketing margin goes for commission and profit of the middleman in the market.

Sharma and Pandey (1972) studied marketing of guava. They observed that producer's share in consumer's price was 26.36 per cent while 28.17 per cent were the marketing charges and middleman's margin accounted for the 45.47 per cent.

Singh (1973) carried out the study on marketing of grapes through co-operatives in Ludhiana district of Punjab and the budgeting

technique was used for estimating the costs of assembling, grading, packing and transportation for examining the possibility of involving co-operative socieities for marketing grapes on a profitable basis. The budgeting analysis showed that through co-operative marketing the net returns could be increased by reduction in marketing costs and increase in gross returns by selling at the right place. Through co-operative marketing, costs decreased by 21.29 per cent, while returns increased by 24.55 per cent or Rs. 2.67 per pack.

Raghubanshi and Sharma (1977) reported in their paper that grading is a common yardstick to measure the quality variation in fruits. It helps in treating mutual confidence between buyers and sellers. If the produce is graded, the consumer gets the quality and the producer, a better return.

Patil and Dhongade (1978) studied the price spread of pomegranate in Maharashtra and observed that the marketing costs worked out to Rs. 34.00 and Rs. 11.00 per quintal in Mumbai and Rahuri markets, respectively, in the channel, producer-commission agent-retailer-consumer. The intermediaries involved in the marketing channel of pomegranate in Mumbay and Rahuri markets were 40 per cent and 27 per cent, respectively. The producer's share in consumer's rupee in Mumbai and Rahuri markets worked out to 44.55 per cent and 64.96 per cent, respectively.

Negi *et al.* (1980) observed that 60 per cent of the citrus growers and 44 per cent of the stone fruit growers were selling their fruits by adopting contract method of sale. The main reasons putforth by orchardists for giving orchard on contract basis were lack of time and risk aversion followed by difficulty in arranging marketing inputs, financial needs and low production in

the case of citrus fruits. In the case of stone fruits, the main reasons for giving orchards on contract basis were financial needs, lack of time and difficulty in arranging marketing inputs followed by risk aversion and low production. The main problems in respect of market intelligence were late as well as inadequate information and inefficient system.

Binari (1981) estimated producer's share in consumer's rupee in marketing of banana. It was 31.60 per cent for co-operative fruit sale society, 30.00 per cent for group sale and 30.00 per cent for private agency. This indicates that 70.00 per cent of consumer's sale was apprortioned by the expenses and margins of the market intermediaries involved in marketing of banana.

Negi and Thakur (1981) conducted the study on marketing channels and price spread in marketing of plums in Himachal Pradesh and found the following channels in the marketing of plums.

I. Orchardist-preharvest contractor-commission agents-wholesaler-secondary wholesaler - Retailer - consumer.

II. Orchardist-commission agents-wholesaler-retailer/processor-consumer.

III. Orchardist-commission agents-wholesaler-retailer/processor-consumer.

IV. Orchardist-primary commission agents- wholesaler-secondary commission agent/wholesaler-retailer/processor-consumer.

V. Orchardist-commission agents- wholesaler- mashakhor-retailer-consumer, and

VI. Orchardist-preharvest contractor-commission agents-wholesaler-mashkhor - retailer -consumer.

Benedicto and Caballers (1983) studied the use of cold storage in citrus fruits marketing in the Levante area of Spain. Cold storage was used

by the citrus industry with two purposes : (i) fruit degreening to provide suitable colour for marketing demands and thus to initiate earlier fruit marketing. (ii) Preservation of the fruit by preventing the physiological process, and therefore, to extend the marketing period, once the harvest has been done.

Birari and Kasar (1983) conducted the study on the marketing of Jalgaon banana in Delhi market. They reported that the per quintal cost of marketing of banana was Rs. 24.84. They also observed that the marketing cost shared 44 per cent of the total cost of production. Producer's share was only 31.62 per cent of the consumer's price. They concluded that about 70 per cent of the consumer's price was apportioned by expenses, margins of intermediaries and marketing cost showing inefficiency in marketing of banana.

Deshpande and Autkar (1988) examined the marketing of Nagpur Mandarin (oranges) in Akola and found that the cost of marketing worked out to Rs. 17.47 per quintal. Considering the elements of marketing cost, middleman's share is major component constituting 35.11 per cent followed by transportation cost (32.41 per cent). Producer-preharvest contractor-wholesaler-retailer-consumer was the biggest channel of distribution and the producer's share worked out to 31.40 per cent.

Subrahmanyam (1988) studied the marketing of horticultural crops in Karnataka and made suggestion that there is a need to control the activities oif the commission agents for encouraging self marketing. For this purpose, there is a need to introduce auctioning, gradings and selling by weight, etc., for ordering transactions. For elimination of pre-harvest

contractors and to improve marketing, steps like advancing production and market credit, etc., be taken. The co-operative socieities should be developed as a real alternative channel of trade.

Subrahmanyam (1988) studied marketing of horticultural crops covering mangoes, bananas, mandarin, papaya and pineapple in Karnataka. He observed that the cultivators sold the produce mainly to commission agents to the market or preharvest contractors/Traders at the field/village level. In the case of vegetables, most of the cultivators sold their produce through commission agents at the market. District sales to retailers were negligible except in case of Okra. The study also revealed that commission agents played a dominant role in the marketing of horticultural crops.

Bhupal (1989) found that the semi-government and co-operative trader channels handled a very small amount of vegetable, and thus served a limited number of consumer's in Delhi. On the other hand, the margins of middleman in private trade channels were high. They suggested that marketing network need to be improved through strengthening of the co-operative sector and regulation of middleman margins.

DE A.K. (1989) examined the role of cold storage in the marketing of potato in West Bengal. The study estimated the marketable surplus of potato in the State as 68 per cent to 70 per cent of total production. Of this, 53 per cent was sold during post harvest period and 47 per cent kept in cold storage. In the year 1987-88, private sector owned 85 per cent of cold storage and 92 per cent of cold storage capacity. Private cold store played a vital role in the potato market mechanism. By delaying the opening of stores

untill after harvest, primary market becomes saliated and price drops rapidly. Delaying tactics serve the intersts of cold stores' owner and potato traders. Cold store owners also play role of lenders to poor farmers with the guarantee of potato supply immediately after harvest at a fixed contract price.

Sharma *et al.* (1989) reported that the marketed surplus of field crops was negligible and not sufficient to meet the household requirements for food grains. However, the marketed surplus of horticultural crops was high 80-90 per cent in the case of apples and 79-84 per cent for walnuts according to farm size.

Thomas and Mukundan (1989) undertook a study on marketing of pineapple in Trichur district of Kerala State during 1981-82 and analysed the marketing methods, functions, channels and marketing efficiency. Data were collected from 50 cultivators and several intermediaries. It was found that there were three important marketing channels. The producers's share in the consumer price was 52 per cent, wholesaler and retailer's margins were 17 per cent and 21 per cent, respectively. Marketing cost comprised about 10 per cent of the final price. The problems faced by growers in marketing pineappleas such as absence of proper marketing facilities and high fluctuation in prices were very important.

Parthasarathy (1990) studied packaging of fruits and vegetables. He observed that farmers were resorting to traditional method of packing for vegetables rather than modern packages. Some of the farmers simply filled the truck without any packaging for some fruits and vegetables. He suggested the need for educating the growers, traders and consumers about the

importance of the need and necessity of scientific packaging though it costs a bit more.

Singh *et al.* (1990) carried out economic analysis of plum and apricot in Himachal Pradesh and found out that most of the fruit growers were selling their produce through pre-harvest contractors. Shortage of time-risk aversion and perishable nature of the commodity were some of the important reasons advanced by the farmers for selling their produce to pre-harvest contractors.

Korde *et al.* (1991) studied the behaviour of arrival in response to price variations using evidence from two major markets in Nagpur and Narkhed. Primary and secondary data from 1980-81 to 1986-87 revealed that price fluctuation varied between the two orange producing seasons (Mrig and Ambia) while producer's prices remained quite high during the study period in Nagpur and consumers faced erratic prices in most markets. A comparison of Mrig and Ambia prices revealed that in 5 out of 7 years, oranges yielded higher revenue for producers in the former season. Consumers, meanwhile faced higher price in the same season in all the 7 years. These findings support the hypothesis that fluctuating prices create instability in the orange supply in India and also concluded that establishment of orange processing units in India is likely to result in higher supply of oranges, provided the price of the product remains stable.

Bhole *et al.* (1992) conducted study for estimating price spread in marketing of oranges for a sample of 60 orange growers from Nagpur and Amravati districts and retailers from Nagpur orange market in the year 1990-91. Farmers were benefitted and received about 32 per cent higher price by

selling their produce themselves in APMC as against selling to PHC in garden itself. Marketing margins were worked out to about 48 per cent of price paid by consumers in local market.

Deshpande *et al.* (1992) analysed the price spread in different channels of marketing grapes in Latur district and they identified four channels of marketing in grape viz.,

A) Producer-aditya-retailer-consumer.

B) Producer-wholesaler-retailer-consumer.

C) Producer-consumer.

D) Producer-retailer-consumer.

The study revealed that the channel 'C' incurred minimum marketing cost of Rs. 76.60 per quintal of grapes as compared to that of channels A, B and D. The channel 'A' and 'B' showed the highest marketing costs i.e. Rs. 166.95. This was due to large number of intermediaries. In channel 'A' and 'B', commission was to the extent of 39.38 per cent. In the channel 'D', weighing and packing cost was 55.52 per cent of total cost of marketing. The transportation charges were high in the case of channel 'C' (i.e. 16.10 per cent of total cost). The share of producers in consumers rupee was maximum in channel 'C' (91.34 per cent).

Waykar and Kadam (1992) revealed from their study on marketing of ber in different markets that, on an average, per quintal cost of packing ber in boxes was Rs. 250.32 and cost of packing ber in loose form was Rs. 21.52 while marketing ber in different markets. On an average, Rs.

429.09 were required per quintal on marketing cost of ber packed in boxes and Rs. 111.13 were incurred as marketing cost ber of packed in loose form. The major components of costs were packing charges, marketing and transport expenses.

Lepcha *et al.* (1993) analysed the economics of marketing of mandarin orange in Darjeeling district of West Bangal. The study reported that Mandarin oranges like other perishable agricultural commodities faced various marketing problems such as inefficient purchasing, lack of storage facilities, inappropriate transport and insufficient processing units causing sharp fluctuation in prices and large marketing margins. The study identified different marketing channels in Darjeeling district of West Bengal, analysed the price spread of Mandarin oranges from producers to consumers and found out the percentages distribution of cost incurred by different intermediaries. The results showed that significant proportion of the consumer's rupee in the area is taken by the intermediaries, indicating the inefficiencies and shortfalls in the marketing system. Transport accounted for the highest share of costs in marketing of the oranges. For improving the production and marketing system, the report suggested, the need for adopting co-operative marketing.

Senthilnathan *et al.* (1994) studied the cost and returns of Poovan cultivar banana production, identified the marketing channels and analysed the marketing efficiency from selected farmers in the Trichirapalli District. The study showed high profitaiblity of Poovan banana cultivation (2.3:1 return cost ratio). Returns through regulated market yielded 71 per cent of consumer price. The study suggested introduction of transport facilities and

prompt payment for sale which would motivate farmers to market their crops through regulated market.

Subrahmanyam and Gajanana (1994) studied the functioning of existing fruit and vegetable co-operative marketing societies and provided some useful guidelines that would help in the proper planning and establishment of new fruit and vegetables co-operative societies so that they would be successful. The data were collected from two fruit and vegetable marketing socieities located in Bangalore and Hyderabad. It was suggested that the overhead expenses incurred by the society should be proportionate to the share capital received through membership. Some incentives in the form of slightly higher procurement price, credit, input supply, etc., should be given to members to attract more cultivators. The procurement of produce from the market should be kept at a minimum as far as possible and the most of the produce should be taken from the cultivators. The location of the society should be such that it will avoid double transportation.

It is ascertained from the literature that there were few studies on the topic of present investigation. However, few of the studies directly relating to production and marketing of these fruits are quite useful for completion of the present study. This study is focusing on cost of production, marketing and constraints in production and marketing of pineapple, orange and quava and thus covering all aspects of production and marketing of these fruit crops.

METHODOLOGY

3. METHODOLOGY

Introduction :

The objective of any scientific investigation is to draw meaningful conclusions in view of the objectives of the study. It comprises of design of schedule, collection of data, analysis of data, presentation and interpretation of results. This chapter devoted itself to discuss in brief the methodology adopted for the present study. It provides an insight into the source of data, method of obtaining data, selection of region, selection of sample for detailed analysis, definitions of various variables chosen for analytical purpose and analytical technique deployed in the analysis of data to obtain estimates of different variates and establish relationship between output and input of pineapple, orange and guava production activity and marketing in Nagaland to meet the requirements of the objectives of the study.

3.1 Data requirement and source of data

Inadequacy and non-availability of data is a big handicap for any research work in economics. In the present study, the comparative economics regarding establishment, production and marketing system involved in the production and disposal of pineapple, orange and guava has been dealt with. Obviously the data were required on various aspects of resource used in establishment, production and marketing of pineapple, orange and guava. The major aspects of the data requirement were as under :

(i) Agro-climatic features of the study area.

(ii) Geographical area and land use pattern of the study area and of individual cultivator.

(iii) Cropping pattern of the study area and of individual cultivator.

(iv) Population and employment in the state and of the selected individual farmer.

(v) Investment in capital assets of the individual orchardists.

(vi) Details on the Cost on account of establishment, production and marketing of pineapple, orange and guava.

(vii) Details on marketing method and marketing channel.

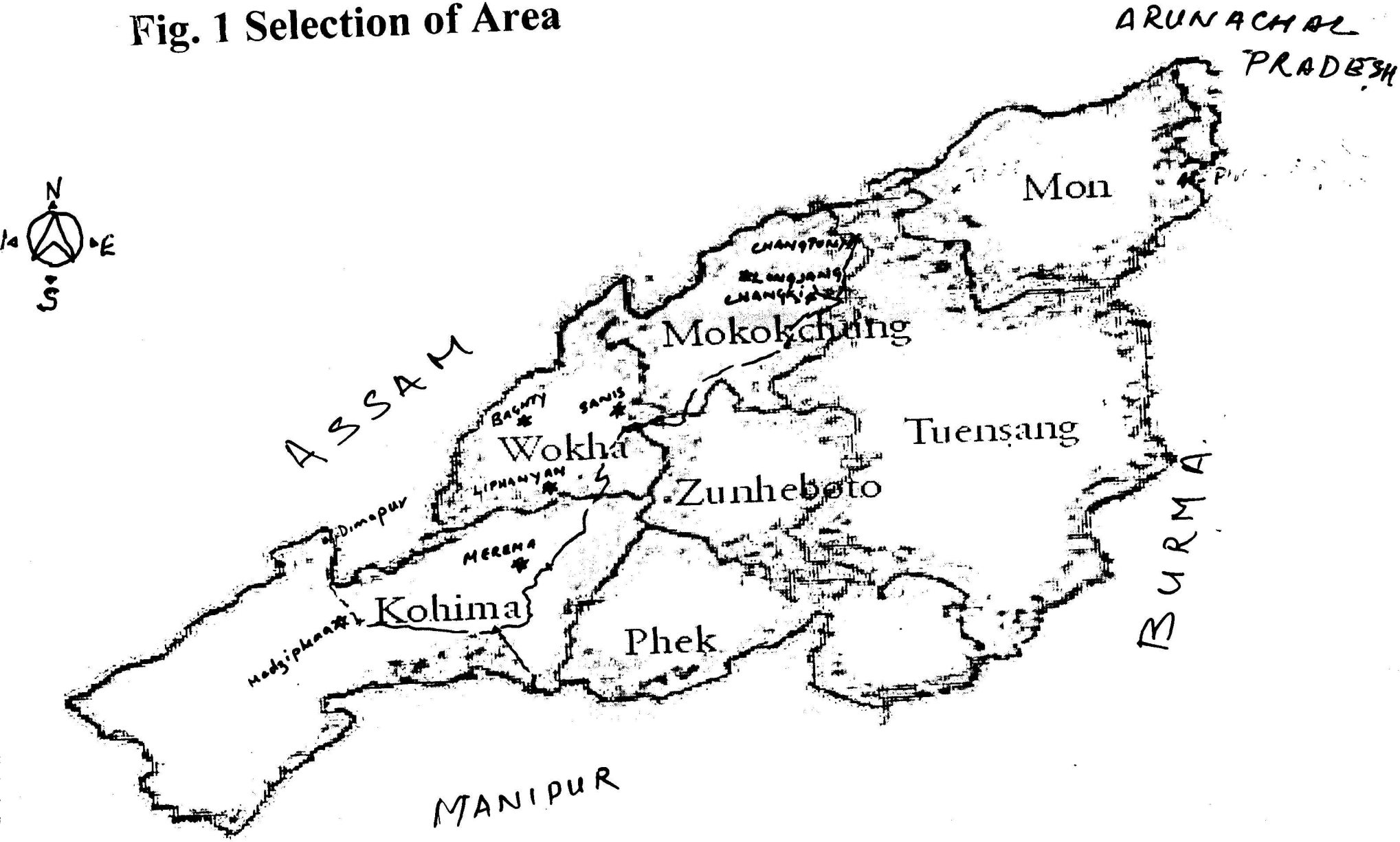
The data related to the above information were collected from the individual orchardist and the market intermediaries. The secondary data on different agro-economic aspects of Nagaland were obtained from different sources such as Department of Agriculture, Nagaland, statistical abstract and various other publications of the state government. The data on some of the variates were collected from the office records of the Directorate of Economics and statistics, Government of Nagaland.

3.2 Selection of the area and the sample

3.2.1 Selection of area

The three major fruits producing districts viz., Kohima, Mokokchung and Wokha in Nagaland were purposively selected for undertaking the investigation. From each district, based on the area under

Fig. 1 Selection of Area



pipeapple, orange and guava, three major fruits producing villages were selected after obtaining information from respective District Agriculture Office. The sample villages were Medziphema, Kohima and Merema from Kohima district; Baghty, Sanis and Liphanyam from Workha; Changki, Chantonya and Longjang from Mokokchung district. The study was based primarily on the farm level data related to different aspects of production and marketing of pineapple, orange and guava.

3.2.2 Selection of sample

The information related to fruit orchardists is obtained from the respective village extension worker. From the available name lists of pineapple, orange and guava producers, 10 samples of each fruit producers were randomly selected from the three villages under each district. In all 30 fruit producers of each fruit were selected from the three districts. For the three fruits all together 90 samples were selected from the three districts for the study. For the purpose of analysis, these orchardists were categorised into three classes on the basis of the actual area under the respective fruit crops viz., (i) Small size having area upto 0.39 ha (ii) Medium size having area from 0.40 to 0.79 ha (iii) Large size having area 0.80 ha and above.

	Orchard size (ha)	Growers			Overall
		Pineapple	Orange	Guava	
1.	Upto 0.39	8	5	7	20
2.	0.40 - 0.79	10	11	16	37
3.	0.80 - above	12	14	7	33
	Total	30	30	30	90

3.3 Preparation of schedule and collection of data

A set of schedules including the following aspects was prepared for the puppose of collection of data.

1. Size of holding
2. Land utilization
3. Cropping pattern
4. Farm assets
5. Details of orchard establishment cost
6. Items of cost of cultivation
7. Yield data and disposal of produce
8. Price of material used and
9. Marketing cost

The formats of the schedules used are given in Appendix I. The data relating to the costs and returns of pineapple, orange and guava and the constraints in production and marketing of these fruits were collected by the survey method through personal interview of the sample fruit producer for the year 1994-95 with the help of the schedule prepared for the purpose. The information on marketing of these fruits was collected from the sample orchardists by obtaining the sale receipts and also from Kohima, Wokha and Mokokchung markets. The retailers were interviewed for obtaining the required information. The data collected were then processed, tabulated and analysed for presenting the results.

3.4 Analysis of data

The data collected from different fruit growers and other market intermediaries from the three districts were analysed to obtain estimates of different variates relating to establishment, production, marketing cost and marketing margins of pineapple, orange and guava in Nagaland.

3.4.1 Cost of establishment of pineapple, orange and guava

The primary data collected from the sample of pineapple, orange and guava growers were compiled and tabulated suitably. The various item of cost incurred from the beginning of plantation till the orchard reaches economic bearing stage are included under the establishment cost. The different items contributing to the establishment cost are,

i. Human labour
ii. Cost of seedling
iii. Manure and fertilizer cost
iv. Plant protection
v. Depreciation and repairs
vi. Interest on fixed and working capital
vii. Rental value of land
viii. Bullock labour and protective irrigation cost.

No charges on bullock labour and protective irrigation cost were accounted in the establishment cost, and the same is explained in Appendix II under respective heading.

3.4.2 Cost of production of pineapple, orange and guava

The primary data collected from 30 samples each of pineapple, orange and guava growers were compiled and tabulated suitably. The standard cost concepts viz., cost - 'A', 'B' and 'C', usually used in farm management studies, provide different measures of returns to the cultivators.

Cost 'A' : The cost 'A' includes the cost on account of

i. Hired human labour
ii. Bullock labour
iii. Seed
iv. Fertilizer
v. Manure
vi. Irrigation
vii. Insecticides and pesticides
viii. Interest on working capital
ix. Land revenue and cesses
x. Depreciation on implements and machinery
xi. Annualised establishment cost (Amortization value)

Cost 'B' :

This cost includes cost 'A' plus the rental value of owned land and interest on owned fixed capital (excluding land).

Cost 'C' :

This comprises of cost 'B' plus the imputed value of family human labour. This cost represented the total cost of cultivation.

The standard cost concepts provide the following different measures of returns to the cultivator.

i. Gross returns -- Cost 'A' = Farm business income

ii. Gross returns -- Cost 'B' = Family labour income

iii. Gross returns -- Cost 'C' = Net profit or loss

The methodology for valuation of different items of cost in estimation of cost of cultivation is discussed in Appendix II.

3.4.3 Functional analysis

The data on production of pineapple, orange and guava were also analysed with the help of production function approach, viz., Cobb-Douglas type of production function. The factors affecting the production of these fruits were included in the production function. The estimated production function was statistically tested with the help of student 't' test, R^2 and F value . The form of the function used in the present study was of the following type :

$$Y = a X_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} \ldots\ldots e^u$$

where,

Y = Yield (qtls.)/hactare

X_1 = Area under fruit crop (hectares)

X_2 = Value of human labour (Rs.)

X_3 = Value of fertilizer cost (Rs.)

X_4 = Value of plant protection (Rs.)

X_5 = Other working capital (Rs.)

a = Constant

bi's = Elasticities of production of respective resource categories

e^u = Error term

3.5 Marketing of pineapple, orange and guava in Nagaland

a) Selection of market :

The three district towns viz., Kohima, Mokokchung and Wokha and the other important commercial town i.e., Dimapur have been selected purposively for the present study. These are the important consumer markets in the State.

b) Selection of sample :

Farmers, wholesaler, and retailers who usually undertake marketing of pineapple, orange and guava in the various markets were contacted to obtain the required data.

A set of questionnaire was prepared for the purpose of collection of data on the aspects such as quantity produced, quantity used for consumption and gift, quantity damaged by pest and disease, net quantity sold and quantity sold through different channels. The various marketing costs such as packaging cost, labour cost, transport charges, town committee tax, price receieved by various market middlemen, expenses incurred by various middlemen for selling quantity of produce in the market in the particular year were considered and compared with the price realized in the market.

The data were collected by survey method through personal interview with the producers, the wholesalers and the retailers to accomplish the various objectives of the present investigation.

During the process of investigation effort was made to collect all the required data. However, it is regretted that due to absence of any regulated market in the state, the data pertaining to the objective relative to supply-price relationship analysis in respect of pineapple, orange and guava were not obtained during the present investigation.

During the investigation a peculiar marketing channel i.e. producer--factor--consumer was observed in marketing of fruits. Here the factor collect the produce from the producer for sale but he avoid taking the ownership title of the produce. He tries to sell the produce at his discretion price. However, the unsold produce will be returned back to the producer. For his service, a service charge will be paid to him. Here in this channel, the returns income for both the parties depend upon the integrety of the individuals and the close relationship they enjoy with each other.

3.6 Marketing margin and price spread

The price spread refers to the difference between the price received (after deducting all marketing expenses incured) by the grower and that paid by consumer. In order to find the price spread the different items of cost of marketing were taken from different marketing intermediaries. The marketing cost includes the packaging cost, packing/ loading cost, transport cost, unloading charges and town committee taxes. The different expenses incurred by the producer, the wholesaler, the retailers and the factors were collected separately to find this margin seperately. Channel I, II and IV were chosen for finding price spread for different marketing agencies as they are the most popularly used channel for marketing of the different fruit crops.

GENERAL INFORMATION OF THE STUDY AREA

4. GENERAL INFORMATION OF THE STUDY AREA

Agricultural production is a biological process which is influenced by several factors, such as climatic conditions, physiographic features, temperature, soil type, rainfall, etc. Though these natural factors are beyond the control of man, farmers adjust their farming in such a way as to take advantage of the prevailing climatic conditions. Besides these factors, irrigation, communication facilities, development of production facilities, market facilities at market centres, progress in the field of education, storage, credit facilities, etc. play an important role in production of agricultural commodities. For the obvious reason, the knowledge about physical features and economic background of a given tract, therefore, helps better understanding of the problem under research. In view of the above, the information relative to Nagaland is briefly discussed in this chapter.

4.1 Background information of Nagaland State

Nagaland is one of the 25 States in India. Nagaland State came into existence on 1.12.1963 after division of the erstwhile Assam State into 7 north-eastern hilly States.

4.1.1 Location

Nagaland State lies between 26°6' and 27°4' latitudes, North of Equator and between the longitudinal lines 93°20' E and 95°15' E.

Nagaland State is bounded by Assam in the West, Myanmar on the East, Arunachal Pradesh and Part of Assam on the North and Manipur in the South.

4.1.2 Topography

The topography of Nagaland is very complex as it is full of hill ranges with steep slopes. The average elevation is in the ranges of 194 metres to 3016 metres. The average height at which the villages are located is in between 1000-3000 metres. About 94 per cent of the State is hilly. The rest is foot hills with rolling topography. Topographically, the State can be divided into three regions viz., (I) The foothills with undulating and rolling topography (ii) Lower ranges and mid slopes with varying degrees of slopes and (iii) High hills above 900 metres.

There are a number of seasonal and perennial rivers, which dissect the State. The Dhansiri, Doyang and Dikhu rivers drain into the Brahmaputra and the Tizu river which flows to the east and drains into Irawati in (Burma) Myanmar. The rivers, by and large, pass through deep gorges.

4.1.3 Climate

The climate of Nagaland is sub-tropical and sub-montane but varies with elevations. Climate in foothills is warm and sub-tropical, but over high hills it is cooler and temperate. In the mid slopes and lower ranges of the western flank, climate is moderate and sub-montane. The temperature in the hills varies between a minimum of 5°C in the winter to 25°C in the summer seasons. This variation is between 12 to 32°C in the foot hills.

The average annual rainfall is between 2000 to 2500 mm. The most of the rainfall occurs between May to October, May to August being the

wettest months. The period between November to April is dry. The rainfall is uncertain.

4.1.4 Soils

Nagaland had completed a soil survey and brought out a report for the State in 1975 which tentatively classified soils into 4 orders, viz., Entisols, Oxisols, Mollisol and Spodosol along with a number of sub-orders depending upon geomorphic conditions. Soils of Nagaland are acidic and pH value was found to be 4.8 to 5.6, on an average. Although the State is small, large variations in topography lead to various combinations of soils. These are grouped as follows :

1. Recent Alluvium (Entisols)
2. Old Alluvium (Oxisols and Ultisols)
3. Valley soils (Entisols)
4. Lateritic soils (Oxisols and Ultisols)
5. Non-lateritic red soils (Oxisols and Ultisols)
6. Brown forest soils (Mollisol and Inceptisols)
7. Podzolic soils (Spodosol)

4.1.5 Area, population and workers

Nagaland State comprises of 7 districts (now 8 districts). It has an area of 16,579 sq. km. (Table 4.1) and a population of 12,09,546 as per 1991 Census, showing a decadal growth of 56.08 per cent since 1981. The average density of population is 73 persons per square km. The population consists of 6, 41,282 males (53 per cent) and 5, 68, 264 (47 per cent) of

females with a literacy of 61.65 per cent. Out of this literate percentage, male constitutes 58.80 per cent while 41.20 per cent is covered up by females.The percentage of the workers to the total population is 42.29 per cent.

4.1.6 Land utilization

There is no cadastral survey of land in Nagaland and as such data on land use is incomplete. As per available data (based on reporting areas), the details of different land use are shown in Table 4.1.

The total area of Nagaland is 16, 579 sq. km. (total reporting area is 15, 32, 912 hectares). Out of this forest covers an area of 8, 62, 532 hectares, i.e., 52.03 per cent of the total area, cultivable waste land constitutes about 5.98 per cent or 99,190 hectares and fallow land constitutes as high as two lakh hectares or 13.75 per cent to the total geographical area. Area under fruits was as low as 5,150 hectares (1.52 per cent) only. Total cropped area was reported to be 2,10,402 hectares. Out of this, 22,550 hectares of land area was sown more than once. The total reporting area was 15,32,912 hectares. The proportion of net area sown was small and proportion of fallow land was comparatively higher in Nagaland. High proportion of fallow land is characteristic of hill areas where shifting cultivation is in practice. In the case of shifting cultivation, the abandoned areas are kept fallow for vegetative regrowth.

4.1.7 Land system

The State of Nagaland has no records of land rights. The ownership pattern of land varies from tribe to tribe. There are privately owned land besides clan land and community land. This aspect is discussed

Table 4.1. Population, area and land utilization of Nagaland State (1991-92)

	Particulars	Total (Nos/ha)
1.	Population (1991 Census)	12,09,546
	a) Male	6,41,282
	b) Female	5,68,264
2.	Percentage decadal growth	56.08
3.	Literacy rate (per cent)	61.65
	a) Male	58.80
	b) Female	41.20
4.	Density of population per sq.km (Nos.)	73
5.	Percentage of main workers	42.29
6.	Area (in hectare)	16,57,900
7.	Forest	8,62,532
8.	Area not available for cultivation	
	a) Barren and uncultivable land	NA
	b) Land put to non-agril. use	28,848
9.	Other uncultivated land excluding	
	a) Permanent pasture and other grazing land	NA
	b) Land under misc. tree crops and groves	1,24,530
	c) Cultivable waste land	99,190
10.	Fallow land	2,27,960
	a) Current fallow	1,18,260
	b) Old fallow	1,09,700
11.	Area under fruits	5,150
12.	Net area sown	1,89,852
13.	Area sown more than once	20,550
14.	Total cropped area	2,10,402
15.	Total reporting area	15,32,912

Source : Statistical abstract of Nagaland 1992)

in the "Report on Land System in Tribal Areas of North-East India" by the working group of the Zonal Planning Team. The land system in Nagaland varies from tribe to tribe.

It may be mentioned that the government of Nagaland has no much control over the land and forests of the state, as these are owned privately as well as by the community according to the tribal traditional land system.

4.1.8 Irrigation facilities

The intensity of cropping can be judged from the area under irrigation. Land can be put to more than two crops in a year when irrigation facilities are available. Irrigation facilities also show reflection on the area under fruit crops and vegetables. The details of irrigated area are given in Table 4.2.

Table 4.2. Irrigated area

	Particulars	Area (ha)	Per cent to the total
1.	Net irrigated area	54,400	28.65
2.	Net sown area	1,89,852	100.00
3.	Gross irrigated area	60,224	28.62
4.	Gross cropped area	2,10,402	100.00
5.	Irrigation intensity	(Per cent)	110.70
6.	Cropping intensity	(Per cent)	110.82

Table 4.2 shows that the gross cropped area in the state was 2,10,402 hectares during the year 1991-92. The percentage of net area

irrigated was 28.65 per cent of the net sown area whereas gross irrigated area was only 28.62 of the gross cropped area.

4.1.9 Shifting cultivation (Jhumming)

Shifting cultivation is a problem because it keeps the people at a very low level of subsistence and yet it continues because it is the only means of producing the food required. Complete cutting down of trees and under-growths, burning the soil and stirring the soil for growing of crops leads to undesirable consequences. The productivity of the soil reaches the minimum within two years due to erosion of the top soil. The plot has to be abandoned and cultivation shifted to new place. The period after which the cultivation rotates to a previously cropped plot is called the jhum cycle. In Nagaland, the Jhum cycle is reported to be 5 years. It is also reported that, with the rapid increase of population in Nagaland,the land for Jhumming also becomes scarce which resulted in encroachment upon the most valued community village forests and some inaccessible class VII and VIII land.

Total area under shifting cultivation in Nagaland is nearly 63.3 thousand hectares and this is nearly 38.18 per cent of the geographical area. But the annual area under Jhum is only 10.14 thousand hectares. The rest of the area is kept fallow for the re-growth of vegetation. It is difficult to estimate the area under crops in Jhumming because mixed cropping is generally adopted. The mixtures , however, do not have any set proportions.

4.1.10 Cropping pattern

The study of cropping pattern is very essential to know the economic condition of the area. The nature of cropping pattern shows a

predominance of food or commercial crops which in turn indicates the levels and economic conditions of the cultivators in the tract.

The information on cropping pattern of Nagalnd for the year 1962-63 and 1991-92 is given in Table 4.3. Being an important staple crop of Nagaland, rice occupied a dominating proportion (61.3 per cent) of the total cropped area. Maize occupied 11.83 per cent, oilseeds constituted 5.63 per cent, total pulses together covered 6.65 per cent while fruits occupied only 2.45 per cent of the total cropped area during the year 1991-92.

The area shares of different crops in the total cropped area given for 1962-63 and 1991-92 showed that there was considerable increase in the area under food grain crops. Some crops like rice, maize, oilseeds, pulses and sugarcane showed significant increase. Area under fruits also increased significantly. There is a quantum jump in the case of tapioca but it holds little acreage percentage of the total cropped area. At the same time, there was noticeable decrease in the area under other cereals and potato. The proportion of food crops to non-food crops, however, did not change much over the time.

4.1.11 Transport and marketing facilities

An adequate market and transport facility plays a vital role in the development of fruit crops. There are number of roads connecting the villages and the district headquarters. The transport of vegetables and fruits has been slowly increasing from these areas to the district headquarter and also to the State capital Kohima. This position is likely to improve a lot with more and more private owned buses and other commercial vehicles plying

Table 4.3. Cropping pattern of Nagaland

(Area in ha)

	Crop	1962-63		1991-92		Change over 1962-63	
		Area	%	Area	%	Area	%
1.	Autumn Rice	47076	48.10	70100	33.32	23024	48.9
2.	Winter Rice	14865	15.20	58900	27.99	44035	296.2
3.	Maize	7346	75.00	24900	11.83	17554	238.96
4.	Wheat	NA	-	540	0.26	540	-
5.	Other cereals	15719	16.10	14000	6.65	- 1719	- 10.9
6.	Total pulses	2705	2.80	14000	6.65	11295	417.6
	Total food grains	87711	89.60	182440	86.71	94729	10.8
7.	Oilseeds	1844	1.90	11850	5.63	10006	542.6
8.	Sugarcane	1066	1.10	3300	1.57	2234	209.6
9.	Potato	2999	3.10	1400	0.67	- 1599	- 53.3
10.	Sweet potato	299	0.30	250	0.12	- 49	- 16.39
11.	Tapioca	25	Neg.	450	0.21	425	1700
12.	Fruits	800	0.8	5150	2.45	4350	543.8
13.	Vegetables	1265	1.3	2300	1.09	1035	81.8
14.	Fibres	638	0.7	350	0.17	- 288	45.1
15.	Tobacco	27	Neg.	50	0.02	- 23	- 85.2
16.	Onion	12	Neg.	40	0.02	28	233.3
17.	Spices	1153	1.2	470	0.22	- 683	- 59.2
18.	Plantation crops and other unaccounted crops	NA	-	2352	1.12	2352	-
	Total non-food grain crops	10128	10.0	27962	13.29	15482	152.9
	Total	97839	100.0	2104.02	100.0	112563	115.05

Cropping intensity in 1991-92 was 110.75.

into the remote villages. Another boost to the farmer community is the Village Development Board (VDB) scheme in which utilization of the allocated fund for village development is decided by the villagers. As a result, many villages have their own buses now. This has greatly facilitated the transportation of vegetables and fruits to the market at a time when the State transportation department is plagued with corruption and inefficiency.

4.1.12 Marketing

In Nagaland, marketing of produce is a grey area which needs to be tackled with utmost urgency. There are no regulated markets. Weekly markets are not held except in some part of Kohima district. There are no growers' associations for production and marketing or co-operative bodies to play the role in marketing of fruits within and outside the State.

4.2 Economic characteristics of the selected pineapple, orange, and guava growers

Some important economic features of the selected fruit producers such as average family size, land utilization pattern, cropping pattern, capital assets, etc., have been discussed below in brief.

4.2.1 Average size of family of selected fruit producers

Fruit crops cultivation requires relatively more human labour and personal attention. Hence an attempt has been made to study the family size of the selected fruit producing farm families. The information pertaining to the selected fruit growers of pineapple, orange and guava is given in Table 4.4.

Table 4.4. Average family size and literacy of selected fruit producers

(persons)

	Particulars	Categories			Overall
		Pineapple growers	Orange growers	Guava growers	
1.	Total members	171	222	211	604
		[100]	[100]	[100]	[100]
2.	Average size of family	5.70	7.40	7.00	6.70
		[100]	[100]	[100]	[100]
	a) Male	2.40 [42.11]	3.60 [48.65]	3.30 [47.14]	3.10 [46.27]
	b) Female	2.20 [38.60]	2.90 [39.19]	2.80 [40.00]	2.60 [38.81]
	c) Children	1.10 [19.29]	0.90 [12.16]	0.90 [12.86]	1.00 [14.93]
3.	Literacy				
	a) Literate	3.70 [64.91]	5.10 [68.92]	4.50 [64.29]	4.43 [66.12]
	b) Illiterate	2.00 [35.09]	2.30 [31.08]	2.50 [35.71]	2.27 [33.88]
4.	Total workers	2.64 [46.30]	2.90 [39.19]	3.43 [49.00]	2.99 [44.62]
	a) Agriculturist	1.57 [27.54]	1.77 [23.92]	1.87 [26.60]	1.74 [25.97]
	b) Others	1.07 [18.77]	1.13 [15.27]	1.56 [22.19]	1.25 [18.65]
5.	Dependents	3.07 [53.85]	4.50 [60.81]	3.60 [51.21]	3.72 [55.52]

(Figures in the parentheses indicate percentages to total number of family members)

The table shows that the average size of the selected sample families worked out to be 6.7 members, at the overall level. The average literate number was 4.43 and illiterate numbering 2.27 persons. The per family average workers and dependent were 2.99 and 3.72 respectively. The composition of the family at the overall level showed that each family had 3.1 males, 2.6 females and 1.0 child.

4.2.2 Land utilization pattern of growers

The information about the average land use pattern of the selected fruit growers in Nagaland is given in Table 4.5. It can be seen from the table, that the average land holding of the different fruit sample growers was 6.73 ha. at the overall level. The net cultivable land was 48.59 per cent at the overall level and the same was about 50 per cent for the pineapple and orange growers categories and 44.94 per cent for the guava category. The next most important land area was the fallow land, which constituted as high as 34.03 per cent. Under the different orchardists categories, the fallow land area of the guava category was quite high constituting about 40.03 per cent while it was about 30 per cent for pineapple and orange categories. The area under forest, at the overall level, was 17.38 per cent. The area under irrigation, was categorised into rainfed irrigated land and rainfed unirrigated land. Rainfed irrigated area indicates the area that has been irrigated during monsoon or rainy season. Wet paddy cultivation comes under this category. The source of irrigation is the rainfall and not any other perennial source of water. The overall area under this category was 19.76 per cent, while the same was 24.96 for pineapple, 15.01 for orange and 19.94 for guava. The rainfed unirrigated area was comparatively higher than the rainfed irrigated

Table 4.5. Land utilization pattern of the average fruit producing farm family

(hectares)

	Particulars	Category			Overall
		Pineapple growers	Orange growers	Guava growers	
1.	Total land holding	6.21 [100]	7.06 [100]	6.92 [100]	6.73 [100]
2.	Forest	1.06 [17.07]	1.41 [19.97]	1.04 [15.03]	1.17 [17.38]
3.	Fallow	1.99 [32.04]	2.12 [30.03]	2.77 [40.03]	2.29 [34.03]
4.	Net cultivable land	3.16 [50.89]	3.53 [50.00]	3.11 [44.94]	3.27 [48.59]
5.	Rainfed irrigated land	1.55 [24.96]	1.06 [15.01]	1.38 [19.94]	1.33 [19.76]
6.	Rainfed unirrigated land	1.61 [25.93]	2.47 [34.99]	1.73 [25.00]	1.94 [28.83]
7.	Area under selected orchard	0.97 [15.61]	0.77 [10.91]	0.52 [7.51]	0.75 [11.14]
8.	Gross cropped area	3.23	4.19	3.57	3.66
9.	Percentage of area under orchard to irrigated area	62.58	72.64	37.68	57.63
10.	Cropping intensity with orchard (%)	102.46	118.76	114.61	111.94
11.	Cropping intensity without orchard	147.00	151.00	137.00	145.00

(Figures in the parentheses indicate the percentages to the total land holding).

with 28.83 per cent at the overall level. The area under selected orchard, at the overall level, was 0.75 ha. (11.14 per cent of the total crop area). The acreage under pineapple was 15.61 per cent of the total holding, while in the case of orange and guava producers it constituted about 10.91 and 7.51 per cent of the total cropped area. The per farm family gross cropped area was 3.66 ha. at the overall level and it was the highest for orange orchardist (4.19 ha.) followed by guava and pineapple with 3.57 and 3.23 ha, respectively. The percentage of area under orchard to irrigated area at the overall level was 57.63 per cent. The cropping intensity was the highest on the farms of orange growers. The cropping intensity with orchard was just 119.94 per cent, whereas without orchard it was 145 per cent at the overall level.

4.2.3 Cropping pattern

The information of cropping pattern adopted by the fruit growers had a lot to do with resource use and farm profitability. This information is equally important in working out the quantum of labour utilization and in indicating the income strategy. The average cropping pattern of the selected fruit growers is presented in Table 4.6.

It is observed that rice was mainly grown by the orchardist. Rice occupied 57.6, 48.04 and 53.86 per cent of the gross cropped area in the case of pineapple, orange and guava growers, respectively. The next important crop at the overall level was the selected fruits crops themselves constituting 20.49 per cent of the gross cropped area. Amongst the three fruits the pineapple's area share in the gross cropped area was 30.00 per cent while orange and guava area shares were 18.37 and 14.56 per cent, respectively.

Table 4.6. Cropping pattern of sample fruit growers

(hactare)

	Crop	Area under respective crop of			Overall
		Pineapple growers	Orange growers	Guava growers	
1.	Rice	1.86	2.01	1.92	1.93
		[57.60]	[48.04]	[53.86]	[52.73]
2.	Other cereal crops	0.12	0.10	0.03	0.08
		[3.80]	[2.34]	[0.76]	[2.19]
3.	Pulses	0.17	0.62	0.61	0.47
		[5.40]	[14.71]	[17.02]	[12.84]
4.	Vegetables	0.08	0.57	0.36	0.34
		[2.60]	[13.69]	[10.00]	[9.29]
5.	Spices	0.02	0.04	0.09	0.05
		[0.60]	[0.89]	[2.60]	[1.37]
6.	Selected fruit	0.97	0.77	0.52	0.75
		[30.00]	[18.37]	[14.56]	[20.49]
7.	Other fruit	-	0.08	0.04	0.04
		-	[1.96]	[1.20]	[1.09]
8.	Gross cropped area	3.23	4.19	3.57	3.66
		[100]	[100]	[100]	[100]

(Figures in the parentheses indicate the percentages to the gross cropped area).

The area under pulses was 5.4, 14.71 and 17.02 per cent of the gross cropped area respectively of pineapple, orange and guava grower categories. The area under other crops such as vegetables, spieces and other fruits crops at the overall leel was 9.29, 1.37 and 1.09 per cent of the gross cropped area, respectively.

4.2.4 Capital assets

The information on capital assets such as land, farm buildings, irrigation structures, machinery and implements and livestock per holding indicates the level of capitl formation in agriculture. For this, the details about the average value of capital assets of the selected fruit growers are presented in Table 4.7.

About 98 per cent of the total value of capital was invested under land in all the three categories. The next important items of capital assets at the overall level were livestock (1.10 per cent), farm building and implements (0.52 and 0.07 per cent). There was no investment in irrigation and machinery.

The value of capital assets, excluding land value constituted only 1.69 per cent of the total capital value at the overall level. The same value for pineapple, orange and guava growers categories were 2 per cent, 1.54 per cent and 1.58 per cent, respectively.

The total capital asset value was the highest in the case of orange orchardist with a value of Rs. 7,16,056.85 followed by guava with Rs. 6,94,291.19 and then by pineapple grower with Rs. 5,87,092.64.

Table 4.7. Per farm capital assets of sample fruit growers

(Rs)

	Asset category	Orchardist category			Overall
		Pineapple growers	Orange growers	Guava growers	
1.	Land	575366.67	705000	683333.33	654566.67
		[98.00]	[98.46]	[98.42]	[98.31]
2.	Farm buildings	3183.33	4516.66	2666.66	3438.88
		[0.54]	[0.63]	[0.39]	[0.52]
3.	Livestock	8023.99	6000.83	7858.72	7294.51
		[1.37]	[0.84]	[1.13]	[1.10]
4.	Implements	568.65	539.36	432.48	513.50
	(no machinery)	[0.10]	[0.07]	[0.60]	[0.07]
5.	Irrigation	NA	NA	NA	-
6.	Total value	587092.64	716056.85	694291.19	665813.56
	(including land)	[100]	[100]	[100]	[100]
7.	Total value	11725.97	11056.85	10957.86	11246.89
	(excluding land)	[2.00]	[1.54]	[1.58]	[1.69]

(Figures in the parentheses indicate the percentages to the total value).

RESULTS AND DISCUSSION

5. RESULTS AND DISCUSSION

Fruit cultivation is usually undertaken by skillful farmers who have an experience and management ability of utilizing the production resources rationally. Fruit crops require lot of personal attention and after care. Fruit plantations are generally taken up on smaller area even by big and progressive cultivators. In general, fruit cultivation is really the feature of small and medium cultivators. A considerable time lag in production is an important limitation for fruit cultivation.

The cultivation of selected fruits for the study viz., pineapple, orange and guava, like other horticultural plantations, involves a sizable amount of expenditure on fixed cost. The farmer has to suffer the loss of raising alternative crops. However, this can be compensated to some extent by having some intercropping during the first 2 years or during the non-bearing stage. Pineapple crop develops fruiting in fourteen months after planting suckers, whereas orange and guava take considerable long period of 6 years to bring income to the farmers and continue to be in good bearing upto twenty five years. In the case of pineapple, the economic productive life is five years after which the size of the fruits gets affected.

In this chapter, an attempt has been made to study the cost of cultivation, the gross income, net profits, marketing channels, marketing cost and margins and constraints in cultivation and marketing of pineapple, orange and guava.

Pineapple, orange and guava all come under perennial crops. For pineapple, the plant starts bearing after fourteen months from planting suckers, while in the case of orange and guava, economic fruiting starts on the seventh year after planting. The orchard has to be nourished from the planting time till it starts bearing fruits. It requires, however, a relatively high investment of capital in the initial stage, that is during the non-bearing years of the establishment of the orchard. The total establishment cost thus for pineapple crop is the total expenditure upto the fourteenth months. And for orange and guava, the net cost of the first year and the cost involved for the subsequent five year constituted the total cost of establishment. The total cost of establishment of these fruit crops needs to be spread over their economic life span of the respective garden. The yearly cost involved in establishment of the respective orchards has been entirely debited to the returns which farmers receive after the orchard starts bearing. In view of this, the cost of cultivation is divided into two parts viz., plantation cost (i.e. establishment cost) and maintenance cost.

5.1 Non-recurring expenditure of orchard plantation (Establishment cost)

During the first year of the plantation, farmers have to incur expenditure on the various items such as jungle clearing and land development, layout preparation, digging out and filling of pits, planting material, interculture operations, manures and fertilizers, plant protection and imputed costs i.e., land revenue and taxes, depreciation and repairs, interest on working capital, rental value of land, etc. It is to be noted that, protective irrigation is not practiced in Nagaland by farmers. Instead, planting

material is usually planted with the onset of Monsoon season. Nagaland has high rainfall distribution area spanning over five to six months in a year. The items of expenditure for the second year are the different intercultural operations such as manuring and fertilizer application, weeding and earthing up, plant protection, training and pruning in the case of orange and guava and all imputed cost.

In order to work out the annualized establishment cost for the three crops, the fixed costs worked out have been apportioned over their respective economic productive life. For pineapple, the economic productive life is considered as five years, while for orange and guava, the fixed costs worked out have been apportioned over twenty-five years. The information relating to operationwise per hectare cost of establishment of different fruit orchards during the initial non-bearing years is presented in Table 5.1.

The table shows the various items of per hectare establishment cost for pineapple, orange and guava in their respective columns. It could be seen from the table that amongst the various items, the most expensive items of the total cost were rental value of land, fertilizer and manure cost, weeding and earthing up, jungle clearing and land development, depreciation, application of fertilizer and manure and plant protection cost. However, the magnitudes of these cost items varied among the different orchards. The number of plants per hectare were 47,442, 270 and 268 in the case of pineapple, orange and guava, respectively.

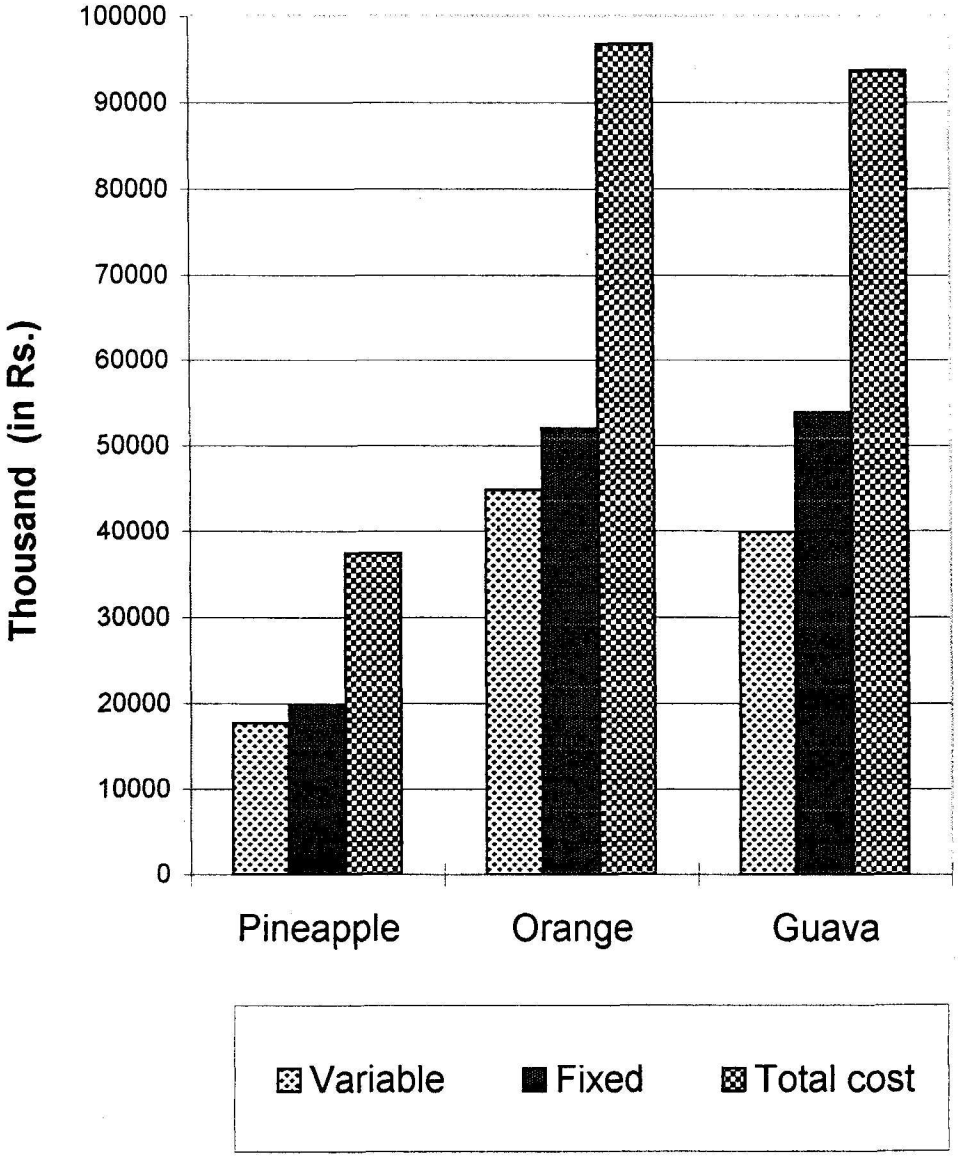
The per hectare cost of establishment of pineapple, orange and guava orchards was worked out to Rs. 37,479.69, 96,774.77 and 93,776.81,

Table 5.1. Per hectare cost of establishment of different fruit orchards

	Items	Pineapple (Rs)	Percentage	Orange (Rs)	Percentage	Guava (Rs)	Percentage
1	Jungle clearing and land development	3637.70	9.71	2302.42	2.38	2242.10	2.39
2	Layout preparation	37.80	0.10	53.93	0.05	95.54	0.10
3	Cost of seedling	765.20	2.04	1350.00	1.39	1340.00	1.43
4	Digging of pit/*digging and planting suckers	*1765.2	4.71	810.00	0.84	804.00	0.86
5	Filling of pit and planting of seedling	-	-	675.00	0.70	670.00	0.71
6	Manure and fertilizer application (*and earthing up)	523.50	1.39	*7261.25	7.50	*6987.99	7.45
7	Weeding (*and earthing up)	*4069	10.86	6949.50	7.18	7112.10	7.58
8	Plant protection	1200.00	3.20	5050.00	5.22	5757.00	6.16
9	Manure and fertilizer cost	3478.00	9.28	11961.00	12.36	8258.00	8.81
10	Training and pruning	-	-	2900.00	3.00	1770.00	1.89
11	Interest on working capital	2166.70	5.78	5503.83	5.69	4907.66	5.23
12	Land revenue and cesses	52.50	0.14	406.50	0.42	427.50	0.46
13	Depreciation and repairs	1250.53	3.34	10111.02	10.45	6156.96	6.57
14	Rental value of land	18083.33	48.25	37800.00	39.06	45024.00	48.01
15	Interest on fixed capital	450.23	1.20	3640.32	3.76	2205.96	2.35
	Total establishment cost	37479.69	100.00	96774.77	100.00	93776.81	100.00
	(a) Apportioned capital cost	7495.94		3871.00		3751.81	
	(b) Annual interest cost	2623.58		6774.25		6564.38	
	Total Annualised Est. cost	10,119.52		10,645.23		10,315.45	

* Indicates operation under respective column

Fig. 2. Establishment cost of pineapple, orange and guava (variable, fixed and total costs)



respectively. Amongst the different items of cost, the imputed cost on rental value of land was the highest for each crop. The amount of this cost for pineapple, orange and guava was Rs. 18,083.33 (48.25 per cent), Rs. 37,800 (39.06 per cent) and Rs. 45,024 (48.01 per cent), respectively. The next important item of cost for pineapple orchard was the weeding and earthing up Rs. 4069 (10.86 per cent). Whereas for orange and guava it was the fertilizer and manure cost amounting to Rs. 11,961 (12.36 per cent) and Rs.8,258 (8.81 per cent), respectively. Jungle clearing and land development was third important cost item for pineapple with Rs. 3637.70 (i.e. 9.71 per cent), but it does not show equal significant percentage in the total cost for orange and guava. Instead depreciation and repairs constituted 10.45 per cent of the total cost for orange orchard and for guava weeding covered 7.58 per cent as third important cost item. The fourth important cost item for pineapple was the manure and fertilizer cost with 9.28 per cent share in the total cost, while the same equally important cost item for orange and guava was the cost incurred on account of fertilizer and manure application. The percentage shares of this cost item in the total cost were 7.50 and 7.45 in the case of orange and guava orchards, respectively. The other variable cost such as layout preparation, cost of seedling, digging and planting of suckers, manure and fertilizer application and plant protection together constituted 11.44 per cent of the total cost in the case of pineapple. Whereas, for orange the other variable cost such as jungle clearing and land development, layout preparation, cost of seedling, digging out and filling of pit and planting of seedlings, weeding and earthing up, training and pruning and plant protection together shared 20.76 per cent of the total cost. For guava, other variable cost together was 13.54

Table 5.2. Resource use structure for cultivation of different fruit orchards

	Resources	Pineapple	Orange	Guava
1	Human labour (days)			
	Male			
	a) Family male labour	50.27	31.31	26.16
	b) Hired male labour	68.4	28.07	30.15
	Total	118.67	59.38	56.31
	Female			
	a) Family female labour	40.62	28.49	21.94
	b) Hired female labour	63.73	31.54	30.24
	Total	104.35	60.03	52.18
2	Manures (qtl)	45.00	25.00	25.00
3	Fertilizer (kg)			
	N	123.00	141.75	121.50
	P	32.00	75.00	64.66
	K	308.00	141.60	122.00
4	Plant protection expenditure (Rs.)	1200.00	1150.00	975.00

different fruit orchards, the per hectare use of male human labour was 118.67 days for pineapple while for orange and guava the use of male human labour was 59.38 and 56.31 days, respectively.The per hectare use of female labour was 104.35, 60.03 and 52.18 days for pineapple, orange and guava respectively. The use of hired and family human labour was mostly of the same magnitude. So also the use of male and female labour was mostly of the same order in all the fruit orchards.

5.2.2 Manures and fertilizers

It could be seen from the table that, the per hectare manure requirement for pineapple was 48 quintals and for orange and guava it was 25 quintals each. The fertilizer consumption per hectare for pineapple was N-123 kg, P-32 kg and K-308 kg, while for orange the requirement was N-141.75, P-75 and K-141.6 kg and for guava the NPK requirement was 121.5, 64.66 and 122 kg, respectively.

5.2.3 Plant protection expenditure

The highest per hectare plant protection expenditure was on pineapple crop with Rs. 1200 per hectare followed by orange with Rs. 1150 and guava with Rs. 975.

5.3 Operationwise labour requirement

It could be seen from the Table 5.3 that weeding and earthing up constitute 57.27 per cent of the total labour requirement for pineapple cultivation, followed by watching and harvesting with 23.30 per cent and manuring and fertilizer application with 19.43 per cent of the total labour

Table 5.3. Operationwise per hectare labour requirement for different orchards

(Man equivalent day)

	Operation	Pineapple				Orange				Guava			
		Human labour											
		Family	Hired	Total	Percentage	Family	Hired	Total	Percentage	Family	Hired	Total	Percentage
1	Manuring and fertilizer application (*earthing up)	17.15	22.14	39.29	19.43	13.72	9.74	*23.46	21.36	10.25	11.48	*21.73	20.65
2	Weeding (*earthing up)	51.36	64.44	*115.8	57.27	15.67	6.21	21.88	19.92	13.66	8.98	22.64	21.51
3	Training and pruning	-	-	-	-	11.34	6.14	17.48	15.92	5.6	2	7.6	7.22
4	Watching and harvesting	14.26	32.84	47.1	23.3	13.38	33.62	47	42.8	14.2	39.08	53.28	50.62
	Total labour	82.77	119.42	202.19	100	54.11	55.71	109.82	100	43.71	61.00	105.25	100
	Percentage to the total labour	40.94	59.06	100		49.27	50.73	100		41.53	58.47	100	

* Indicates operation in respective column

required. Of the human labour used hired human labour composed of nearly 60 per cent. In the case of orange and guava, watching and harvesting constitute the most important labour requirement making upto 42.80 per cent and 50.62 per cent , respectively, of the total labour requirement. Manuring and fertilizer application and earthing up was higher in the case of orange with 21.36 per cent while for guava it was 20.65 per cent. Weeding operation constitute near about 20 and 22 per cent respectively for orange and guava. In the case of training and pruning the labour requirement for orange was twice as high as that of guava. The total man equivalent labour used for orange was 17.48 man days while in the case of guava it was only 7.6 man days. Their contribution to the total were 15.92 per cent and 7.22 per cent respectively for orange and guava. This indicates that training and pruning for orange orchard was more labour intensive as compared to that of guava orchard. The hired labour percentage for the orange and guava were 50.73 and 58.47 per cent. The total man equivalent days required for maintenance of pineapple orange and guava were 202.19, 109.82 and 105.25 man days for pineapple, orange and guava, respectively.

5.4 Per hectare annual cost of cultivation of the selected fruit orchards

The annual cost of cultivation of the selected fruits viz., pineapple, orange and guava includes the fixed cost and the working cost. The cost of production is mainly influenced by the relationship between output and inputs. The yearly expenditure incurred on maintenance of bearing orchard such as utilization of all material inputs, human labour, bullock labour and all imputed costs are included in this cost.

The per hectare annual cost of cultivation of pineapple, orange and guava were worked out by using standard cost concepts. The information on itemwise cost of cultivation of these fruit crops is presented in Table 5.4.

It could be observed that the per hectare annual cost of cultivation of pineapple, orange and guava was worked out to Rs. 47,190.62, Rs. 29,969.19 and Rs. 29,295.23, respectively.

Amongst the different items of cost for the three fruit crops, the most important item in the case of pineapple was the rental value of land constituting 38.22 per cent (Rs. 18,083.33) while the same for orange and guava was the annualized establishment cost which amounted to Rs. 10,645.25 and Rs. 10,315.45 i.e. near about 36 per cent of the cost of cultivation of their respective orchards.

The next important item of cost for pineapple cultivation was the annualised establishment cost with Rs. 10,119.52 which shared 21.44 per cent of the total cost of cultivation while in the case of orange and guava, the rental value of land contributed 21.02 per cent and 25.62 per cent to the total cost of cultivation. The third major item of cost for pineapple and guava was the hired human labour with an amount of Rs, 6,289.75 and Rs. 3,273.30 per hectare i.e. 13.33 per cent and 11.17 per cent respectively, of the total cost. While, the same in the case of orange was the imputed family labour value which contributed 9.50 per cent to the total cost. This was followed by family labour and hired human labour cost items for pineapple and guava and the latter for orange with the shares ranging between 7.83 to 9.41 per cent in the total cost. The cost on account of fertilizers was Rs. 3,170, Rs. 2,509 and Rs.

Table 5.4. Per hectare annual cost of cultivation of pineapple, orange and guava

	Items	Unit	Pineapple			Orange			Guava		
			Unit required	Cost (Rs)	Percentage	Unit required	Cost (Rs)	Percentage	Unit required	Cost (Rs)	Percentage
1	Hired human labour	Days									
	i) Male		68.42	3421.00	7.25	28.07	1403.50	4.68	30.15	1507.50	5.14
	ii) Female		63.73	2868.75	6.08	31.54	1419.30	4.73	39.24	1765.80	6.03
	Total		132.15	6289.75	13.33	59.61	2822.80	9.41	69.39	3273.30	11.17
2	Manures	Qtl.	45.00	650.00	1.38	25.00	375.00	1.25	25.00	375.00	1.28
3	Fertilizers	kg									
	N		123.00	-	-	141.75	-	-	121.50	-	-
	P		32.00	3170.00	6.72	75.00	2509.00	8.37	64.66	2149.00	7.34
	K		308.00	-	-	141.60	-	-	122.00	-	-
4	Plant protection		-	1200.00	2.54	-	1150.00	3.84	-	975.00	3.33
5	Land revenue and cesses		-	52.50	0.11	-	67.75	0.23	-	71.25	0.24
6	Interest on working capital		-	1583.36	3.36	-	959.95	3.20	-	948.12	3.24
7	Depreciation and repairs		-	1250.53	2.65	-	1685.17	5.62	-	1021.16	3.49
8	Annualized Est. cost		-	10119.52	21.44	-	10645.25	35.52	-	10315.45	35.21
	Cost "A"		-	24315.66	51.53	-	20214.92	67.45	-	19128.28	65.30
9	Rental value of land		-	18083.33	38.32	-	6300.00	21.02	-	7504.00	25.62
10	Interest on fixed capital		-	450.23	0.95	-	606.72	2.03	-	367.65	1.25
	Cost "B"		-	42849.22	90.80	-	27121.64	90.50	-	26999.93	92.17
11	Family labour										
	i) Male		50.27	2513.50	5.33	31.31	1565.50	5.22	26.16	1308.00	4.46
	ii) Female		40.62	1827.90	3.87	28.49	1282.05	4.28	21.94	987.30	3.37
	Total		90.89	4341.40	9.20	59.80	2847.55	9.50	48.10	2295.30	7.83
	Cost "C"		-	47190.62	100.00	-	29969.19	100.00	-	29295.23	100.00

2,149 for pineapple, orange and guava respectively. This cost contributes 6.72 per cent, 8.37 per cent and 7.34 per cent of the total cost for pineapple, orange and guava cultivation, respectively. Whereas, the share of depreciation and repairs was 2.65 per cent 5.62 per cent and 3.49 per cent of the total cost of cultivation of respective fruit crops. The remaining cost items such as cost on account of manures, plant protection, land revenue and cess, interest on working capital and interest on fixed cost together constituted 8.34 per cent, 10.55 per cent and 9.34 per cent of the total cost respectively, of pineapple, orange and guava. The per hectare cost 'A' was worked out to be Rs. 24,315.66 (51.53 per cent), Rs. 20,214.92 (67.45 per cent) and Rs. 19,128.28 (65.30 per cent) for cultivation of pineapple, orange and guava respectively. The cost 'B' for the different fruit crops ranged between 90.50 to 92.17 per cent of the total cost.

The highest per hectare annual total cost i.e. (cost 'C') amongst the three crops was observed for pineapple orchard with Rs. 47,190.62 followed by orange with Rs. 29,969.19 and then by guava with Rs. 29.295.23.

Moreover, similar trend of per hectare cost of cultivation at different cost levels as well as itemwise cost was observed among the selected fruit crops. It could be revealed from the above discussion that pattern of cost on various items of cost of cultivation of orange and guava was more or less, the same. The reason for higher expenditure on the cost of cultivation for pineapple as compared to orange and guava was mainly due to the higher inputs requirements, such as, labour and fertilizers and the high rental value of land which was due to steep price of land value for plain region.

5.5 Returns from selected fruit orchards

An attempt has been made here to compare the per hectare yields of pineapple, orange and guava along with cost of production, marketing cost, gross income, and net profit in respect of these fruits. The details in this respect are given in Table 5.5. It can be seen that the per hectare total yield obtained was the highest in the case of pineapple with 542.50 quintals followed by guava with 75.04 quintals and orange with 37.80 quintals. The gross income received from these fruit crops was observed to be Rs. 1,35,625, Rs. 56,700 and Rs. 60,032 from pineapple, orange and guava orchards, respectively. The gross returns also depicted the similar trend as that of per hectare yield.

The per hectare total cost i.e. cost 'C' was the highest in pineapple (Rs. 47,190.62) followed by orange (Rs. 29,969.19) and guava (Rs. 29,295.23). The pineapple orchard growers received the highest per hectare gross income followed by guava and orange. The per hectare net profit at cost 'A' for pineapple was Rs. 1,11,309.34 while for orange and guava it was Rs. 36,485.08 and Rs. 40,903.72. The per hectare net profit at cost C was the highest in pineapple (Rs. 88,434.38) followed by orange (Rs. 26,730.81) and guava (Rs. 30,736.77).

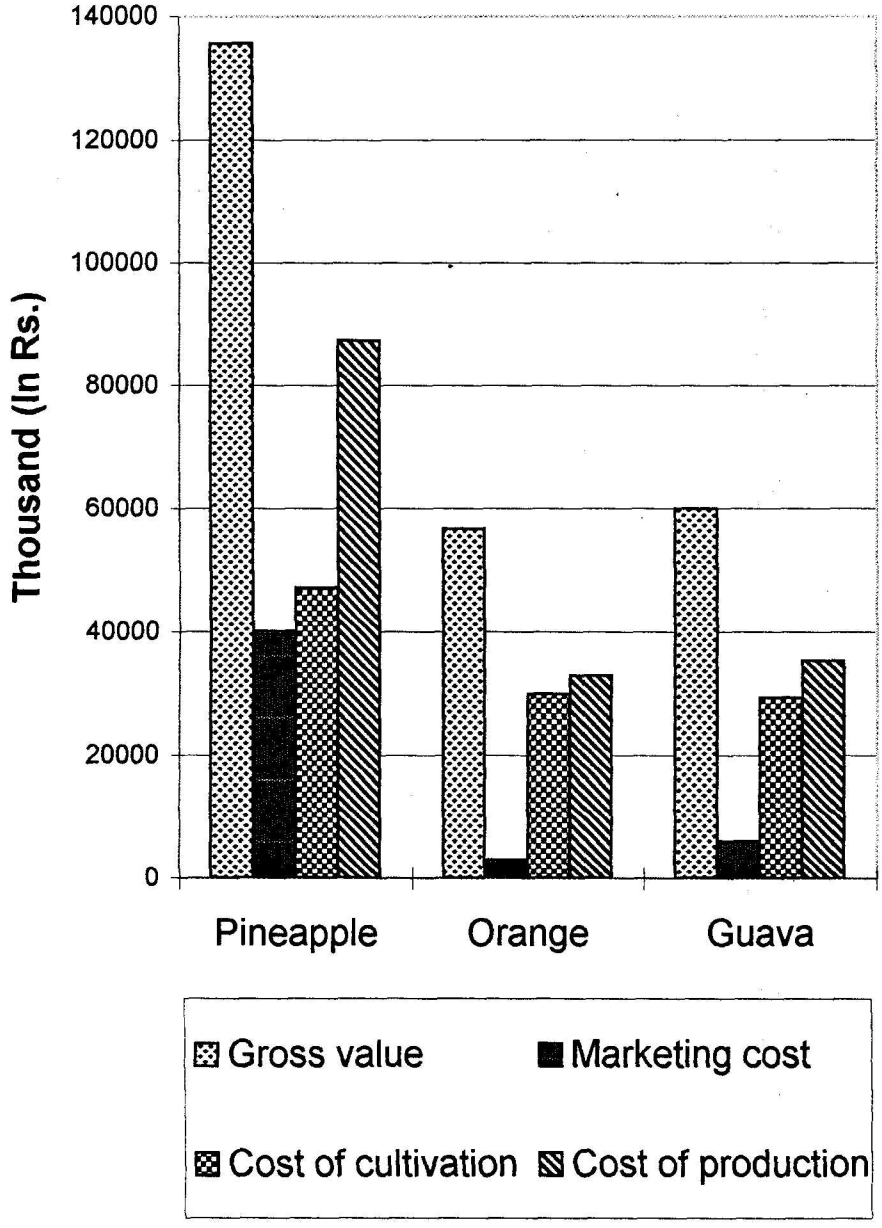
The total marketing cost worked out to Rs. 40,145, Rs. 3,061.80 and Rs. 6,078.24 per hectare for pineapple, orange and guava, respectively. The highest marketing cost was observed in the case of pineapple followed by guava and then orange. Pineapple recorded the highest total cost of production on per hectare basis with Rs. 87,335.62 followed by guava with

Table 5.5. Per hectare cost, returns and net returns of different orchard category

(Rs.)

Items	Pineapple	Orange	Guava
1 Yield (q)	542.50	37.80	75.04
2 Gross value	135625.00	56700.00	60032.00
3 Costs			
Cost "A"	24315.66	20214.92	19128.28
Cost "B"	42849.22	27121.64	26999.93
Cost "C"	47190.62	29969.19	29295.23
4 Profit at			
Cost "A"	111309.34	36485.08	40903.72
Cost "B"	92775.78	29578.36	33032.07
Cost "C"	88434.38	26730.81	30736.77
5 Cost of cultivation (i.e. Cost "C")	47190.62	29969.19	29295.23
6 Marketing cost	40145.00	3061.80	6078.24
7 Total cost of production (5 + 6)	87335.62	33030.99	35373.47
8 Per quintal cost of production	166.69	873.83	471.39

Fig. 4. Per hectare cost production



Rs. 35,373.47 and then by orange with Rs. 33,030.99. The increase in the total production cost of guava was mainly due to increase in the marketing cost as compared to orange. The lowest per quintal cost of production was Rs. 166.99 for pineapple followed by Rs. 471.39 for guava and the highest was Rs. 873.83 for orange.

5.6 Production function analysis

The relationship between the output of pineapple, orange and guava and the different factors determining the output such as human labour, fertilizer and manure, plant protection and other working capital has been examined with the help of Cobb-Douglas type production functions fitted to the sample data separately for the three fruit crops for the year 1994-95. The details regarding specification of the model and measurement of the variables have already been discussed under methodology. The results of the estimated production functions are presented in Table 5.6 in respect of elasticities of production, standard errors of regression coefficients, their significance and coefficients of multiple determination (R^2) along with 'F' statistic.

The fitted production function was of the following type.

$$Y = a X_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} \ldots\ldots e^u$$

where,

Y = Yield (qtls.)/hectare

X_1 = Area under fruit crop (hectares)

X_2 = Value of human labour (Rs.)

X_3 = Value of fertilizer cost (Rs.)

X_4 = Value of plant protection (Rs.)

Table 5.6. Regression coefficient standard error and coefficient of multiple determination for different fruit crops production

Crop	Intercept/ constant	Area under crop (ha) X_1	Human labour cost (Rs.) X_2	Fertilizer and manure cost (Rs.) X_3	Plant protection expenditure (Rs.) X_4	Other working capital (Rs.) X_5	R^2	'F' value
Pineapple	0.4389	NS 0.1890 [1.1514]	NS 1.3937 [1.1422]	NS 0.0276 [0.2740]	*** - 0.5744 [0.2270]	NS - 0.0377 [0.0680]	0.9852	*** 317.36
Orange	3.3132	*** 0.9221 [0.2792]	NS 0.1086 [0.1583]	NS - 0.1726 [0.1752]	NS 0.0768 [0.0598]	NS 0.0517 [0.0616]	0.9925	*** 635.2
Guava	4.5246	*** 1.1675 [0.2986]	NS 0.0048 [0.1498]	NS - 0.0889 [0.1646]	NS - 0.1019 [0.1497]	NS - 0.0150 [0.0580]	0.9418	*** 77.71

X_5 = Other working capital (Rs.)

a = Constant

bi's = Elasticities of production of respective resource categories

e^u = Error term

The value of coefficient of multiple determination was estimated at 0.9852, 0.9925 and 0.9418 in the case of pineapple, orange and guava production functions, respectively. The five resource categories together explained 98.52 per cent 99.25 per cent and 94.18 per cent of the variation in the output in the case of pineapple, orange and guava, respectively.

The critical examination of the production elasticities and their standard errors revealed that most of the production elasticities (i.e. regression coefficients) of the included resource variables turned out to be non-significant. The only exception was of production elasticities of area under orange and guava and plant protection expenditure in pineapple where they turned out to be highly significant. Furthermore, out of the two-fifth of the production elasticities turned out to be negative.

It was thought that most of the resource variables might have been highly correlated with a single variable input i.e. area under the crop. This poses the problem of existence of multicollinearity among the resource variables. To overcome this problem the original data series of output and non-land resource variables were transformed on per hectare basis and the multiple regression analysis was attempted to obtain estimates of production functions. The results of these production functions are presented in Table 5.7.

The fitted production function was of the following type.

$$Y = a X_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} \ldots\ldots e^u$$

where,

Y = Yield (qtls.)/hectare

X_1 = Value of human labour (Rs.)

X_2 = Value of fertilizer cost (Rs.)

X_3 = Value of plant protection (Rs.)

X_4 = Other working capital (Rs.)

a = Constant

bi's = Elasticities of production of respective resource categories

e^u = Error term

The value of coefficient of multiple determination indicated that the four resources together explained 31.79 per cent, 15.66 per cent and 3.97 per cent of the total variation in the output of pineapple, orange and guava production activity, respectively.

The regression coefficient of the human labour (X_1) resource variable was positive and significant at 10 per cent level in the production function of pineapple, indicate little scope to increase labour for production of the crop. The production elasticities of human labour in the case of orange and guava were positive but non-significant indicating thereby little scope to increase usage of human labour in the production of these fruit crops.

The regression coefficient of expenditure on fertilizers (X_2) was positive and non-significant for pineapple while it was negative but non-significance for orange and guava.

The regression coefficient of expenditure on plant protection (X_3) was negative but non-significant for pineapple and guava while it was positive and significant only at 10 per cent level for orange.

The regression coefficient of expenditure on other working capital (X_4) was negative and non-significant for pineapple and it was positive and non-significant for guava.

In the Cobb-Douglas type of production function frame work, the (standard error) regression coefficients of the individual resource variables are also production elasticities which indicate percentage change in the dependent variable associated with one per cent change in the concerned resource variable, other resource variables remaining unchanged. The production elasticities of human labour were therefore, 1.1021, 0.1558, 0.1477 for pineapple, orange and guava respectively. For the fertilizers cost it was 0.2685, 0.1736 and 0.1401, respectively. The same of plant protection for pineapple, orange and guava was 0.2197, 0.0592 and 0.1417, respectively and for other working capital for pineapple it was 0.0665, orange 0.0602 and for guava 0.0569.

At the overall level the 'F' value turned out to be non-significant for the estimated production functions for all the three fruit crops.

In effect, the agriculture in Nagaland is quite backward compared to the one observed in some other States of Indian Union. Especially, the use of new production technologies and resource inputs in the production of horticultural crops is at a lower level. Furthermore, there were wide variation in the use of different resouces for the selected fruit crops among the sample farms. This has ultimately resulted into lower values of regression coefficients and higher values of their standard errors. The results, therefore, need not be used for the purposes of working out estimates of optimal use levels for different resources.

5.7 Marketing of pineapple, orange and guava

Production of any farm commodity is said to be completed when it reaches the hands of the consumers. Marketing, therefore, is a part of production activity. The various services such as packaging, grading, standardization, assembling, transportation, etc., are the activities of marketing and are performed by various marketing agencies at different stages.

It is said that "Indian farmer is a good producer but a bad businessman". He does not know how and when to market the produce. Because of this reason, many a times he suffers from low returns. The ultimate success of any enterprise largely depends upon the efficiency with which the final product is marketed. It is not the quantum of production but the speed and efficiency with which marketing takes place that decides the profitability in agriculture.

The nature of agricultural product being seasonal, they pose a number of problems in landing, transporting and marketing. Besides, the bulkiness of the agricultural products increases the expenditure on transportation. The marketing efficiencies of the perishable commodities depend upon the rapidity with which they can be transported to the large consuming market centres. In specialized farming, the producer who is in a position to adjust his production with the market demand, reaps the maximum benefit. But if the cultivators are unable to adjust their production pattern in accordance with the market demand, there can be no appreciable gains or profit with good harvest.

The marketing of agricultural products, in general, and marketing of fruits and vegetable, in particular, is confronted with many problems. Large quantities of fruits are seldom stored and processed. Naturally they are required to be sold immediately after harvest. This has a considerable impact on the producer's share in the consumer's rupee. In view of these peculiarities of agricultural produce observed in the production of pineapple, orange and guava, an attempt has been made to study in detail their marketing arrangements in Nagaland State.

5.7.1 Marketing practices followed in the marketing of pineapple, orange and guava in Nagaland State

The information regarding the practices and procedures of marketing in the Nagaland State for the selected fruits has been described briefly in the subsequent paragraphs.

The harvesting of these fruits is followed in sequences to one another. The harvesting of pineapple begins from the month of June and continues upto the month of August. The harvesting of guava begins from the month of September and goes upto November, while orange harvesting commences from the month of October and continues till the end of December. After picking, the fruits are brought to the farm houses for collection or taken to the market directly for sell. For small size growers, the harvested fruits are carried to home by headload and are personally taken to market for sell. None of the fruit growers interviewed graded their produce. Majority of the pineapple growers felt that there the grading of their produce will not make any difference as far as price gain is concerned. For orange and guava, the majority felt that if produce is graded then the smaller sized fruits will remain unsold. Harvested fruits are mostly transported through headload in Naga bamboo basket. For larger quantity, fruits are usually put in jute sack and are transported through buses or trucks. Farmers do not use any advanced packaging material while transporting their produce to the market.

5.7.2 Production and disposal of pineapple, orange and guava

The information relating to per hectare production and disposal of pineapple, orange and guava is presented Table 5.8.

The total quantity of pineapple, orange and guava produced was 542.50, 37.80 and 75.04 quintals per hectare, respectively, of which the total quantity marketed was 491.67, 35.84 and 69.59 quintals. The quantity used for consumption and gratis was in the range of 2.34 to 4.80 per cent of the total production of the different fruit categories. The proportion of infested

Table 5.8. Per hectare production and disposal of different fruits

	Items	Pineapple		Orange		Guava	
		Quantity (qtls)	Percentage	Quantity (qtls)	Percentage	Quantity (qtls)	Percentage
1	Quantity produced	542.50	100.00	37.80	100.00	75.04	100.00
2	Quantity used for consumption and gratis	12.69	2.34	1.35	3.56	3.60	4.80
3	Infested quantity by pest and diseases	38.14	7.03	0.61	1.62	1.85	2.46
4	Net quantity sold (ungraded)	491.67	90.63	35.84	94.82	69.59	92.74

quantity of fruits by pest and diseases was observed to be the highest in the pineapple with 7.03 per cent followed by guava with 2.46 per cent while for orange it was as low as 1.62 per cent. The proportion of the total quantity of fruits sold in the market was the highest in orange followed by guava and pineapple with 94.82 per cent, 92.74 per cent and 90.63 per cent, respectively.

5.7.3 Method of sale

Most of the growers have the practice of sending the produce directly to the district and State capital. There they either sell their produce themselves during the day or dispose of their produce directly to retailers in whole lot. Since there are no regulated markets in the State, retailers and few wholesalers play important role in marketing of these fruits, especially for long distance markets. Comparatively, the marketing of pineapple was much better of as compared to orange and guava. The pineapple cultivation is mostly concentrated in Medziphema area through which the National Highway No. 39 passes through the region. The area of this pineapple cultivation lies in between and is equal distance from both Kohima, State capital and Dimapur, the most important commercial Town in Nagaland. Having this strategic position, the fruits are either sold at roadside stall or are transported to other markets. They are also sold during weekly market days.

5.7.4 Marketing channels of selected fruits

The consumers always prefer the consumption of fresh fruits. In order to satisfy the consumers at different locations, it becomes necessary to reach the fruits to the marketing centres as quickly as possible. This mostly

depends on the type of the marketing channel adopted and its efficiency. In this section, an attempt has been made to understand various types of marketing channels involved in marketing of pineapple, orange and guava in the State.

The selected fruit growers sell their produce to the consumers through four channels.

Channel I Producer → Consumer

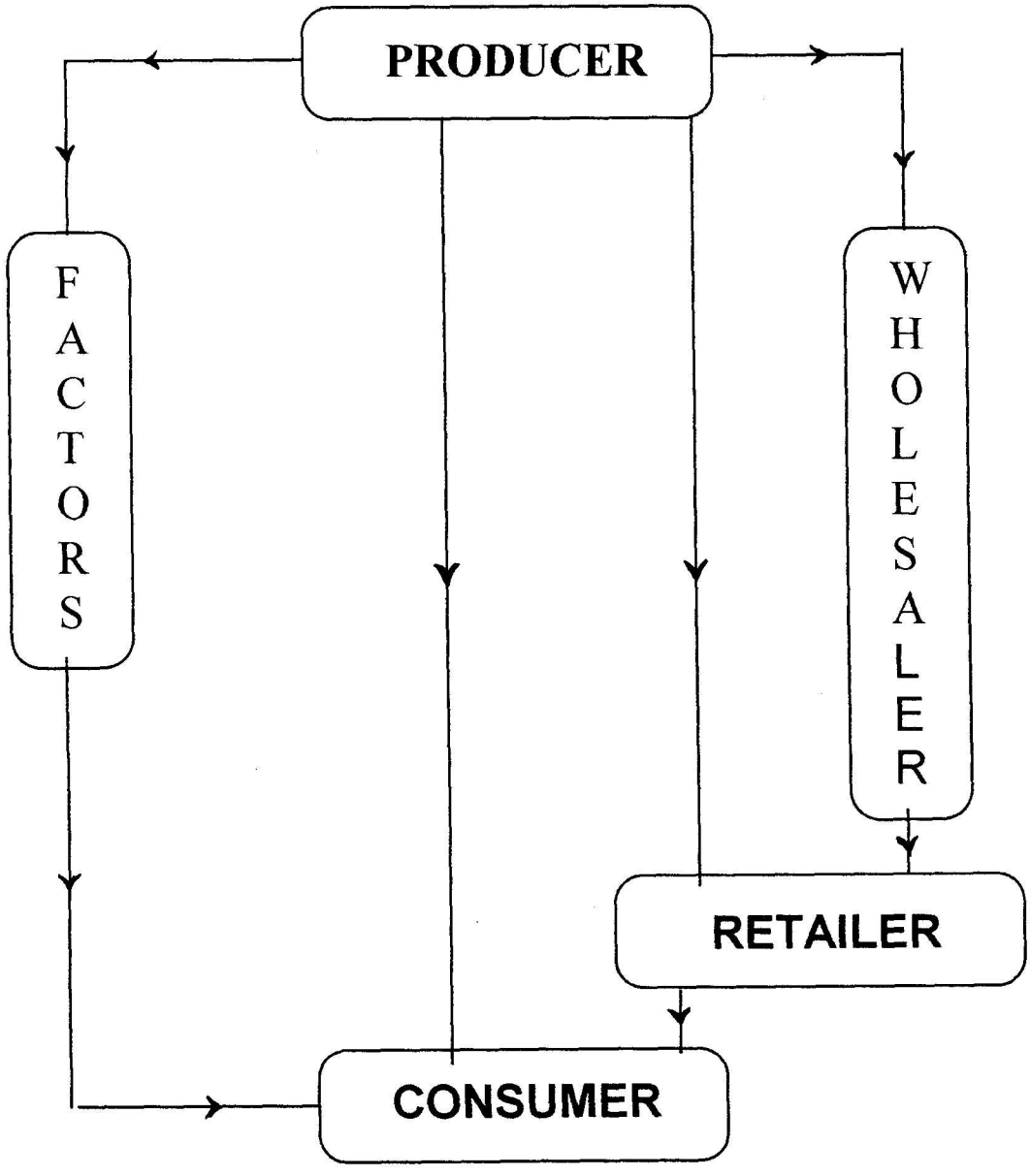
Channel II Producer → Retailer → Consumer

Channel III Producer → Factor→ Consumer

Channel IV Producer → Wholesaler → Retailer → Consumer

The first and the third channels are mostly followed for local and short distance consuming centres while the second channel is opted for short as well as long distance markets. The fourth channel is usually adopted for long distance markets. The third channel is a peculiar type of marketing channel observed in Nagaland. Here the factor collect the produce from the producer for sale in the market. He avoid taking the ownership title of the goods. He tries to sell the produce at his discretion price. However, the unsold produce will be returned back to the producer. For his service for the sale of the produce, a service charge will be paid to him by the producer. Here the returns for both the parties depend on the integrity of the individuals and the close relationship they enjoy with each other.

Fig. 5. Marketing channels of selected fruit produce



5.7.5 Quantity sold through different channels

The total quantity sold by the respective fruit growers through different channels has been given in Table 5.9.

The total quantity of pineapple fruits sold through different marketing channels was 491.67 quintals. Of this total quantity, 50 per cent (245.84 quintals) was sold through the second channel, 27 per cent (132.74 quintals) through the fourth channel, 20 per cent through the first channel and only 3 per cent through the third channel. In the case of orange, the total quantity of 35.84 quintals was sold through the four different channels. The highest proportion quantity sold was in the second channel with 40 per cent (14.34 quintals) followed by the fourth channel with 27 per cent, first channel with 23 per cent and the third channel with 10 per cent. The total quantity of guava sold in different channels was 69.59 quintals. Of the total, the proportion of fruits sold through second, first, third and fourth channels were 47, 22, 16 and 15 per cent, respectively.

Mostly, the channel, Producer-→Retailer→Consumer was followed channel for marketing of the fruits. The second most important channel for pineapple and orange was the Producer→ Wholesaler→ Retailer→ Consumer while for guava it was the first channel i.e. Producer→ Consumer. The third important channel for pineapple and orange was the first channel followed by the third channel. While for guava the same was the fourth channel i.e. Producer→Wholesaler→Retailer→Consumer followed by Producer→Factor→Consumer.

Table 5.9. Quantity sold through different channels

Crop	Quantity sold (qtl)	Types of channel			
		I	II	III	IV
Pineapple	491.67	98.34	245.84	14.75	132.74
		[20.00]	[50.00]	[3.00]	[27.00]
Orange	35.84	8.24	14.34	3.58	9.68
		[23.00]	[40.00]	[10.00]	[27.00]
Guava	69.59	15.32	32.70	11.13	10.44
		[22.00]	[47.00]	[16.00]	[15.00]

(Figures in parentheses indicate the percentages to quantity sold).

5.7.6 Channelwise per quintal marketing cost

An attempt has been made to work out the itemwise and channelwise per quintal cost of marketing of the selected fruits in different markets and the details of the same are presented in Table 5.10.

Among the different items of marketing cost, the cost on transport charges was the major item. It constituted about 40 to 60 per cent of the average marketing cost in different channels. The other items added to the marketing cost were cost on packaging material, packing and loading charges, unloading charges and town committee charges.

In channel I, the average total per quintal marketing cost for pineapple, orange and guava was Rs. 143.54, Rs. 86.72 and Rs. 101.14, respectively. In the case of pineapple, the major marketing cost was due to transport charges with 41.97 per cent share followed by packaging cost with 20.90 per cent share in the total cost. For orange and guava, the major marketing cost was on account of transport charge with 58.41 and 64.90 per cent respectively. Unloading charges constituted the second important cost with the share of 23.06 per cent for orange and 19.77 per cent for guava. In this channel, the highest per quintal marketing cost was observed in the case of pineapple with Rs. 143.54 followed by guava with Rs. 101.14 and orange with Rs. 86.72.

In channel II, the per quintal marketing cost was observed to be the highest for guava followed by orange and lastly by pineapple with the marketing cost of Rs. 154.69, Rs. 137.53 and Rs. 115.86, respectively. The per quintal cost of marketing for pineapple was lower in the channel II as

Table 5.10. Channelwise per quintal marketing cost

	Items	Channel-I			Channel-II			Channel-III			Channel-IV		
		Pineapple	Orange	Guava	Pineapple	Orange	Guava	Pineapple	Orange	Guava	Pineapple	Orange	Guava
1	Packaging cost	30.00	-	-	35.00	15.00	15.00	30.00	16.00	18.00	32.20	18.90	29.96
		[20.90]			[30.51]	[10.91]	[9.70]	[30.62]	[21.62]	[23.68]	[12.83]	[8.73]	[12.24]
2	Packing/loading cost	25.20	8.00	7.50	15.13	26.07	30.95	10.00	-	-	54.48	58.00	68.34
		[17.56]	[9.22]	[7.42]	[13.06]	[18.95]	[20.01]	[10.20]			[21.72]	[26.79]	[27.91]
3	Transport charges	60.24	50.72	65.64	44.63	68.46	70.74	40.00	50.00	50.00	110.20	106.40	107.52
		[41.97]	[58.49]	[64.90]	[38.52]	[49.78]	[45.73]	[40.82]	[67.57]	[65.79]	[43.93]	[49.24]	[43.92]
4	Unloading charges	20.10	20.00	20.00	13.10	20.00	30.00	10.00	-	-	46.00	25.00	31.00
		[14.00]	[23.06]	[19.77]	[11.31]	[14.54]	[19.39]	[10.20]			[18.33]	[11.54]	[12.66]
5	Town committee tax	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
		[5.57]	[9.23]	[7.91]	[6.90]	[5.82]	[5.17]	[8.16]	[10.81]	[10.53]	[3.19]	[3.70]	[3.27]
	Total	143.54	86.72	101.14	115.86	137.53	154.69	98.00	74.00	76.00	250.88	216.5	244.82
		[100.00]	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]
Average price/Qtl		500	1600	900	425.64	1500.74	800.18	-	-	-	300.05	1400.15	750.54

(Figure in the parentheses indicate percentages to total cost)

Fig. 6. Channelwise marketing cost and net price realised by pineapple producer

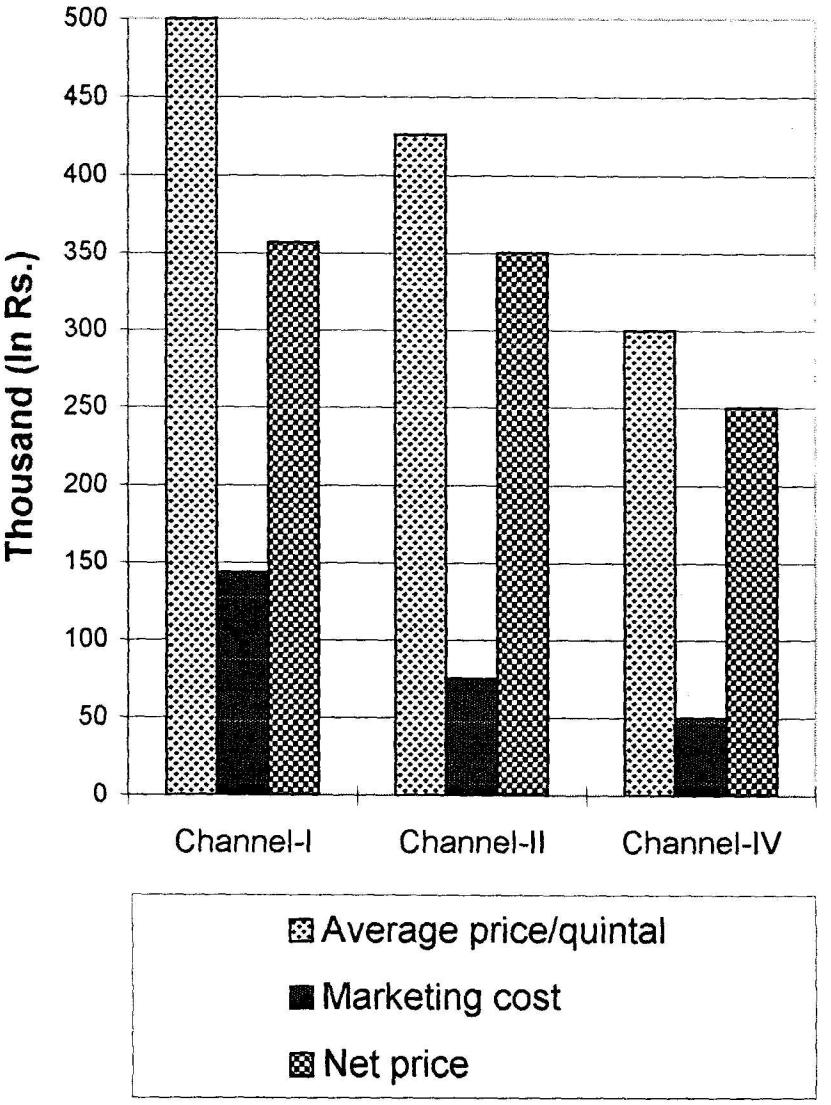


Fig. 7. Channelwise marketing cost and net price realised by orange producer

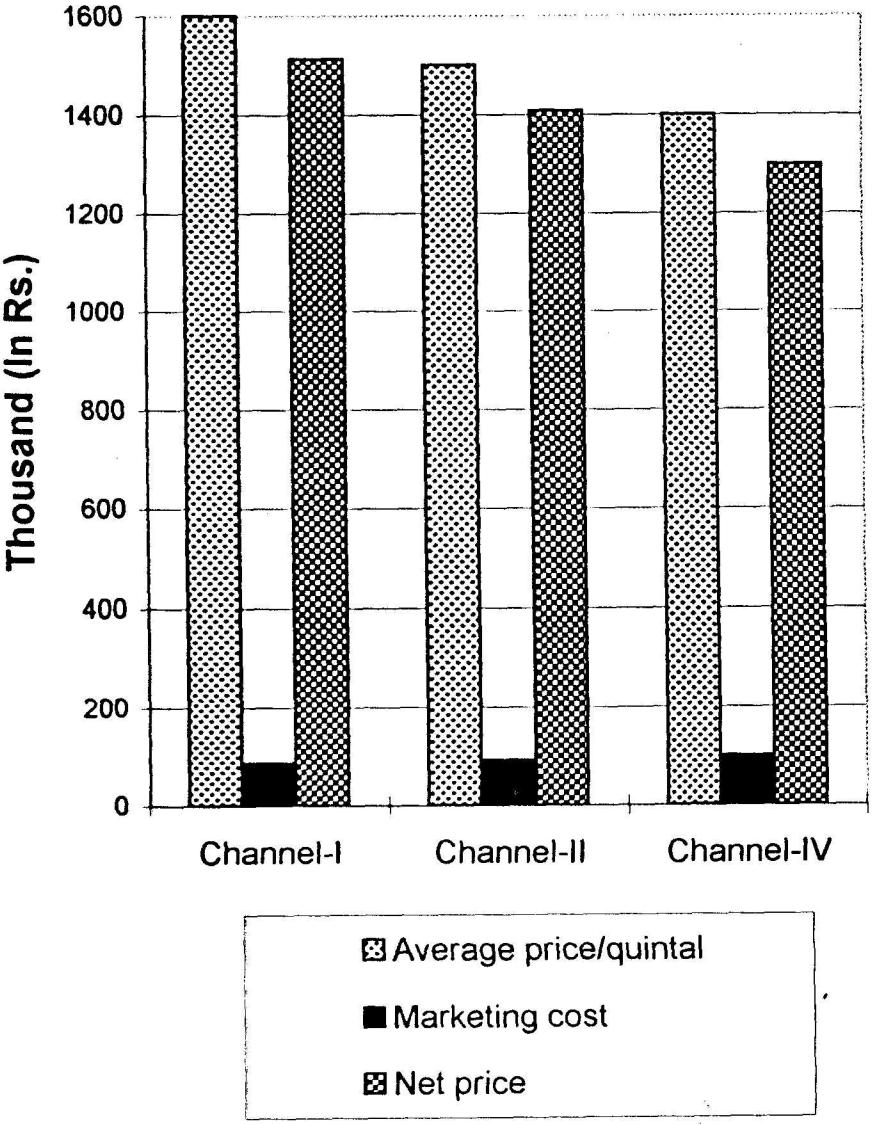
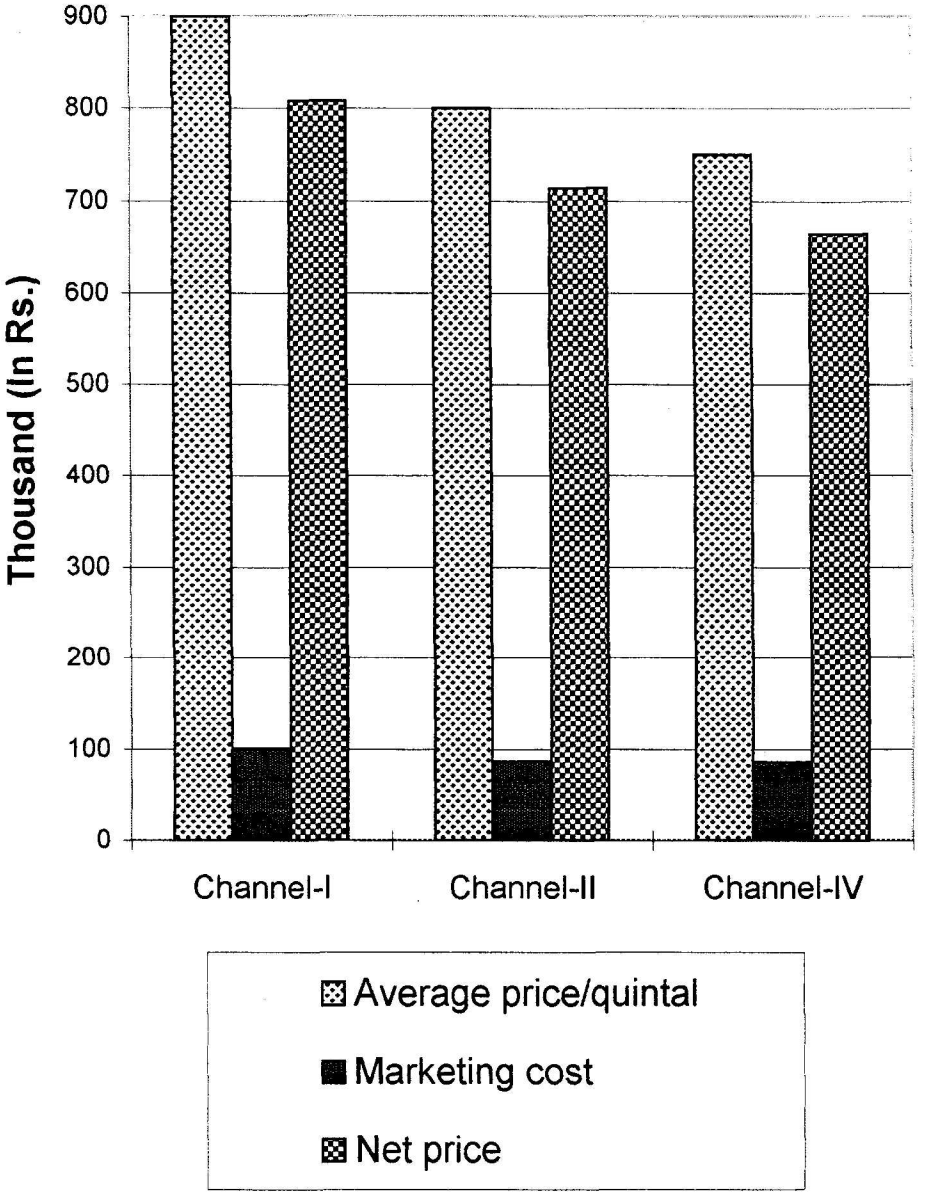


Fig. 8. Channelwise marketing cost and net price realised by guava producer



compared to the channel I, while it was more expensive for orange and guava in the same channel mainly due to cost on account of packaging materials.

In channel III, the per quintal marketing cost for pineapple, orange and guava was Rs. 98, Rs. 74 and Rs. 76, respectively. The per quintal marketing cost in this channel was the lowest of all the channels. The lower cost was mainly due to small quantity handled by the factors for which the labour charges were eliminated.

In the fourth channel, the per quintal marketing cost was the highest for all the three fruits. The per quintal marketing cost for pineapple, orange and guava was Rs. 250.88, Rs. 216.50 and Rs. 244.82, respectively. The costs on account of packing and loading cost, transporting charges and unloading charges have pushed up the marketing cost in this channel.

5.7.7 Price spread

Price spread is the difference between the price paid by the consumer and the price received by the producer for a unit quantity of farm produce. It consists of the marketing cost and margins of the intermediaries which ultimately determine the overall efficiency of marketing system.

The price spread is made up of various costs incurred and margins of intermediaries in the various marketing processes such as assembling, transport, wholesale, retailing, etc. Since the bulk of the produce was sold through channel I, II and IV, the shares of the producer in consumer's rupee in the case of pineapple, orange and guava in Kohima and

Dimapur markets through these channels have been estimated and the results obtained are presented in Table 5.11.

The per quintal consumers' price (retail price) of pineapple was Rs. 500 in channel I, Rs. 600 in channel II and Rs. 700 in channel IV. The expenses incurred by the producer was to the extent of 28.71, 12.54 and 7.14 per cent of the consumers' price in channel first, second and fourth, respectively. The producers net share in the consumers rupee was worked out to 71.29, 58.40 and 35.72 per cent in channel first, second and fourth, respectively. The producers' net share in the consumer rupee was quite low in the fourth channel as compared to the first and second channels. The reasons were, (i) expenses incurred on transportation were higher because of longer distance and (ii) increased labour charges as produce moved from one middleman to another. The higher producer's share in the consumer's rupee in channel I was mainly attributed to produce being not sent through the middleman even though the per quintal marketing cost was higher than the marketing cost in channel II. This is due to the reason that in the first channel lesser quantity was handled for disposal at a time leading to increase in transport and labour cost. The proportion of wholesaler's margin in channel IV was 10.74 per cent of the consumer's price. While the share of retailers in consumer's rupee was 22.29 and 17.70 per cent in channels second and fourth, respectively. Thus, about 41.60 and 64.28 per cent of the consumer's price was swallowed by the market intermediaries in channel second and fourth, respectively, in the marketing of pineapple.

The per quintal consumer's price (retail price) of orange was Rs. 1600, Rs. 1900.00 and Rs. 2350.00 in channel first, second and fourth,

Table 5.11. Price spread of different fruit crops in Channel-I, II and IV

Items	Channel-I			Channel-II			Channel-IV		
	Pineapple (Rs)	Orange (Rs)	Guava (Rs)	Pineapple (Rs)	Orange (Rs)	Guava (Rs)	Pineapple (Rs)	Orange (Rs)	Guava (Rs)
1 Price received by the producer	500.00	1600.00	900.00	425.64	1500.74	800.18	300.05	1400.15	750.54
	[100.00]	[100.00]	[100.00]	[73.38]	[78.99]	[82.07]	[42.86]	[59.58]	[75.05]
a) Expenses incurred by the producer	143.54	86.72	101.14	75.23	92.19	86.54	50.00	100.40	86.26
	[28.71]	[5.42]	[11.24]	[12.54]	[4.85]	[8.86]	[7.14]	[4.27]	[8.62]
b) Net price realised by the producer	356.46	1513.28	798.85	350.41	1408.55	713.64	250.05	1299.75	664.28
	[71.29]	[94.58]	[88.76]	[58.40]	[74.13]	[73.19]	[35.72]	[55.31]	[66.43]
2 Wholesaler's price	-	-	-	-	-	-	545.84	1850.70	864.50
a) Expenses incurred by the wholesaler	-	-	-	-	-	-	170.64	65.95	84.46
							[24.38]	[2.81]	[8.45]
b) Wholesaler's margin	-	-	-	-	-	-	75.15	384.60	29.50
							[10.74]	[16.37]	[2.95]
3 Retailer's price	-	-	-	600.00	1900.00	975.00	700.00	2350.00	1000.00
a) Expenses incurred by the retailers	-	-	-	40.63	45.34	38.15	30.24	50.15	74.10
				[6.77]	[2.39]	[3.91]	[4.32]	[2.13]	[7.41]
b) Retailers margin	-	-	-	133.73	353.92	136.67	123.92	449.15	61.40
				[22.29]	[18.63]	[14.02]	[17.70]	[19.11]	[6.14]
4 Price paid by the consumer	500.00	1600.00	900.00	600.00	1900.00	975.00	700.00	2350.00	1000.00
	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]	[100.00]

(Figures in the parentheses indicate percentages to the total price paid by the consumer

respectively. The expenses incurred by the producer shared 5.42 per cent of the consumer's price in channel I, 4.85 per cent in channel II and 4.27 per cent in channel IV. The producer's share in the consumer's rupee was worked out to 94.58, 74.13 and 55.31 per cent in channel first, second and fourth, respectively. The low share of producers in the consumer's rupee in channel fourth was due to long distance transportation cost and the higher market intermediary charges. The higher producer's share in the consumer's rupee in channel I was mainly due to less expenditure on transportation, no expenses on packaging material and absent of middleman service charges. The share of wholesaler's margin in the consumer's rupee in channel IV was 16.37 per cent. The retailer's shares in consumer's rupee was 18.63 and 19.11 per cent in channel second and fourth respectively. Thus, the share of intermediaries in consumer's rupee in channel IV was as high as 35.48 per cent.

For the guava fruit, the per quintal consumer's price was Rs. 900 in channel I, while it was Rs. 975 and 1000 for channel II and IV. The producer expenditure in marketing of the produce was to the extent of 11.24, 8.86 and 8.62 per cent of the consumer's price in channel I, II and IV, respectively. The share of the producer in consumer's rupee was 88.76 per cent in channel I , 73.19 per cent in second channel and 66.43 per cent in fourth channel. Here the producer's share in consumer's rupee was comparatively higher than that of pineapple and orange fruits for the same channel. But the wholesaler's margin (2.95 per cent) and retailer's margin (6.14 per cent) were very low. This less incentive to wholesaler and retailer has made this channel unattractive to market intermediaries.

In channel I, the producer's share in the consumer's price was the highest in the case of orange with 94.58 per cent share followed by guava and pineapple with 88.76 per cent and 71.29 per cent, respectively. This channel gave the highest incentive to fruit producers. While in the channel II, the net price realized by pineapple producer was lower i.e., 58.40 per cent whereas for orange and guava, the producer's share in consumer's price was about 74 per cent. In the case of channel IV, the producer's share in consumer's price was 35.72, 55.31and 66.43 per cent for pineapple, orange and guava, respectively. Thus, it calls for the efforts to be made in order to increase the producer's share in the consumer's rupee in the fourth channel for all the fruits. While in channel II, the producer's share needs to be increased in the case of pineapple.

5.8 Supply-price relationship analysis in respect of pineapple, orange and guava

The supply-price relationship analysis in respect of pineapple, orange and guava was not attempted for want of data due to absence of any regulated market in the State.

5.9 Per hectare profitability of pineapple, orange and guava production

An attempt has been made to compare the per hectare profitability of production for pineapple, orange and guava fruit crops. The details in this respect are given in Table 5.12.

Fig. 9. Per hectare profitability of pineapple, orange and guava production

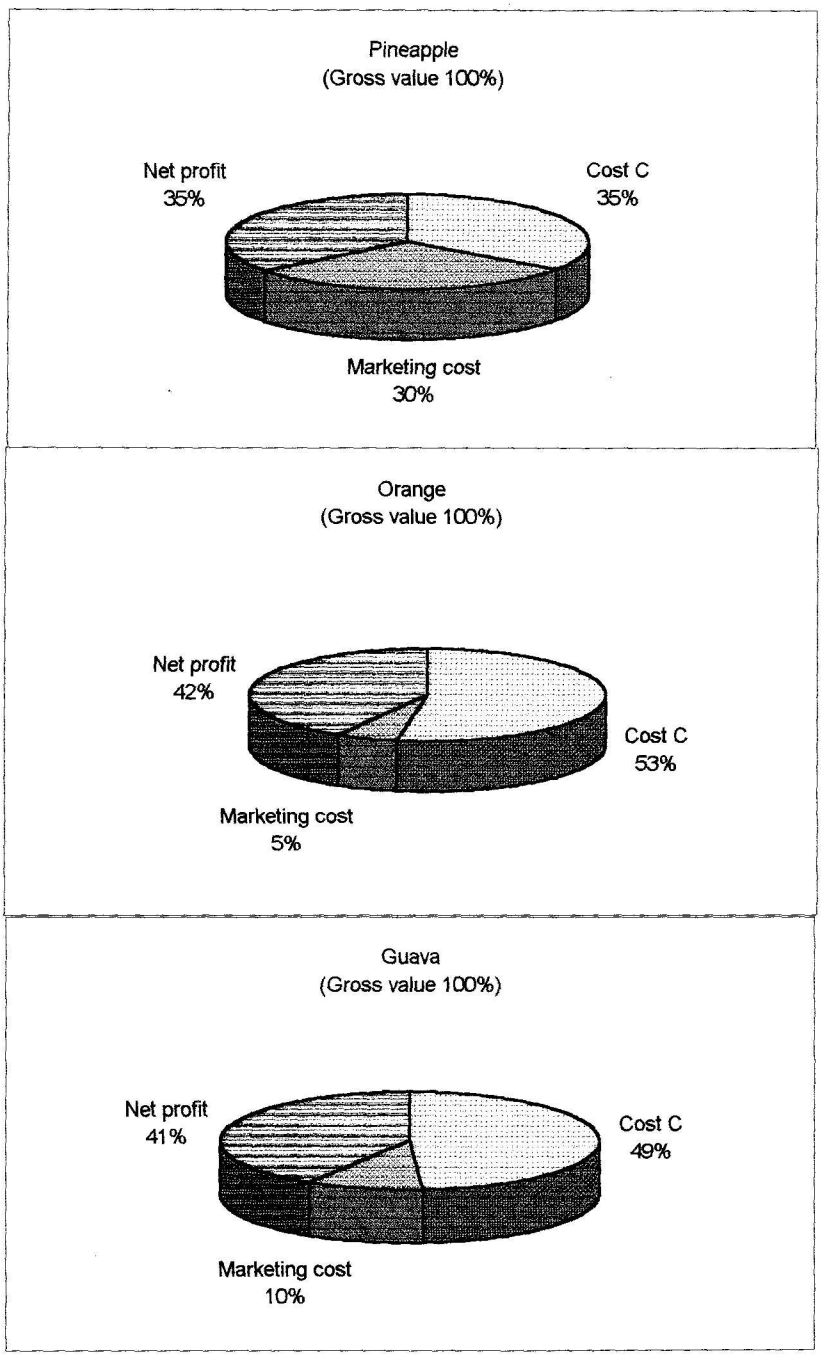


Table 5.12. Per hectare profitability of production

	Items	Pineapple (Rs.)	Orange (Rs.)	Guava (Rs.)
1.	Gross return	1,35,625	56,700	60,032
2.	Total cost of production	87,335.62	33,030.99	35,373.47
3.	Net profit	48,289.38	23,669.01	24,658.53

It can be seen that the per hectare annual gross income received by the producer was the highest in the case of pineapple with Rs. 1,35,625 followed by guava with Rs. 60,032 and orange with Rs. 56,700. The per hectare annual cost of production (including marketing cost) worked out to was Rs. 87,335.62, Rs. 33,030.99 and Rs. 35,373.47 respectively for pineapple, orange and guava. The net returns over the production i.e. inclusive of marketing cost was the highest from pineapple orchard (Rs. 48,289.38) followed by orange (Rs. 23,669.01) and guava (Rs. 24,658.53) .

5.10 Constraints in the production of pineapple, orange and guava

The constraints involved in establishment and maintenance of pineapple, orange and guava orchards are presented in Table 5.13, by way of giving frequency distribution of sample fruit growers.

It could be seen from the table that the position of farmers having complete technical know-how on different cultural practices in the

Table 5.13. Constraints in production

Particulars	Pineapple		Orange		Guava	
	No. of respondent	%	No. of respondent	%	No. of respondent	%
1	2	3	4	5	6	7	8
1 Technical know-how on different cultural practices						
a) Complete	7	23.33	10	33.33	3	10
b) Moderate	18	60	18	60	23	76.67
c) Inadequate	5	16.67	2	6.67	4	13.33
2 Availability of fertilizers and pesticides						
a) not easily available	18	60	24	80	26	86.67
b) Easily available	5	16.67	-	-	-	-
c) Available free from Agril. Department	-	-	2	6.67	-	-
d) Not available	7	23.33	4	13.33	4	13.33
3 Labour availability for different cultural practices						
a) Easily available at moderate wage	22	73.33	6	20	15	50
b) Not available easily	-	-	3	10	3	10
c) Available but costly	8	26.67	21	70	12	40
4 Availability of seedling						
a) Not available	-	-	22	73.33	24	80
b) Available but costly	-	-	8	26.67	6	20
c) Available cheaply	30	100	-	-	-	-
5 Pest and diseases infestation						
a) High	20	66.67	14	46.67	18	60
b) Moderate	8	26.67	12	40	10	33.33
c) Low	2	6.67	4	13.33	2	6.67
6 Family labour						
a) Sufficient	10	33.33	16	53.33	12	40
b) Insufficient	20	66.67	14	46.67	18	60

case of orange cultivation is better as compared to pineapple and guava. Out of the total respondents 33.33 per cent of orange growers, 23.33 per cent of pineapple growers and 10 per cent of guava growers have expressed that they have complete knowledge about cultural practices. About 60 per cent each of pineapple and orange and 76.67 per cent guava growers have expressed that they have moderate knowledge. The remaining 16.67 per cent, 6.67 per cent and 13.33 per cent of the pineapple, orange and guava growers, respectively, do not have adequate technical know-how on the different cultural practices.

Regarding availability of crucial inputs such as fertilizers and pesticides, about 60 per cent of pineapple growers, 80 per cent of orange growers and 86.67 per cent of guava growers expressed that these inputs are not easily available and 6.67 per cent of orange growers stated that these are available free from agriculture. department. The remaining 23.33 per cent of pineapple growers, 13.33 per cent of orange and 13.33 per cent of guava growers opined that they are confronted with non-availability of these crucial inputs.

Among the pineapple growers 73.33 per cent indicated that labour for different cultural operation is available at moderate wage rate but 26.67 per cent felt that it is available but costly. In the case of orange growers, 90 per cent expressed that labour is available and only 10 per cent expressed that it is not available easily. 70 per cent of the orange growres opined that labour is available but costly, while 20 per cent expressed that it is available at moderate wage rate. The response from guava orchardists was divided. 50 per cent of the respondents felt that the labour is available at moderate rate, while 40 per cent expressed that it is available but costly.

Non-availability of good quality seedling is a major constraint faced by the orange and guava farmers. About 73 per cent and 80 per cent of orange and guava orchardists, respectively, expressed that seedlings are not available in the market. Only 27 per cent of orange and 20 per cent of guava growers expressed that seedlings are available but costly. While in the case of pineapple growers, 100 per cent responded that the seedlings are available at cheaper rates.

The incidence of pest and diseases infestation was reported to be higher for pineapple and guava than for orange. About 67 per cent of pineapple growers, 46.67 per cent of orange growers and 60 per cent of guava growers reported the infestation as high. Moderate infestation was reported by 40 per cent orange growers followed by 33.33 per cent guava growers and 26.67 per cent pineapple growers. Out of the total respondents only 6.67 per cent each from pineapple and guava and 13.33 per cent from orange orchardists said that the infestation was low.

About the family labour requirement for different cultural operations 33.33 per cent, 53.33 per cent and 40 per cent of pineapple, orange and guava orchardists, respectively, expressed that it is sufficient, while 66.67 per cent of pineapple growers, 46.67 per cent of orange growers and 60 per cent of guava orchardists expressed it as insufficient.

5.11 Constraints in the marketing of fruits

Surprisingly, it was observed (Table 5.14) that none of the orchardists graded their produce for sale. About 67 per cent of pineapple cultivators said that there is no difference between graded and ungraded

Table 5.14. Constraints in marketing of fruit produce

1	2	3	4	5	6	7	8
1	Grading of produce						
	a) Graded	-	-	-	-	-	-
	b) Ungraded	30	100	30	100	30	100
	i) No difference	20	66.67	6	20	4	13.33
	ii) No price gain	6	20	6	20	10	33.33
	iii) Smaller size will remain unsold	4	13.33	18	60	16	53.34
2	Market intelligence						
	a) Little information	6	20	10	33.33	8	26.67
	b) No information	24	80	20	66.67	22	73.33
3	Mode of transportation						
	a) Headload	22	73.33	18	60	20	66.67
	b) Truck/buses	6	20	12	40	10	33.33
	c) Hand-pull cart	2	6.67	-	-	-	-
4	Produce for distance market						
	a) Sufficient	6	20	4	13.33	3	10
	b) Insufficient	24	80	26	86.67	27	90
5	Availability of transportation						
	a) Timely available	26	86.67	21	70	14	46.66
	b) Inadequate	4	13.33	9	30	16	53.34
	c) Costly	19	63.33	27	90	24	80
	d) cheap	11	36.67	3	10	6	20
6	Packaging material used						
	a) Jute sack	24	80	26	86.67	22	73.33
	b) Bamboo basket	6	20	4	13.33	8	26.67
	c) Plastic crates	-	-	-	-	-	-
7	Place of market						
	a) Near	12	40	6	,20	16	53.33
	b) Not far off	18	60	19	63.33	10	33.33
	c) Far away	-	-	5	16.67	4	13.34
8	Price of the fruit (Rs/kg)						
	a) Pre-season	4	-	20		10	
	b) Peak season	2.5	-	15		8	
	c) Lean season	3	-	12		6	

produce. 20 per cent responded saying that there was no price gain for graded produce and about 13 per cent feared the smaller size will remain unsold. In the case of orange and guava, majority of the orchardists, 60 per cent and 53.34 per cent, respectively, expressed their fear that produce if graded will result to rejection of smaller size fruits by the consumers. 20 per cent of orange and 13.33 per cent of guava farmers expressed that there was no difference between graded and ungraded produce and the remaining 20 per cent of orange growers and 33.33 per cent of guava growers said that there was no price gain for graded produce.

Regarding marketing intelligence only 20 per cent of pineapple growers, 33.33 per cent of orange growers and 25.67 per cent of guava growers expressed that they are getting little information on the prices at different markets. While the majority of them (i.e. 80 per cent of pineapple growers, 66.67 per cent of orange and 73.33 per cent of guava orchardists) have expressed that they did not get any information on prices and arrivals of fruits in different markets.

The mode of transportation of the produce was mostly by means of headload. In the case pineapple, 73.33 per cent growers reported headload as mode of transportation, 20 per cent said by trucks and buses and only 6.67 per cent said hand-pull cart as the mode of transportation. Even for orange and guava, 60 per cent of orange growers and 66.67 per cent of guava growers indicated headload as the mode of transportation. The remaining 40 per cent of orange growers and 33.33 per cent of guava growers indicated trucks and buses as mode of transportation. About sale of produce in distant markets, only 20 per cent pineapple growers, 13.33 per cent orange growers

and 10 per cent guava growers opined that they had sufficient produce quantity for sale in the distant markets, whereas the remaining respondents expressed that the produce far insufficient

Regarding the availability of transportation for disposal of produce, 86.67 per cent, 70 per cent and 46.66 per cent of the pineapple, orange and guava growers, respectively, expressed it was timely and available, while the remaining fruit growers expressed it as inadequate. In the case of pineapple growers, 63.33 per cent felt transportation as costly while 36.67 per cent said it was cheap. 90 per cent of the orange growers and 80 per cent of the guava growers found transportation as costly and only 10 per cent and 20 per cent said transportation as cheap. Jute sack was used as packaging material by over 73 per cent of the different fruit growers and bamboo basket was used as packaging material by 13.33 per cent to 26.67 per cent of fruit growers. None of the farmer used modern plastic crates for packing the fruits.

The distance of market is an important factor which determines the level of return to the farmers. 40 per cent of pineapple growers felt the market place to be near while 60 per cent felt the distance as not far off. For the orange growers, 20 per cent said the market place as near, 63.33 per cent described it as not far off while 16.67 said it as far away. In the case of guava, 53.33 per cent of the respondents expressed the market place as nearby, 33.33 per cent said that the distance was not far off and remaining 13.34 per cent thought it to be far away.

The price of pineapple during pre-season, peak season and lean season was Rs. 4, Rs. 2.50 and Rs. 3 per kg respectively, while for orange during pre-season it was as high as Rs. 20 per kg and Rs. 15 per kg during peak season and Rs. 12 per kg during lean season. In the case of guava, the price during pre-season was Rs. 10 per kg. While at peak season it was down to Rs. 8 per kg and at lean season it was Rs. 6 per kg.

5.12 Constraints on technology transfer and infrastructure facility

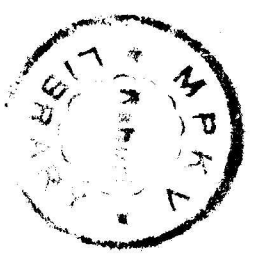
Regarding the presence of ancillary industries as indicated in Table 5.15, about 57 per cent of pineapple farmers responded that they are having knowledge of the presence processing unit in the nearly area, while 43 per cent respondents said that they have no idea of such industry. About 66.67 of orange growers and 73.33 per cent of guava growers expressed the lack of ancillary industries around their places. The remaining 39.33 per cent and 26.67 per cent of the orange and guava orchardists said that they have no idea whether there are any ancillary industries or not.

One of the major constraints faced by many farmers is the difficulties in obtaining loan facilities either from commercial banking institution or from State sponsored banking institution. All the respondents of the different orchardists expressed the non-availability of loans from either of these institutions.

About 20 per cent of pineapple growers, 80 per cent of orange growers and 73.33 per cent of guava growers were getting the technical knowledge from Agricultural Department, 60 per cent respondents of

Table 5.15. Constraints on technology transfer and infrastructure facilities

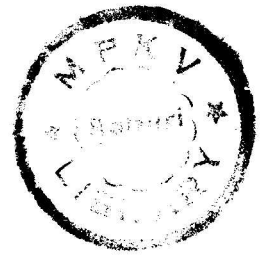
1	2	3	4	5	6	7	8
1	Ancillary industries						
	a) Yes	17	56.67	-	-	-	-
	b) No	-	-	20	66.67	2.2	73.33
	c) No idea	13	43.33	10	39.33	8	26.67
2	Availability of loan						
	a) Yes	-	-	-	-	-	-
	b) No	30	100	30	100	30	100
3	Technical know-how information						
	a) Agril./Hort. Department	6	20	24	80	22	73.33
	b) Agril. University	18	60	-	-	-	-
	c) Progressive farmer	6	20	6	20	6	20
	d) Others	-	-	-	-	2	6.67
4	Reason behind undertaking fruit cultivation						
	a) More profitable	18	60	10	33.33	13	43.33
	b) Govt. scheme	2	6.67	12	40	14	46.67
	c) Motivated by other faremrs	6	20	6	20	3	10
	d) Family needs	4	13.33	2	6.67	-	-



pineapple growers received the same from Agril. University and the remaining 20 per cent from progressive farmers. In the case of orange and guava, 20 per cent each of the fruit growers received the technical knowledge from progressive farmers, while the remaining 6.67 per cent of the guava growers received technical knowledge from other source.

The reasons expressed by the farmers for undertaking cultivation of the fruits are as under.

While indicating reasons for taking up cultivation of selected fruit crops, about 60 per cent of pineapple growers, 33.33 per cent of orange growers and 43.33 per cent of guava growers expressed that they took up to fruit cultivation with the hope that it will bring them more income. About 7 per cent of pineapple growers, 40 per cent of orange growers and 46.67 per cent of guava growers have taken advantage of government sponsored scheme. 20 per cent each of pineapple and orange growers and 10 per cent of guava growers were motivated by other farmers. Only 13.33 per cent of pineapple growers and 6.67 per cent of orange growers have cultivated the fruits in the beginning for family needs.



SUMMARY AND CONCLUSIONS

6. SUMMARY AND CONCLUSIONS

Cultivation of fruit crops plays an unique role in the prosperity of a nation. Due to their nutritional values, production of fruits contributes to health and happiness of the people. Moreover, fruit growing has significant place in diversified farming. It also promotes the development of several ancillary industries like preservation, dehydration, essential oils, packing, transport, refrigeraiton, etc. It also helps in maintaining the ecological balance. Because of varying agro-climatic conditions and abundant labour availability, India produces practically all varieties of tropical and sub-tropical fruits.

Pineapple, orange and guava are some of the popular fruits grown in the country. They are commonly grown throughout India. Nagaland has a wide range of climate and soils combinations making it possible to grow a variety of temperate, tropical and subtropical fruits in the state. In Nagaland, the total area under fruit crops for the year 1993-94 was 5867 hectares with a production of 55,968 metric tonnes. Pineapple crop occupies an area of 1166 hectares with a production of 28,221 metric tonnes, orange occupies an area of 775 with a production of 2061 metric tonnes and guava occupies an area of 359 hectares with a production 736 metric tonnes. The major fruits producing districts in Nagaland are Kohima, Wokha and Mokokchung. Pineapple, orange and guava are important nutritious fruit crops. They provide various types of minerals, vitamins, acids, proteins, fibre, sugar, essential oil, etc. They are rich source of vitamin C, calcium, phophorous and iron.

In the present study, an attempt has been made to examine the production and marketing aspects of three major fruit crops grown in Nagaland viz., pineapple, orange and guava. Efficient marketing is an essential adjunct for increasing production. With this aim in view, the problem namely, "Economics of production and marketing of pineapple, orange and guava in Nagaland", has been studied, with the following framed objectives.

1. To estimate per hectare cost of cultivation of pineapple, orange and guava.

2. To study the marketing methods and channels involved in marketing of the selected fruits for the study.

3. To study the marekting cost, margins and price spread in the marketing.

4. To analyse supply-price relationship in respet of pineapple, orange and guava.

5. To identify constraints and to suggest strategies for increasing profitability in production and marketing of pineapple, orange and guava.

The three major fruit producing districts in Nagaland viz., Kohima, Mokokchung and Workha were selected purposively for the present study. From each of this district, three fruit producing villages were selected. The sample villages were Medziphema, Kohima and Merema from Kohima district; Baghty, Sanis and Liphanyam from Workha; Changki Chantonya and

Longjang from Mokokchung district. Ten fruit growers were selected randomly from each of the sample villages from the three districts. The sample included 30 fruit growers for each of the fruit crops. Thus the study was based on the total sample of ninety fruit growers selected from nine villages of the three districts in Nagaland.

Most of the produce of this tract is marketed in Kohima and Dimapur markets. The marketing information has been collected from the retailers and wholesalers involved in marketing of pineapple, orange and guava in these markets. The data pertaining to the producer and marketing costs were collected through personal interviews by survey method with the help of a specially designed questionnaire. The data thus collected were analysed by tabular method for estimation of cost of production, marketing cost and margins. The functional analysis was also carried out within the frame work of Cobb-Douglas type of production function and the significance of the parameters of the function was tested by using Student 't' test. The appropriateness of the estimated model and variables incorporated in the model was tested by estimating R^2 and 'F' values.

6.1 Summary of findings

The important findings of the study are summarised below :

1. The average per farm area under pineapple, orange and guava was 0.97, 0.77 and 0.52 hectares, respectively, thus making the total area under these fruits during the investigation 29.10, 23.18 and 15.7 hectares for the sample farms as a whole for respective fruit crops.

2. The per hectare number of plants for pineapple was 43,400 plants, for orange 270 plants and for guava it was 268 plants.

3. The per hectare total establishment cost for pineapple plantation for 14 months was Rs. 37,479.69, while for orange and guava it was Rs. 96,774.77 and Rs. 93,776.81 respectively over a period of 6 years. The highest establishment cost was observed in the case of orange followed by guava and then pineapple.

The annualised per hectare establishment cost of pineapple plantation was Rs. 10,119.52 while the same in the case of orange and guava was Rs. 10,645,25 and Rs. 10,315.45, respectively.

4. The study of human labour utilization in pineapple and guava fruit crops revealed that about 59 per cent of total labour force was from hired labour and about 41 per cent from their own families. Whereas in the case of orange equal hired labour and family labour formed the total labour force.

5. The per hectare annual cost of cultivation of pineapple, orange and guava was Rs. 47,190.62, Rs. 29,969.19 and Rs. 29,295.23, respectively. The variable cost i.e. cost 'A' for pineapple was Rs. 24,315.66, for orange Rs. 20,214.92 while, for guava it was Rs. 19,128.28. Amongst the major items of cost in the case of pineapple rental value of land accounted for Rs. 18,083.33 (38.32 per cent) followed by annualised establishment cost with Rs. 10,119.52 (21.44 per cent), hired labour amounted to Rs. 6,289.75 (13.33 per cent). Family labour and fertilizers cost constituted 9.20 per cent and 6.72 per cent. While in the case of orange and guava, the major cost was the annualised establishment cost which accounted for Rs. 10,645.25 (35.52 per

cent) and Rs. 10,315.45 (35.21 per cent). The next important cost item was the rental value of land which worked out to Rs. 6,300 (21.02 per cent) and Rs. 7,504 (25.62 per cent) for orange and guava.

The family labour and hired labour were the third and fouth important items of cost in the orange orchard cultivation contributing 9.50 per cent and 9.41 per cent to the total cost. While in the case of guava hired human labour formed the third important item which shared 11.17 per cent followed by family human labour with 7.83 per cent of the total cost.

6. The per hectare yield of pineapple was the highest with 542.50 quintals followed by guava and orange with 75.04 and 37.80 quintals, respectively. The gross income recieved from pineapple, orange and guava orchardist was Rs. 1,35,625, Rs. 56,700 and Rs. 60,032 per hectare, respectively. The net profit at cost 'A' for pineapple, orange and guava was, respectively, Rs. 1,11,309.72, Rs. 36,485.08 and Rs.40,903.72 per hectare. At cost 'C' level the per hectare profit was Rs. 88,434.38, Rs. 26,730.81 and Rs. 30,736.77 from pineapple, orange and guava orchards, respectively.

7. The total annual cost of production was Rs. 87,335.62, Rs. 33,030.99 and Rs. 35,373.47 per hectare for pineapple, orange and guava, respectively. And the net profit at total cost for pineapple, orange and guava was, respectively, Rs. 48,289.38, Rs. 23,669.01 and Rs. 24,658.53 per hectare.

8. The per hectare quantity of manure used up for pineapple was 45 quintals while for orange and guava the quantity was 25 quintals each. The plant protection expenditure was Rs. 1200, Rs. 1150 and Rs. 975 per hectare for pineapple, orange and guava, respectively. The quantity of NPK used for

pineapple was 123:32:308 kg per hectare, the same for orange was 141.75:141.60 and in the case of guava the quantity required was 121.50:64.66:122 kg per hectare. The total annual human labour required for various cultural operations of pineapple orchard was 202.19 man equirvalent days, while in the case of orange and guava the requirement of human labour was about half of that pineapple with 109.82 and 105.25 man equivalant days per hectare, respectively.

9. The per hectare quantity produced was 542.50 quintals, 37.80 quintals and 54.04 quintals for pineapple, orange and guava, respectively. Out of this, the quantity used for consumption and gratis was 12.69 quintals, 1.35 quintals and 3.60 quintals for pineapple, orange and guava, respectively. While the quantity infested by pest and disease for pineapple was 38.14 quintals, orange 0.61 quintals and guava 1.85 quintals.

The net quantity sold of pineapple was 491.67 quintals, while for orange the same was 35.84 quintals and in the case of guava it was 69.59 quintals.

10. Most of the fruit growers have the practice of sending their produce for marketing directly in the district headquarter and state capital markets. There, they either sell the produce themselves during day time or they dispose of the produce to retailer in whole lot. Wholsalers and retailers play important role in marketing of pineapple, orange and guava in the long distance markets. There are no regulated markets in Nagaland to protect the interest of the cultivators.

11. The selected fruit growers sold out their produce through four channels. Out of the four channels. The producer->Retailer->Consumer channel was the most important channel. Between 40 to 50 per cent of the produce was sold through this channel. The other two channels were Producer-> Consumer and Producer->Wholesalar->Retailer->Consumer.

12. The per quintal cost of marketing of pineapple was Rs. 143.54, Rs. 115.86, Rs. 98 and Rs. 250.88 in the channel I, II, III and IV, respectively. The same in the case of orange was Rs. 86.72, Rs. 137.53, Rs. 74 and Rs. 216.50 in channel I, II and III and IV, respectively. While for guava it was Rs. 101.14, Rs. 154.69, Rs. 76.00 and Rs. 244.82, respectively.

13. The price spread in the case of Kohima and Dimapur markets showed that the producers net share in consumer's rupee in channel I, II and IV for pineapple was 71.29 per cent, 58.40 per cent and 35.72 per cent, respectively. While the same for orange was 94.58 per cent, 74.13 per cent and 55.31 per cent. And for guava the same was 88.76 per cent 73.19 per cent and 66.43 per cent, respectively.

14. The per hectare annual gross value received of by the producers was worked out to Rs. 1,35,625, Rs. 56,700 and Rs. 60,032, respectively, for pineapple, orange and guava. While the per hectare annual cost of production for the same fruit crops was Rs. 86,335.62, Rs. 33,030.99 and Rs. 35,375.47, respectively. The net profit realised by the producer was Rs. 48,289.38, Rs. 23,669.01 and Rs. 24,658.53 per hectare for pineapple, orange and guava fruit crops, respectively.

15. The non-availability of important crucial inputs such as fertilizers, pesticides and good quality seedlings were the constraints expressed by the farmers. The high labour wages, the incidence of pests and diseases and the lack of complete technical know how on different cultural operations in the cultivation of the pineapple, orange and guava are other constraints expressed by the orchardists.

16. Absence of grading and packing practices, lack of price difference, market preference and non-availability of advanced packing material were the constrainsts expressed by the orchardists. Furthermore, inadequate transportation service, high tranportation charges, lack of information on prices and arrivals of fruits in different markets and market distance are the constraints affecting the efficiency of marketing of fruits. In addition, non-availability of loan from the lending institution has greatly added to the farmer's difficulties.

6.2 Conclusions

The present investigation was intended to depict the picture of the pineapple, orange and guava growing enterprises in Nagaland State. These enterprises have assumed an important place in the economy of the state as they are the important horticultural crops grown in the state. In this investigation, it was found that the cultivation of all the three fruit crops was in profit. The following conclusions have emerged out from the findings of the study.

The per hectare establishment cost of pineapple for 14 months was quite high, amounting to about Rs. 37,500, while the same for orange and

guava for 6 years was almost equal to each other at about Rs. 95,000. The economic productive life of pineapple was five years, while in the case of orange and guava the same was 25 years. The annualised establishment cost for all the fruit crops was worked out to be almost equal at about Rs. 10,000.

1. The per hectare cost of cultivation amongst the three fruit crops i.e., pineapple, orange and guava, was higher in the case of pineapple at Rs. 47,190.62, which was one and a half times more than that of orange and guava cultivation cost. The cost on account of different inputs used were almost of the same order and in equal proportion for orange and guava fruit crops. The reasons for higher production cost in the case of pineapple as compared to the other two fruit crops were mainly due to higher inputs used of hired labour and fertilizers and the higher costs on account of rental value of land and the imputed family labour cost.

The major items of cost of production for all the three fruit crops were the rental value of land, annualised establishment cost, human labour charges, fertilizers costs, etc.,

2. Between 91-95 per cent of quantities produced by the fruit producers have been sold in different markets. Surprisingly, none of the produce sold in the market was graded before marketing. The quantities produced were mostly marketed in Kohima and Dimapur markets through four different channels. The most followed channel was the Producer → Retailier → Consumer. About 40-50 per cent of the marketed fruits were sold through this channel. About 20-23 per cent of quantity sold are sold in Producer → Consumer channel and between 15-27 per cent of quantity marketed are sold in

Producer → Wholesaler → Retailer → Consumer channel. And very limited quantity was are sold through the third channel.

3. The marketing cost per hectare was the highest in the case of pineapple with an amount of Rs. 40,145 followed by guava with Rs. 6,078.24 and orange with Rs. 3,061.80. The higher cost attributed to pineapple and guava was mainly due to higher yield per hectare. The per quintal marketing cost of pinepple was cheaper as compared to orange and guava. This shows that with the increase in the quantities handled, the marketing cost decreases.

The producer's net share in consumer's price was the highest in channel first for all the three crops. Amongst the three fruit producers, orange produer's share in the consumer's rupee was 94.58 per cent. Which was followed by guava with 88.76 per cent and pineappe with 71.29 per cent in the consumer's rupee. In channel II, the producer's share in consumer's price ranged between 58.40 to 74.13 per cent, while in channel IV the producer share ranged between 35.72 - 66.43 per cent of the consumer's price. In general, the orange and guava growers have had higher per cent share in the consumer's rupee than the pineapple producers.

The major constraints faced by the fruit producers were the high labour wages, lack of quality seedling, inavailability of fertilizers and pesticides, good packing material, absence of quick and cheap transportation facilities, low and fluctuating price, etc.

6.3 Policy implications

It is concluded that investments in raising pineapple, orange and guava crops are profitable and financially viable. The net income per hectare comes to Rs. 48,289.38, Rs. 23,669.01 and Rs. 24,658.53 for pineapple, orange and guava, respectively. Cultivation of these fruit crops not only increases the farmer's income but also gives more employment opportunity. These findings indicate that there is a scope for increasing cultivation of these fruits crops in Nagaland.

Although there is a vast and considerable scope for the improvement and extension of pineapple, orange and guava cultivation in Nagaland, it suffers alot from many hurdles on its way. A combined efforts both by the government as well as by the co-operative associations should be made to tackle the constraints relating to cultural practices, credit facilities, inputs availabilities, storage facilities, transportation, price fluctuation, lack of market intelligence, etc. Solving only one of these issues may not materially help the cultivation of fruit crops in the state. Therefore, the following efforts are required to be made which may result in improving the economy of the fruit growers and the state as a whole.

1. Efforts should be made by the government and other lending institutions to provide adequate credit facilities to farmers community to extend the existing orchard and to develop new orchards especially more on the existing fallow land. The wide range of climate and soil combination added to the hilly terrain, horticultural crops are best suited from economic view point of production.

2. The state government should arrange quality grafted seedlings which give much higher yield as compared to the seeded seedling, which is commonly used by farmers in Nagaland specially in the case of orange and guava.

3. As per the finding the higher labour cost is a major constraint in the production of fruit crops. The use of chemical weedicides should be advocated to reduce labour cost.

4. Plant protection measures should be taken more vigorously with the help of subject matter speicalists in order to reduce losses due to incidence of pests and diseases.

5. Farmers can realise greater returns than they are earning at present by resorting the practice of intercropping vegetables and legumes with the fruit trees. This will increase soil fertility by legume crops, reduce weeding cost and provide increased employment.

6. There is a potential profitability of pineapple leaves as fibre as reported by Rayasikhram in 1989. A processing industry for extracting fibre from pineapple leaves may be set up in the pineappole producing area. The fibre extracted from the pineapple leaves is used for weaving hand bags, caps, mat and many other products.

7. Processing unit or cold storage should be set up within the major fruit producing region in order to give better price to farmers. The higher returns will encourage more people to undertake fruit cultivation.

8. Small holding fruit growers should undertake cooperative pooling, transporting and marketing of their produce. Singh (1973) reported that

marketing of grapes in Ludhiana district of Punjab through cooperative marketing could increase the net returns by reduction in marketing costs and increase in gross returns by selling at the right place. Similar thing holds true in Nagaland also.

9. Producers and market intermediaries should use better packaging material to avoid losses due to damage during transporting.

10. The standardization and grading should be followed by producers to increase their share in the consumer's rupee.

11. Market intelligence service should be spread through local radio programme.

12. Government should set up regulated market to protect the interest of the producers. This will also facilitate in maintaining records of supply and price of various commodity in the market at different markets.

13. The Agricultural Department be activated to carry on research on the adaptability, feasibility and viability of other fruit crops in different districts of Nagaland.

LITERATURE CITED

7. LITERATURE CITED

Anonymous, 1989. A reports submitted by Field Officer (II), C.P.M.C.C. Scheme, Deptt. of Agril. Economics, MPKV, Rahuri on "Economics of Production and Marketing of Ber in Solapur District", to the Research Review Sub-Committee, Deptt. of Agril. Economics, MPKV, Rahuri.

Anonymous, 1987. A report submitted by the Deptt.Agril.Economics and Statistics, C.S.Azad University of Agriculture and Technology on "Economics of production and marketing of guava in Allahabad (U.P.)1985-86), pp.35.

Aparna, S. and R.Bansal . 1993. System of land tenure in Nagaland : A case study of Kohima and Mokokchung district. Administrator, 38(2): 125-132. (Forest and Environment Department, Sachivalaya, Gandhinagar, Gujarat).

Bhole, B.D., Y.P. Mahalle, M.D. Korde and M.H.Choudhari 1992. Price spread in Marketing of oranges. Maharashtra J. Agril. Economics, 4 : 33.

Birari, K.S. 1981. A study of economics of production and marketing of banana in Jalgaon district. M.Sc.(Agri.) thesis submitted to MPKV, Rahuri.

Birari, K.S. and D.V.Kasar 1983. Marketing of Jalgaon banana in Delhi market. Indian J.Agril.Econ., 13(6-7): 27-30.

Bhupal, D.S. 1989. Price spread in marketing of vegetables in Delhi Agricultural Situation in India, 44(9): 725-726.

De, A.K. 1989. The role of cold storage in the marketing of potato in West Bengal. Agricultural Marketing, 32(2): 33-37.

Deshpande, B.S., C.D. Deole and J.N Borle 1992. Price spread in different channels of marketing of grapes in Latur district. J. Agril. Economics, 4: 28.

Deshpande, S.L. and V.N Autkar 1988. Appraisal of marketing of Nagpur Mandarian (Oranges) in Akola market (M.S.) Indian J. Agril. Marktg. 2(1): 69.

Dhaliwal, R.S. and A.S. Kahlon. 1972. Planning large sweet - orange orchards in South-Western Punjab. Indian J. Res., 9(4) : 647-651.

Funt, R.C. 1975. An economic analysis of several apple orchard systems in Pennslvania. Dissertation Abstracts International, 36(3) : 1000-1001.

Gangwar, A.C. and R.K.Godara 1982. Economic feasibility of grape cultivation. Haryana Agril. Univ. J. Res., 12(1) : 140-147.

Gohain, D. 1977. Apple cultivation in Arunachal Pradesh. Agro-economic Research Centre for North-East India. Assam Agril. Univ. No.33, pp. 50.

Gupta, G.S. and P.S.George 1974. Profitability of Nagpur Santra Cultivation. Indian J. agric. Econ., 29(3) : 134-142.

Gupta, M.R. and Sohan Singh. 1972. Marketing of ber progressive farming. 8(8) : 17-18.

Hayes, W.B. 1953. Fruits growing in India Kitabistan, Allahabad, 98.

Hugar, L.B.,P.S.S. Murthy, K.B. Umesh and B.S. Reddy 1991. Economics of feasibility of guava cultivation under scientific management, an empirical evidence. Agril.Situation in India, 46(4) : 211-214.

Hutchinson, A. 1977. Establishment costs and management of high density orchards. Proceedings, Annual Meeting Massachusetts Fruit Growers Association, 83 : 55-68.

Kahlon, A.S. and G.S. Randhawa 1956. Some consideration for research in marketing of horticultural product in India. Indian J. Hort., 13(4): 199.

Kitsopanidis, G. and A.V. Karkabouna 1972. The economics of fruit production (Peaches, Apples, Pears). Deptt. Ari Sterelian Univ. Thesseloniki, pp. 16.

Korde, M.D., V.M. Koranne, D.D. Yenpreddiwar, and N.F. Gore 1991. Behaviour of arrivals and prices in orange markets. Agril. Marketing, 33(4): 27-30.

Lepcha, Y., M.H. Ali, A. Maity, A.K. Mukherjee and T.K. Chattopadhayay 1993. Economics affairs(Calcutta). 38(4): 232-241.

Mehta, P. and B. Singh 1970. The comparative profitability of apple orchards in the Kullu and Parbati valley. J.Res.,Ludhiana, 7(2): 225-228.

Mohan, B.; P.V.N. Saih and N. Subranarasaiah 1991. Citrus fruits cultivation in Andhra Pradesh : A study. Agril. Situation in India, 46(2): 77-79.

Negi, Y.S., S.C. Tewari and A.K. Randev 1980. Market structure, conduct and price spread of citrus and stone fruits in Himachal Pradesh. Agril.Mrktg. 32(1): 24-29.

Negi, Y.S. and D.S. Thakur 1981. Marketing channels and price spread in marketing of plums in Himachal Pradesh. Agril. Mrktg., 24(2): 1-4.

Pannu, A.S. and D.S. Sidhu 1963. Economics of grading sweet orange fruits under AGMARK, the Punjab Hort. J., 3: 39.

Parthasarthy, P.B. 1990. Packaging of fruits and vegetables. A case study of Hyderabad market. Research papers presented at National Workshop on harvest management of fruits and vegetables at Nagpur.

Patil, S.J. 1975. The economics of pomegranate cultivation in Rahuri region of Ahmednagar district. M.Sc. (Agri.) thesis submitted to MPKV, Rahuri.

Patil, S.J. and M.P. Dhongade 1978. A price spread study in pomegranate marketing in Maharashtra. Agril. Mrktg., 21(1): 17-18.

Patil, T.Y., B.J. Hinge and K.D. Rajmane 1969. Economic problems of horticultural plantation in Maharashtra. Indian J. agric. Econ., 24(4):

Raghubanshi and R.K. Sharma 1977. Grading, a common yard stick. Indian J. Mktg., 7(6) : 19.

Rana, R.S. 1984. Fruit production and marketidng in India. Agril.Mktg., 27(3): 21-31.

Rayasikharan, 1989. Pineapple intercropping in the first three years of rubber planting in small holding; an economic analysis. Indian J. Natural Rubber Res., 2(2) : 118-124.

Reddy, M.R. and H.S.V. Kumar 1990. Problems and prospects in marketing of sweet orange in Prakasan district of Andhra Pradesh. Agril. Mktg., 33(2) : 44-45.

Rothenburger, W. 1977. Cost benefit analysis of social and environmental economic efficiency of horticulture. Acta Horticulture,55:19-32.

Sakia, T.N. and D. Borah 1984. Production and marketing of pineapple in Meghalaya (A study in East Khasi hills district) Ad-hoc Study, Agro-Economic Research Centre for North-East India. Assam Agril. Univ. No. 55, pp. 99.

Senthilnathan, S. and R. Srinivasan 1994. Production and marketing of Poovan in Trichirapalli district. Indian J. Agril. Mktg., 8(1) : 46-53.

Sharma, R.K. and H.K. Pandey 1972. Economic of guava production and marketing. Financing Agril., 9(3) : 25-29.

Sharma, S.K., H.R. Sharma and T.V. Moorti 1989. Pattern of marketable surplus on triabal farms of Himachal Pradesh. Agril. Mktg., 32(2) : 18-21.

Siddappa, G.S. 1967. Preservation of fruits and vegetable scope for development. Indian Horticulture, 11(4) : 37-43.

Sikka, B.K. and R. Swarup 1985. Economic of citrus production in Himachal Pradesh. Agro-Economic Research Centre, Himachal Pradesh University.

Sikka, B.K. and R. Swarup 1988. Economics of fruits production in Himachal : A study of plum, peach, apricot and pear. Agro-Economic Research Centre, Himachal Pradesh University, pp. 5.

Singh, I.J., H. Singh and K.S. Chauhan 1982. Costs and returns analysis of ber growing. Indian J. Hort., 39(1-2) : 45-49.

Singh, N., S.C. Tiwari and R. Chand 1990. An economic analysis of marketing of plum and apricot in Himachal Pradesh. Indian J. Agril. Mktg., 4(2) : 147-156.

Subrahmanyam, K.V. 1988. Post harvest losses in horticultural crop, an appraisal. Agriculture Situation in India, 4(5) : 339-343.

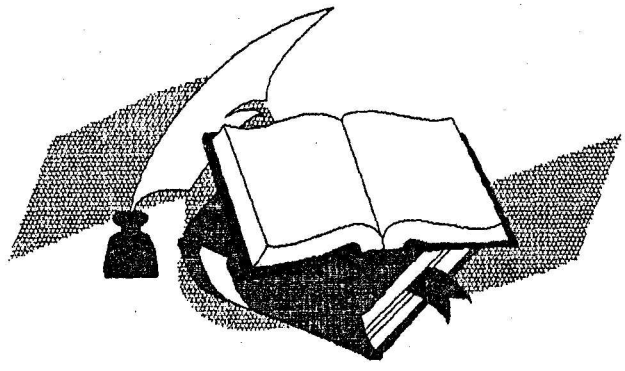
Subrahmanyam, K.V. 1988. Marketing of horticultural crops in Karnataka. Present status and future requirement. Indian J. Agril. Mktg., 32(2) : 18-21.

Subrahmanyam, K.V. 1989. Production and export potential of pineapple, present status and future scope. Agril. Situation in India, 43(12) : 1035-1044.

Subrahmanyan, K.V.and T.M. Gajanana 1994. Planning a successful fruit and vegetable Co-Operative Marketing Society : Lessons from existing society. Agril. Mktg., 37(2) : 36-39.

Thakur, D.S. 1971. Economics and operational efficiency in marketing of Himachal Pradesh apples. Indian J. Mktg., 28(1) : 96-104.

Thomas, K.J. and K. Mukundan 1989. Marketing of pineapple in Trichur district of Kerala. Agril. Mktg., 23(3) : 8-10.



APPENDICES

8. APPENDIX-I

Questionnaire for a study of production and marketing of pineapple, orange and guava in Nagaland state.

A) Name of cultivator District village
Age Occupation-main Subsidary

B) Family workers
1. Male 2. Female 3. Children
4. Servant-payment

C) Assets

1. Land holding

Sr. No.	Survey No.	Soil type	Total land (ha)	Fallow land (ha)	Cultivable land (ha)		Land under forest	Land revenue (Rs.)	Land value (Rs.)
					irrigated	Rainfed			

2. Details of farm assets

A) Farm buildings

Sr. No.	Category	Construction type	Year of constr-uction	Present value (Rs.)	Repairs during the year (Rs.)	Remaining life (yrs.)
1.	House					
	A) In village					
	B) On farm					
2.	Byre					
3.	Store house					
4.	Engine house					
5.	Other					

B) Implements and machinery :

Sr. No.	Type Number	Year of purchase	Value (Rs.)	Present value (Rs.)	Repairs during the year (Rs.)	Remarks
	Implements					
1.	Wooden plough					
2.	Iron plough					
3.	Seed drill					
4.	Harrow					
5.	Hoe					
6.	Bullock cart					
7.	Other					
	Machinery					
1.	Oil Engine					
2.	Ele. motor					
3.	Tractor					
4.	Sprayer					
5.	Duster					
6.	Pipe line					
7.	Other					
	Other					
1.	Pickaxe					
2.	Bucket					
3.	Dau					
4.	Spade					
5.	Weeding hook					
6.	Other					

C) Livestock

Sr. No.	Type	Number	Purchased/ Home-breed	Age	Present value Rs.
1.	Draft animals				
2.	Milch animals				
	A) Cow				
	i. Local				
	ii. Cross bred				

B) Buffalow
C) Calves
i. Cow-calves
ii. Buffalow calves
D) Other animals
i. Goat
ii. Pig
iii. Poulty birds

D) Information regarding wells

Sr. No.	Type of well	Year of construction	Present value (Rs.)	Irrigated area (ha)	If common share	Total life

Note. Hiring irrigation charges by elect. motor/oil engine/day

3) Cropping pattern

Sr. No.	Season and name of crop	Irrigated/dry	Area (ha)
A)	Kharif season		
B)	Rabi season		
C)	Summer season		
D)	Perennial plants		

5) Production and its disposal

Sr. No.	Mode	Quntity (Qtls.)	Remarks
1.	Quantity sold out		
2.	Quantity used for consumption		
3.	Quantity given on gratis		
4.	Quantity used for by-products		
5.	Quantity infested by insects and pests		

6) Channels of marketing and quantity marketed (Qtls.)

i. Producer → commission agent → whoelsaler → Retailer → Consumer
quantity marketed (Qtls)

ii. Producer → wholesaler → Retailer → consumer

iii. Producer → Factor → consumer

iv. Producer → Co-op. society → commission agent → retailer → consumer

v. Producer → Retailer → consumer

vi. Producer → consumer

7. Types of grading and gradewise quntity (qtls.)

8. Details of marketing cost :

	Particulars	Markets			
		Local	Weekly	District	Outside state
1.	Quantity sent to market (qtls)				
	Grade A				
	B				
	C				
2.	Quantity actually marketed (qtls)				
	Grade A				
	B				
	C				
3.	Itemwise marketing costs				
	a. Grading				
	i) Labour days				
	Male				
	Female				
	ii) Wages				
	b. Postage				
	c. Octroi				
	d. Coolie charges				

e. Weighing charges
f. Commission
g. Packing material and labour
h. Package cost
i) Material name
ii) Quantity
iii) Value
i. Transport
Mode
Cost
j. Other charges

9) Questionnaire for commission agent

1. Name
2. Name of market
3. Licence fees/year
4. Wages of permanent/casual labour/year
5. Hiring charges for marketing-shop/year
6. Hospitability charges/year
7. Other expenses if any
8. Total quantity of selected fruits handled in a season
   a) How much quantity handled of other fruits handled
   b) Sale price flow in year
   c) Commission received from selected fruits
9. Expenses incurred
   a) Market fees
   b) Other expenses, if any

10) Questionnaire for retailer

1. Name of retailer
2. Name of purchasing market
3. Name of marketing area
4. Total quantity of selected fruits sold in year
5. How much quantity of other fruits sold in a year
6. Purchase price of selected fruits

7. Expenses incurred
   a) Loading unloading charges
   b) Transporting charges
   c) Repacking charges
   d) Other expenses if any
   e) Losses (per cent)
      i. Sample for testing
      ii. Quantity spoiled
   f) Selling price of selcted fruits/quintal Rs.

11. Questionnaire for constraints in production

1. What was the reason behind for undertaking fruit cultivation ?
   (i) More profitable/motivated by other farmer/govt. scheme/family needs/ others
2. Are seedlings available? Yes/No. Is it cheap/costly/moderate?
3. Whether you have technical know-how on fruit cultivation?

	Complete	Moderate	Inadequate
a. Irrigation application			
b. Training & pruning			
c. Intercropping benefit			
d. Pre-cooling and cold storage facilities			
e. Manure & fertilizer doses			
f. Pest & diseases control measures			

4. Whether fertilizers are (i) Easily available/Not available
   (ii) Available but costly/available free from Agril. depart.
5. Whether pests & disease infestations are more/medium/less ?
6. Whether chemicals used for controlling of pests & diseases are
   a. Easily available /N.A.
   b. Available but costly/available free of cost from govt.
7. Whether sufficient labours are available for different cultural operations Yes/No
8. Whether hired labour charges are too high/cheap/moderate
9. Whether family labour are sufficient/insufficient.
10. Whether you face any problem regarding cultural operation ? Yes/No. if yes, why ?

11. Do you grade your produce for sale ? Yes/No
    if no, why not ?
    a. Absence of skill labour
    b. High wage rate
    c. No price gain
    d. Product remains of the same grade
12. Whether market intelligence service are available Yes/No
    If yes, whether
    a. Timely/lately
    b. Reliable/misleading
    c. Sufficient market covered/inadequte coverage
13. Mode of transportation of produce to market place
    Headload/truck/bullock cart/hand-pull cart/bus
14. Whether produce quantities are sufficient for long distance market, Yes/No
15. Whether transportation is (i) adequate and timely/inadequate
    (ii) Too costly/cheap/moderate
16. Whether bamboo basket/woodern box/jute sack/plastic crates are used for packing fruits Yes/No
    If yes whether (a) available easily/ not avaiable
    (b) Cheap/moderate/costly
17. Place of market -- nearby / far/ too far
18. Type of agencies involved in marketing : commission agent/retailer/co-operative marketing society/
19. What are the commission charges : a. Service charges
    b. Commission
    c. Weighing charges
    d. Transportation
    e. Postage
    f. Association
    g. Others
20. Whether C.A. are reliable/unreliable. Do they quote the price at which they sell your produce. Yes/No. Do they take you consent before selling your produce Yes/No.
21. What are the market prices of the fruit at
    a. Early season Rs. ..... kg/qtls.
    b. Peak season Rs. ..... kg/qtls.
    c. Lean season Rs. ..... kg/qtls.
22. Whether there are any ancillary industries available for manufacturing by-product in you area. Yes/No.

23. What are the problems likely to face in future of the increasing area under the fruit cultivation :
    a. Problem of disposing
    b. Low price of the produce.
    c.
    d.
24. Are loan facilities available for fruit cultivation : Yes/No.
    if yes, from whom ? State govt./commercial bank/co-operative society/ private and at what rate ? @ .....
25. Did you receive any technical know-how from :
    a. Training and visit scheme.
    b. Agril. Horticulture Dept.
    c. Agril. University
    d. Progessive cultivator
    e. Others
26. General suggestions for improvment in the fruit cultivations :
    a. Credit availability
    b. Seedling material
    c. Pest and disease control
    d. Transportation
    e. Marketing
    f. Method of sale
    g. Price
    h. Storage
    i. Others

Appendix-II

The methodology adopted for valuation of different items of cost in estimation of cost of cultivation is discussed in the subsequent paragraphs

(i) Human labour :

It includes both family and hired labour. Most of the labour force engaged in crop production comes from cultivator's own family. However, the cultivators have to engage hired labour from time to time for certain operations. Human labour cost comprises of : (a) Wages actually paid to the hired labour as also those paid to the labour obtained on contract for the whole year or part thereof, (b) Imputed value of labour put in by the family members, (c) Wages paid to the attached farm servants for different operations have been included in the hired labour.

The wages of male and female members of the family were calculated on the basis of wages paid to casual labourers in force from time to time for different operations. For calculation of man equivalent day, the female day is multiplied by 0.8.

(ii) Planting material :

The planting material the growers used in pineapple cultivation is mostly the suckers; whereas for the orange and guava, seedlings are mostly used. The cost of planting material was worked out at the prevailing rates in the area.

(iii) Manures :

The cost of farm yard manure or compost produced on the farm was considered at a minimum of Rs. 15/quintal.

(iv) Fertilizers :

The cost on account of fertilizers was worked out at the actual prices paid by the cultivator.

(v) Insecticides and pesticides :

The insecticides and pesticides were charged at the actual price paid by the grower.

(vi) Irrigation charges :

Since irrigation is not practiced by the cultivator, no charge has been worked out on this. Farmers usually plant seedling and suckers with the onset of monsoon season.

(vii) Land revenue, cesses and taxes :

These items of cost which are applicable are calculated at the actual cost paid by the farmers :

(viii) Depreciation on implements, machinery and other assets :

Depreciation on implements, farm buildings and machinery were evaluated at the prevailing market prices taking into consideration the condition of assets.

Depreciation of these assets for the current year was calculated using straight line method. For the purpose, the present value and the remaining useful life of assets were considered.

(ix) Interest on fixed capital :

Interest on present value of fixed assets (excluding land) such as farm buildings, implements and equipments was charged at the rate of 12 per cent. For analysis, the interest on fixed assets viz., irrigation and draft animals was not considered as it was not applicable.

(x) Interest on working capital :

Interest on working capital was charged at the rate of 14 per cent per annum on the working capital viz., cash or kind expenses (excluding items in respect of which payments are generally made after the harvest i.e. rent, land revenue, etc.,) incurred during the period of cultivation.

(xi) Rental value of land :

In India, land rent forms an important part of the cost of production. In the case of fruit trees, which do not bear fruit in the first year, the rent of the year goes in the capital cost. When mix-crop is taken in the first year along with the main crop a small part of the first year rent may be debited against the mixed crop.

The rental value of land is either calculated at 10 per cent of the estimated current value of that land or one sixth of the value of gross produce.

In this investigation all farmers were found cultivating their own land, hence the rental value has been calculated at the rate of 10 per cent of the value of land under the concerned fruit crops. The per hectare value of gross produce was ascertained from the cultivators at the time of inquiry.

(xii) Plant protection :

Expenditure on insecticides and pesticides used includes the actual amount paid by the cultivator in purchasing such chemicals.

(xiii) Allocation of expenditure for establishment of orchard :

For setting up an orchard the farmer has to incur expenditure on land clearing, preparatory tillage, planting material, interculturing, manuring, irrigation, etc., in the first year. Similarly, during second year, he has to spend some amount on operations like manuring, fertilizing, irrigation, interculturing, plant protection, etc., though the fruits do not bear. This total expenditure till the orchard reaches economic bearing has to be considered as establishment cost of the orchard and it needs to be apportioned to every year by estimating the productive life of the orchard. The average productive life of pineapple is calculated to be 5 years and the that of orange and guava is considered to be 25 years in Nagaland. Regarding intercropping, farmers of these fruit crops have not taken inter-crops during the initial year mostly because of ignorance of the benefit. Hence the net cost of establishment was apportioned for a year on the basis of the economic life of the orchard.

(xiv) Packing :

The actual expenditure of packing material was accounted for this item. Materials used for packing these fruits are sack, bamboo basket, plastic bags, etc.

(xv) Marketing and transporting :

The total expenditure incurred after packing these fruits for the market was accounted for as transporting, labour charge, local taxes, etc.

(xvi) Bullock labour :

In the case of hired and owned bullock labour no charges were accounted as bullocks are not used by the farmers in Nagaland.

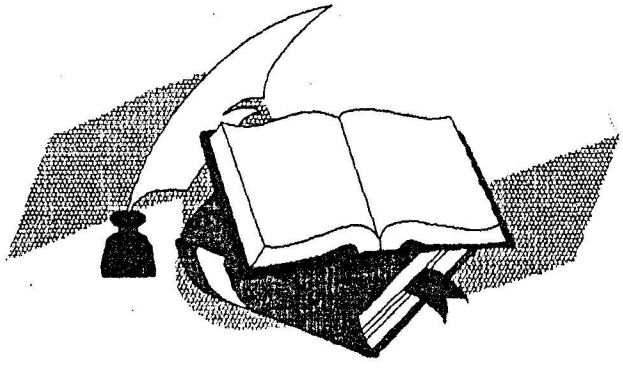
3.5.2 Procedure for the evaluation of farm assets

1. Owned land : Land was valued at the rate prevalent in the village taking into account the difference in soil, distance from village or town, source of irrigation, etc.

2. Farm buildings : Valuation was done on the basis of prevailing values in the villages.

3. Implements : Evaluated on the basis of their prices prevailing in the villages.

4. Draught animals : Not taken into consideration.



VITA

9. VITA

YHOME KEKHRIELETUO

A Candidate for the degree of

MASTER OF SCIENCE (AGRICULTURE)

Title of the thesis	:	"Economics of production and marketing of pineapple, orange and guava in Nagaland state".
Major field	:	Agricultural Economics
Biographical information	:	
- Personal	:	Born on 5th Dec. 1971, at Kohima capital of Nagaland. Son of Shri. Thepfukielie Yhome. Married to Dziesebeinuo (M.A. Delhi) on 28th Oct. 1998.
Educational	:	Schooling completed upto class IV from Christ King School Kohima. Completed upto X from Don Bosco School Kohima. Passed out P.U.Sc. from NEHU. B.Sc. Agril from college of Agriculture, Pune.
Professional	:	Joined service as VEW on 18 Nov. 1995 in Deptt. of Agriculture. Passed NPSC exams. in 1997 and is posted as Farm Manager at Govt. Seed Farm Tizit, Mon district in Nagaland.