AN ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF TURMERIC IN KERALA AND ANDHRA PRADESH

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KERALA, INDIA
2022

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by

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THESIS

Submitted in partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN AGRICULTURE

Faculty of Agriculture
Kerala Agricultural University

DEPARTMENT OF AGRICULTURAL ECONOMICS

COLLEGE OF AGRICULTURE

VELLAYANI, THIRUVANANTHAPURAM – 695522

KERALA, INDIA

2022

DECLARATION

I, hereby declare that this thesis entitled "**AN ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF TURMERIC IN KERALA AND ANDHRA PRADESH**" is a bonafide record of research work done by me during the course of research and the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

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Place: Vellayani

Date: 14/02/2022

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CERTIFICATE

Certified that this thesis entitled "**AN ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF TURMERIC IN KERALA AND ANDHRA PRADESH**" is a record of research work done independently by **Mr. Akkidasari Venkatarao (Admn. No. 2019-11-022)** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to him.

Place: Vellayani

Date: 14/02/2022

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ACKNOWLEDGEMENT

I would like to take this opportunity to express my heartfelt gratitude and deep regard to my research guide, ***Dr. Thasnimol F.****, Assistant professor Department of Agricultural Economics for her exemplary guidance, valuable feedback, patience and constant encouragement throughout the duration of my research. Working under her was an extremely enriching experience for me which has helped not just in academics but beyond it.*

I sincerely accentuate my everlasting gratitude to the revered members of my advisory committee, ***Sri. T. Paul Lazarus*** *Assistant Professor (SS) & Head Department of Agricultural Economics,* ***Dr. Aswathy Vijayan*** *Assistant professor, Department of Agricultural Economics,* ***Dr. Pratheesh P. Gopinath,*** *Assistant professor, Department of Agricultural Statistics and* ***Dr. Sonia N.S.*** *Assistant Professor, Department of Spices and plantation crops for their keen interest, ardent support and persistent encouragement showered to me during the entire period of my research. Also, I acknowledge with great pleasure the manifold assistance rendered by* ***Dr. Durga A. R****, Assistant professor, Department of Agricultural Economics, College of Agriculture, Vellayani.*

I am also thankful to my seniors Supriya, Vijay, and Stephen and my batch mates Meera Raj R.R, Akhila V, Krishnendu, Harsha M.B and Jerin V A and my juniors Koulath and Asmitha for their selfless help, encouragement, moral support and fulfilment of classroom environment during the entire course of study. I also thank my friends Madhuri mani, Sandhya Neelima, Satheesh and Pradeep for their support and guidance for completing my M. Sc. programme.

I am most indebted to my father A. Narasimham, mother A. Guravamma and brothers A. Narasaiah, A. Venkata narasaih and A. Venkateswarlu. for their blessing, constant encouragement, moral support and blessings without which I would not have completed this research work.

I dedicate this thesis to my brother Mr. Akkidasari Narasaiah. Without his guidance, encouragement, support, understanding and most of all love, the completion of this Master's would not have been possible.

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BCR	Benefit Cost Ratio
et al	Co workers
FYM	Farm Yard Manure
GOI	Government of India
GOK	Government of Kerala
HSC	Higher Secondary
IRDP	Integrated Rural Development Programme
KAU	Kerala Agricultural University
MFC	Marginal Factor Cost
MOP	Muriate of Potash
MPP	Marginal Physical Product
MVP	Marginal Value Product
OLS	Ordinary Least Squares
R^2	Coefficient of Multiple Determination
VIF	Variance Inflation Factor

LIST OF SYMBOLS

^{0}C	Degree Celsius
ha^{-1}	Per hectare
%	Per cent
₹	Rupees
<	Less than
>	Greater than
≤	Lesser than or equal to
ha	Hectares
kg	Kilogram
Sq.km	Square Kilometre
kg^{-1}	Per Kilogram
M	Metre
mm	Millimetre
MT	Million tonnes
T	Tonnes
q	Quintal

Introduction

1. INTRODUCTION

Spices are defined as "a strong flavoured or aromatic substance of vegetable origin, obtained from tropical plants, commonly used as a condiment or employed for other purposes on account of their fragrance, preservation or medicinal qualities". India plays a vital role in global spice market. In ancient times, most of the spices produced in India were exported worldwide. Since then, Indian spices have attracted foreigners and they have come to India for the spice trade.

India enjoys a pre-eminent position in spice production in the world and is called the 'country of spice'. During 2019-20, India produced 1,01,25,880 tonnes of spices in an area of 43,17,552 ha with a productivity of 2.34 tonnes per hectare. (GOI, 2020). According to the International Organization for Standardization (ISO), out of the 107 spices, India grows about 65 spices as per their suitability in different agro-climatic conditions. Turmeric is one of the essential spices used as an important ingredient in culinary all over the world (Venkatachalam and Muthukumar, 2014).

Turmeric (*Curcuma longa L.*) is native to India. The tuberous rhizomes or underground stems of turmeric have long been used as condiments, as a dye and as an aromatic stimulant in several medicines. Turmeric, an ancient and sacred spice of India known as 'Indian saffron', is an important commercial spice. Turmeric powder is the most prime ingredient in Indian cuisine. Ayurvedic experts have identified turmeric as the most powerful herbal powder on earth. Turmeric has been used as a medicine in traditional Ayurveda for many years. Curcumin, an extract from turmeric, inhibits certain types of viruses, including dengue virus, hepatitis B, and Zika virus. It also reduces the risk of diabetes, growth of cancer, and heart diseases (TOI, 2021).

Indian turmeric is considered the best in the world because of its high curcumin content. In India, the majority of the farmers are growing local varieties due to its high curcumin content. The various varieties of turmeric that are traded in India are Allepey finger (Kerala), Erode turmeric (Tamil Nadu), Salem turmeric (Tamil Nadu), Rajapore turmeric (Maharashtra), Sangli turmeric (Maharashtra), Nizamabad bulb (Telangana), etc.

Globally, India was the largest producer, consumer and exporter of turmeric (Rohini and Murugananthi, 2019). In India, it is cultivated in an area of 1,93,395 ha with a production of 10,51,160 tonnes (GOI, 2017). India dominates the world production scenario contributing 78 per cent, followed by China (8%) and Myanmar (4%). In the case of export, turmeric ranks third in the total exports of spices from India. The share of turmeric in the export of spice was 11.39 per cent while, in the case of value, turmeric contributed around 5.83 per cent of total spice value. (GOI, 2020).

In India, southernmost states like Telangana, Karnataka and Andhra Pradesh together contribute around 60 per cent of total production. Major turmeric growing states are Telangana (55,444 ha), Maharashtra (54,248 ha), Andhra Pradesh (29,717 ha), Odisha (27,869 ha), Karnataka (20,740 ha), Tamil Nadu (18,532 ha), etc. (GOI, 2019). But, when compared to the southern states, area and production of turmeric were less in Kerala.

In India, Andhra Pradesh occupied the third position in the acreage of turmeric after Telangana and Maharashtra. In the case of production, the state occupied the fifth position after Telangana, Maharashtra, Karnataka and Tamil Nadu. The productivity of turmeric in Andhra Pradesh was 2.4 tonnes per hectare. (GOI, 2020). The major turmeric growing districts of Andhra Pradesh are Visakhapatnam, Guntur, Kadapa, Krishna and Kurnool. Visakhapatnam district is the prime one in the cultivation of turmeric in Andhra Pradesh. It alone occupies an area of about 11,286 hectares, with a production of about 1,35,432 tonnes during 2018-19 (GOAP, 2020).

Similarly, the area and production of cured turmeric in Kerala were 2,778 ha and 8,822 tonnes, respectively, during 2018. In Kerala, Palakkad district has the largest area and production of turmeric, with 655 ha and 2,366 tonnes, respectively (GOK, 2020). While in productivity, Kannur occupied the first position (5,022 kg/ha^{-1}), followed by Idukki (4,169 kg/ha^{-1}) and Pathanamthitta (3,819 kg/ha^{-1}).

Cost of cultivation data of important crops helps to identify the cost incurred for the cultivation of those crops in a unit area of land, and such data is relevant for fixing policy regarding the scale of finance. Input-wise and operational-wise costs of an important crop help to identify the cost structure for the production of the crop, and that

enables the farmers to take suitable measures based on the cost. Moreover, through economic analysis, the farmers came to know about the profitability of the enterprise and the possibility of including that enterprise in his farm to achieve maximum profit.

The demand for turmeric is very high in both domestic and international markets, and the crop contributes a significant share in foreign earning. Hence, in addition to the domestic requirements, the production has to meet the export requirements also. To increase production, productivity needs to be increased through the efficient utilisation of available resources. Moreover, prudent use of the resources may also help to reduce the cost of cultivation. In this context, the analysis of existing resource use and allocative efficiency of important resources placed paramount importance.

As an internationally traded commodity, turmeric is facing frequent price fluctuation. Several studies have shown that price fluctuation was the prime marketing constraint faced by the farmers (Yadav *et.al.*, 2012; Singh *et. al.*, 2012; Lakshmi, 2017). Frequent price fluctuation and low price of turmeric affected both farmers and traders. It has been proved that the increase in production and productivity alone cannot improve the profitability of any crop. Better price is the main requirement for the farmers to remain in the production of a crop. An efficient marketing system not only provides reasonable prices to the farmers but also helps to maintain stable prices. Further, an analysis of the marketing system helps to know about the involvement of marketing intermediaries and the extent of price spread. Thus, it is necessary to study the economics of marketing to make suitable micro-level policies relevant to the study area.

In this context, the present study has been proposed to assess the economics, input use pattern and resource use efficiency of turmeric cultivation in Kerala and Andhra Pradesh, to estimate the marketing efficiency, and to analyse the constraints in the production and marketing of turmeric.

SCOPE OF THE STUDY

A comparative analysis of the production and marketing of turmeric between Kerala and Andhra Pradesh would help the researchers to suggest appropriate and specific recommendations on the production and marketing-related aspects to the farmers in Kerala and Andhra Pradesh to get better income from their produce. The study may also help the policymakers to make suitable policy interventions to improve the production and export earnings from the crop.

LIMITATIONS OF THE STUDY

The study is based on the responses of farmers from the Palakkad district of Kerala and Visakhapatnam district of Andhra Pradesh, and hence generalizations need not be quite accurate. The primary data collected from sample respondents play a prominent role in the perfectness of any social science research. The present study mainly used the primary data collected from farmers and market intermediaries through a pre-tested interview schedule. As the farmers are not in the habit of keeping records, the accuracy of the data depends on their memory and is subjected to recall bias. However, the data was cross-checked to minimize the errors and misapprehensions.

ORGANIZATION OF THE THESIS

The thesis entitled "An economic analysis of production and marketing of turmeric in Kerala and Andhra Pradesh" is presented under the following five headings. The first chapter 'Introduction' comprises the detailed background of the problems, objectives, and scope and limitations of the study. Similar works in the same and related areas are presented in the second chapter 'Review of literature'. The third chapter is on 'Methodology', which includes the description of the study area, sources of data, method of data collection and different statistical tools used for the analysis of collected data. The results of the study have been presented with proper discussion in the fourth chapter "Results and discussion". A summary of the overall results and the main findings of the

study along with the policy implications that emerged are presented in chapter five, 'Summary and conclusions'.

FUTURE LINE OF WORK

It is important from the producer's as well as consumer's point of view to study the price behaviour of turmeric. Similarly, the market information relating to market price and arrival over a period of time also helps the farmers to decide on the future production pattern and scale of production of the commodity. As an internationally traded crop, it is better to analyse the direction of trade and concentration of market share to take appropriate policies at the macro level to retain good market share in the importing countries.

Review of literature

2. REVIEW OF LITERATURE

2.1 ECONOMICS OF TURMERIC CULTIVATION

Lokesh and Chandrakanth (2003) studied the economics of turmeric cultivation in Karnataka and estimated that per hectare cost of cultivation of turmeric was Rs.30,153. Human labour accounted for the highest share of about 30 per cent of total cost of cultivation, followed by rental value of land (16.6%) and planting material (11.9%). The average yield was 30 quintals which valued around Rs.70,800/-. The net return was Rs.40,647 and the benefit-cost ratio was1:1.34.

Sripushpavani (2006) compared the cost of cultivation of turmeric for small, large and pooled farms. The cost of cultivation for small, large and pooled farms were Rs.92,671.26 ha^{-1}, Rs. 87,143.01 ha^{-1} and Rs.89,519.32 ha^{-1}, respectively, and thus proved an inverse association with the cost of cultivation and size of the farm. In total cost, human labour accounted the high share (23.03%) followed by seed material (21.04%), rental value of owned land (14.86%), manures and fertilizers (14.71%) and bullock labour (14.70%). The per hectare yield of turmeric was high in small farms, and it was around 75.98 quintals, and on large farms, it was 72.26 quintals. The net income per rupee of expenditure on small, large and pooled farms were 0.93, 1.03 and 0.97 respectively, indicated that turmeric cultivation on large farms was more profitable when compared to small farms.

Patil *et al.* (2009) examined the economic aspects of production, processing and marketing of turmeric in Western Maharashtra. The estimated cost of turmeric cultivation was Rs. 84,420.56 per hectare. The fresh rhizomes earned the returns Rs. 1,08,692.91 per quintal, with a cost of production of Rs. 724.91 per quintal and a benefit-cost ratio of 1.33. The per quintal cost of processing of the fresh rhizomes was Rs. 156.25. In overall processing cost, human labour accounted the high share of about 44.10 percent, followed by machine labour (27.73%), utensil expenses (21.34%) and fuel (6.82%).

Mane (2011) analyzed the economics of turmeric production in the Sangli district of Maharashtra and showed that the per quintal cost of production in turmeric was Rs.

1,501.09, Rs. 1,485.46 and Rs.1,475.75 for large, medium and small farms. At the same time, net profit was high in small farms (Rs. 3,52,053.97/ha), followed by medium (Rs. 3,44,388.94/ha) and large farms (Rs.3,33,662.36/ha).

Bharathi *et al.* (2012) analyzed the economics of ginger cultivation in Uttar Kannada district of Karnataka and observed that the cost of cultivation incurred for the small farmers was high (Rs. 89,435.17) when compared to medium (Rs. 87,203.3) and large (Rs. 87,015.34) farmers. However, there was no substantial difference between small, medium, and large farmers.

Jagtap *et al.* (2012) studied the economics of chilly production in India and revealed that cost C was found to be Rs. 40,541.72, Rs. 42,811.07 and Rs.53,421.29 per acre for small, medium and large farmers, respectively. Net returns over cost C were Rs.19,329.52, Rs. 24,114.79 and Rs.21,400.51per acre, respectively, and input-output ratios at cost C was 1:1.48, 1:1.56 and 1:1.40 for small, medium and large farmers, respectively.

Singh *et al.* (2012) analyzed the profitability of turmeric production in Punjab. The estimated total variable cost and gross returns were Rs. 66,304 and Rs. 1,37,322 ha^{-1}, respectively. The computed Benefit – Cost (BC) ratio was 2.07 and it indicated that one rupee expenditure would yield more than double the income.

Naik (2013) studied the production, marketing and export performance of turmeric in various districts of Karnataka. Per acre average cost of cultivation, gross returns, net returns and B:C ratios of turmeric in Chamarajnagar district, Mysore district, Bagalkot district and Belgaum district were (Rs.77,263, Rs. 1,95,049, Rs. 98,511 and 2.02), (Rs. 76,985, Rs. 191909, Rs. 95174 and 1.98), (Rs. 82,949, Rs. 2,02,029, Rs. 98,543, and 1.96) and (Rs. 83,402, Rs. 1,75,099, Rs.72,590 and 1.71), respectively. The majority of the total costs were accounted for by seeds, human labour, and farmyard manure

Kiruthika (2013) estimated that the cost of cultivation of turmeric was Rs.2,02,220 ha^{-1}, Rs. 1,73,883 ha^{-1} and Rs. 1,61,644 ha^{-1} for marginal, small and large farms, respectively. The cost of production per kg was found to be Rs. 26.81, Rs. 22.49 and

Rs.19.64 respectively for marginal, small and large farms. The estimated net returns were Rs.99,380, Rs. 1,35,317 and Rs. 1,67,556 respectively for marginal, small, and large farms and it was showing an increasing trend as the size of the farms increased.

According to Olayiwola (2013), the cost of chilli cultivation (Cost C) for small, medium, and large farmers was Rs. 34,225.05, Rs. 38,612.48, and Rs. 42,086.84, respectively. The average net returns over cost C were Rs.50,281.19, Rs.37,140.11, and Rs.38,465.30 for small, medium, and large farmers, respectively, with input-output ratios at cost C of 1.43, 1.72, and 1.76.

Janailin and Tripathi (2014) reported that the average yield of fresh turmeric in Jaintia hills district of Meghalaya was 49 quintal per hectare. The average cost of production was Rs.15.68, Rs. 60.93 and Rs.70.17 per kg for fresh, semi-processed and processed forms, respectively.

Karthik and Amarnath (2014) studied the economic analysis of turmeric cultivation in Tamil Nadu and finding that the cost of turmeric cultivation was Rs.11,987.75/ha. The gross income and net income were Rs. 2,47,754.92/ha and Rs. 1,27,881.17/ha, respectively.

Sekhar *et al.* (2014) studied strategies to enhance garlic production in Tamil Nadu and observed that the annual fixed cost for producing garlic for an acre was Rs. 21875 and the variable expenses involved in producing the garlic crop per acre was Rs. 68975. The post-harvest expenses incurred by the farmer was Rs.4300 including transportation. Altogether the total cost of realizing the output of Garlic per acre was arrived at Rs. 95,150.

Singh and Singh (2015) conducted a socio-economic analysis of ginger cultivation in Himachal Pradesh and revealed that the return from ginger cultivation was Rs.1,13,324 per hectare. The estimated Benefit-Cost Ratio (BCR) at total variable cost and total cost was 2.62 and 1.17, respectively. The cost A_1, A_2, B_1, B_2, C_1, and C_2 were calculated to be Rs. 67,320, Rs. 67,320, Rs. 76,636, Rs. 1,44,270, Rs. 89,564 and Rs.1,57,198 respectively. All income measures per hectare were found to be positive. Family labour income, farm

business income, net income and returns per rupee were Rs. 39,138, Rs. 1,16,087, Rs. 26,209 and Rs. 1.17, respectively.

Shivayogi *et al.* (2015) conducted an economic analysis of garlic production in northern Karnataka and revealed that the total cost incurred by garlic growers of Ranebennur taluk (Rs. 42,929.49) was slightly higher than that in Kundagol taluk (Rs. 39,773.27). Kundagol farmers had a higher marketing cost of Rs.3,726.43, while Ranebennur farmers only incurred Rs.832.27 for marketing. However, when comparing the farmers of Ranebennur with the Kundagol farmers, it was found that the total cost of production in Ranebennur (Rs. 43,761.88) was higher, and gross return (Rs. 1,22,598.54). was higher for Kundagol farmers.

Banjare (2016) studied the economic analysis of production and marketing of major spices in Rajgarh district of Chattisgarh and finding that the cost of cultivation of chilly was Rs. 93,724.87 ha^{-1} and it was greater for large farms when compared to marginal farms. The cost of cultivation for large, medium, small and marginal farms were Rs. 1,02,206.53 ha^{-1}, Rs. 97,109.74 ha^{-1}, Rs.91,774.96 ha^{-1} and Rs. 87,161.97 ha^{-1}, respectively.

Yogesh (2017) worked out the management of black pepper economy in Kodagu district of Karnataka. Total establishment cost, average total maintenance cost and BCR were estimated as Rs.85,960, 67,254and 2.45, respectively. In total fixed cost, the share of amortized establishment cost was high and it was Rs.12,979 followed by rental value of land (Rs.8,000). Input cost comprises the highest share (Rs.21,550) followed by labour cost (Rs.18,950) to the total variable cost (Rs.43,025).

Chinnadurai *et al.* (2018) studied the economics of turmeric cultivation in Erode district of Tamil Nadu and describes that the average cost of cultivation of turmeric in the district was Rs.2,45,577.08 ha^{-1}. The computed cost A_1 and cost A_2 were Rs.1,73,095.18 ha^{-1} and Rs. 1,82,169.58 ha^{-1}, respectively. The net return from per hectare cultivation of turmeric was Rs. 57,262.92, and it was the highest in the case of large farms (Rs. 60,937.40

ha^{-1}), followed by medium (Rs. 58,199.61 ha^{-1}) and semi medium farms (Rs. 55,893.35 ha^{-1}).

Kumar *et al.* (2018) worked on an economic analysis of production and marketing of turmeric in the Guntur district of Andhra Pradesh. The cost incurred by small, medium and large size farms was Rs. 1,44,525.20 ha^{-1}, Rs. 1,39,161.80 $ha^{-1}$and Rs. 1,26,011.60 ha^{-1}, respectively. The gross returns of small, medium and large farms were Rs. 3,61,400 ha^{-1} and Rs. 3,44,500ha^{-1} and Rs. 3,07,450 ha^{-1}, respectively and the net returns were Rs. 2,16,874.80 ha^{-1} and Rs. 2,05,338.20 ha^{-1} and Rs. 1,81,438.40 ha^{-1}, respectively for small, medium and large farms.

Abeynayaka *et al.* (2020) investigated the economics of turmeric production in major turmeric growing districts of Sri Lanka. The findings revealed that labour expenses accounted for the higher percentage of total costs (69.47%), followed by material costs (26.75%), machinery costs (1.76%), and miscellaneous expenditures (2.03 %). The calculated BC ratio was 2.08, indicating that turmeric cultivation in the studied region was a profitable enterprise.

Bhuvana (2020) studied "an economic analysis of turmeric production in the Nirmal district of Telangana". The analysis found that variable cost accounted for 93.41 percent of total costs, while fixed costs accounted for 6.59 percent. In total variable cost, seed cost accounted for the major share (36.29%), followed by manures and fertilizers (15.18%) and interest on working capital (9.25%). The cost of production incurred by the marginal farmers and small farmers was 1.13 lakhs and 1.45 lakhs rupees per acre, respectively. In fixed cost, rental value of owned land accounted for the major share.

Dhok *et al.* (2020) conducted a study on the cost of cultivation of turmeric in Sangli district of Maharashtra. The computed Cost-A, Cost-B, and cost-C were Rs. 1,67,905, Rs. 2,91,440 and 3,09,138 per hectare respectively. The gross return obtained was Rs. 7,39,170.00 per hectare. The computed income measures like farm business income, family

labour income and net profit were Rs.5,71,264, Rs. 4,47,729 and Rs. 4,30,031 respectively, in turmeric production. Finally, the output-input ratio was found to be 2.39.

Bishnoi *et al.* (2020) conducted a study on economics of turmeric production and farmer's perception on new marketing methods in the Samastipur District of Bihar. The average cost of cultivation was Rs. 53,700 per acre. In total cost, the share of organic manure was high (37%), followed by cost of manures and fertilizers (22%), labour cost (19%) and rhizome cost (19%). The usage of plant protection chemicals was very less in the study area and it accounted for about 3 per cent only.

Govindasamy *et al.* (2021) estimated the costs and returns of turmeric cultivation in Coimbatore district. It was found that when compared to small farmers the total cost incurred by the large farmers was relatively high *i.e.,* Rs.1,10,597. Whereas in gross return, the small farmers earn more return (Rs.2,23,333) than that of large farmers due to the high yield obtained by the small farmers. They also computed the benefit-cost ratio and found the ratio was more for small farmers (1.08) as compared to large farmers (0.86).

Jaiswal*et al.* (2021) conducted a case study of Sambhav farmer producer organization in the Raigarh district of Chhattisgarh. It has been observed that the per hectare cost of cultivation of turmeric was estimated as Rs.1,37,835, Rs.1,46,375, Rs. 1,48,103 and Rs. 1,57,683 respectively for marginal, small, medium and large farmers. In total cost, the expenses towards labour accounted for the major share of about 32.70 per cent, followed by seed cost (22.79%).

2.2 STUDIES ON INPUT USE PATTERN AND RESOURCE USE EFFICIENCY

Inbasekar (2011) analysed the resource use efficiency of turmeric production in Warangal district of Andhra Pradesh using Cobb-Douglas production function. It was observed from the analysis that for marginal farms, the factors like planting material, labour, and organic manure were positively and significantly influenced the yield of turmeric. Similarly, fertilizers and irrigation were positively and significantly influenced the yield of turmeric in small farms, while human labour and irrigation were positively

influenced the yield of turmeric in large farms. Return to scale was observed as 1.01, 1.38 and 1.42, respectively for marginal, small and large farms.

Wosor and Nimoh (2012) studied the economic efficiency of chilli production in Ghana. The Cobb- Douglas production function was used to determine the resource use efficiency, and the results revealed that seeds and farm size were significantly contributed to the yield of chilly. The Marginal Value Productivity (MVP) to Marginal Factor Cost (MFC) ratio was unity for both owned labour and hired labour indicating the efficient utilization of these resources. The ratio of MVP to MFC was found to be less than unity for those inputs like seeds, fertilizers, foliar fertilizers, pesticides and farm size, indicating its overutilization.

Amarnath and Sridhar (2012) fitted the Cobb-Douglas production function to determine the efficiency of different factors in the production function of organic turmeric. The study revealed that farmyard manure, neem cake, jeevamrutham, vermicompost, panchagavya and human labour contributed significantly to the yield of organic turmeric. The MVP to MFC ratio was found to be greater than one for all these resources, indicating their underutilization.

Karthick *et al.* (2013) determined the efficiency of each variable in the production of turmeric in Tamil Nadu. The estimated R square value of fitted regression was 0.58, which indicated that 58 percent of the variations in the turmeric yield were influenced by the variables included in the model. Except potash, all variables included in the model (planting material, nitrogen, potash, harvesting and curing, machine hours, and irrigation) were found to be positively and significantly influence the yield of turmeric.

Khose *et al.* (2013) analysed the resource productivity and resource use efficiency of turmeric production in Yavatmal district of Maharashtra using the Cobb-Douglas production function. The result revealed that bullock labour was found to be significant at a 10 per cent level and other variables like human labour, rhizomes, manures, nitrogen, and phosphorous were showed non-significant results. About 63 per cent variation in the yield

was explained by all these variables in the model. For small and medium farms, the marginal value product to the factor cost ratios of selected variables were less than one and negative, indicating the excess use of these inputs.

Kiruthika (2013) studied the input use efficiency of turmeric production in Erode district of Tamil Nadu. Production function analysis revealed that planting material, labour, organic manures and chemical fertilizers were significantly influenced the yield of turmeric. The MVP to MFC ratios of all the variables were found to be greater than one indicating underutilization of these inputs.

Naik (2013) analysed the resource use efficiency and technical efficiency of turmeric in northern Karnataka. The data were analysed using Cobb- Douglas production function and Timmers output-based method of technical efficiency. The study revealed that MVP to MFC ratios for planting material, chemical fertilizers and plant protection chemicals were more than unity for the Belagavi district, indicating the underutilization of these resources. while in Bagalkot district, the ratios were found to be more than one for bullock labour, machine labour and chemical fertilizers, indicating the sub-optimal use of resources in the selected district. The study also reported that due to the traditional cultivation practices, around 50 per cent of farmers were operating with less than 90 per cent of technical efficiency.

Kumar (2014) reported that on average, farmers of fenugreek production employed 66 man-days of labour and 22 hours of machinery services per hectare. Similarly, the average amount of seed, urea and Di- Ammonium Phosphate (DAP) applied were 26, 30 and 28 kg per hectare respectively. The highest level of output was obtained from small farms (1,888kg), and it declined with an increase in the size of the farm.

Karthik and Amarnath (2014) fitted the Cobb-Douglas production function to examine the resource use efficiency in the cultivation of turmeric. They found that the regression coefficients of planting material, potash, harvesting and curing, machine hours

and irrigation were positive and significant at one per cent level with the coefficient values of 0.29, 0.15, 0.24, 0.32 and 0.33, respectively.

Sheikh *et al.* (2014) analysed the resource use efficiency of turmeric cultivation under conventional and modern methods in Northern Karnataka and revealed that the inputs included in the model explained 90 per cent (traditional farmers) and 94 per cent (modern farmers) of the variations in the turmeric output as revealed by the coefficient of multiple determination. The summation of regression coefficients indicated decreasing returns.

Noushad (2015) analysed the economics of production and marketing of small cardamom in Kerala. To know the factors influencing the productivity of the cardamom, they fitted the production function. The estimated R^2 value of fitted regression was 0.97 and it indicated that 97 per cent of variation in the productivity of cardamom is contributed by all the factors in the selected model.

Tirlapur and Mundinamani (2015) analysed the resource utilization pattern of rainfed chilly using the Cobb-Douglas production function. The computed result revealed that seed, plant protection chemicals, bullock labour, and machine labour were over-utilized, and farmyard manure, fertilizer and human labour were under-utilized by the farmers.

Singh and Singh (2015) studied the economics of ginger cultivation in Himachal Pradesh. The estimated regression coefficient was 0.48, indicating that 48 per cent of the variation in the dependent variable is contributed by all the independent variables together in the model. They further revealed that expenses on fertilizer and machine labour had a positive effect on the productivity of ginger. The coefficients of other variables like plant protection chemicals, human labour and area under ginger crop were found to be positive but non-significant.

2.3 STUDIES ON THE MARKETING EFFICIENCY

Ghumatkar (2003) analysed the marketing of garlic in Pune district of Maharashtra.The study reported that the marketing cost incurred by the village merchant was higher when compared to the wholesaler and retailer. Producer share in consumer rupee was highest in channel -IV (93.49%) followed by channel- I (88.36%), channel-III (84.23%) and channel-II (80.36%).

Kumar (2007) studied the marketing channels, costs, margins and price spread in the marketing of ginger. Three major marketing channels were identified in study area. Among three channels the producer's share in the consumer's rupee was the highest in channel I (90.12 %), compared to channel II (62.66 %) and channel III (58.91 %), and it indicated the channel's inverse relation with the number of intermediaries.

Barkade *et al.* (2011) worked out the economics of onion cultivation and its marketing pattern in Satara district of Maharashtra. The estimated producer's share in consumer's rupee was the highest (93.06%) in channel I (producer- consumer) and the lowest (68.82%) in channel IV (producer-wholesaler-retailer-consumer). Marketing efficiency was observed to be highest in channel-I.

Kumar *et al.* (2011) studied the marketing of coriander in Jhalawar district of Rajasthan and identified four main marketing channels. Among four, channel I (producer - commission agent – wholesaler – retailer – consumer) was the predominant marketing channel in the study area because 80 per cent quantity was marketing through this channel. The cost incurred for marketing per quintal of coriander was Rs.811, Rs.723, Rs. 226 and Rs.136, respectively for channel I, channel II, channel III and channel IV. The marketing cost was lowest in channel-IV due to the smaller number of intermediaries. Marketing margins earned by different marketing agencies were the highest in channel-III (Rs 723 per quintal) and the lowest in channel-II (Rs 276 per quintal). The producer's net share was maximum in channel-IV (96.70%) and minimum in channel I (76.82%).

Amarnath and Sridhar (2012) conducted comparative analysis of marketing of organic and inorganic turmeric in Tamil Nadu. The study has identified five marketing channels in the district. When compared to inorganic turmeric, price spread of organic turmeric was less in all the channels, since the marketing cost in organic turmeric was lower. The producer's share in consumer rupee (76.99%) and marketing efficiency index were found to be highest in Channel IV, (Farmer- Regulated market- Retailer- Consumer) due to the absence of a wholesaler and better regulation in this channel as well.

Gummagolmoth (2012) examined the trends in marketing and export of onion in India and observed that the producer's share in consumer rupee was very low in channel-I. It was 49.96 per cent for Karnataka and 51.90 per cent in the case of Maharashtra. This study attempted to account for postharvest losses at various stages by treating them as a marketing cost.

Vinod (2013) studied an economic analysis of production, marketing and export performance of turmeric in Karnataka. Four marketing channels were identified in the study area. Channel-I: producer- commission agent-wholesaler-retailer-consumer; channel-II: producer- distant market commission agent; channel-III: producer-APMC; channel-IV: producer-commission Agent-processors. The estimated marketing costs was more in channel-II than channel-I and channel-III. The producer's share in consumer's rupee was more in channel-IV than in channel-I due to a smaller number of market intermediaries.

Shaikh (2013) examined comparative management appraisal of traditional and modern turmeric cultivation in the Belgaum District of Karnataka. He reported that the marketing cost incurred by traditional farmers was seen to be high *i.e.,* Rs. 207.97 per quintal whereas for modern farmers it was Rs. 158.24 per quintal. The prime difference in cost was observed with respect to storage losses and rent on shop and godown. The storage loss was very high and attributed to 47.31 per cent and 29.78 per cent of marketing costs for traditional and modern farmers. Rent on shop and godown was the next highest having, 11.44 percent and 16.58 percent for traditional and modern farmers respectively. Grading

of the turmeric incurred the highest share in modern farmers (Rs. 22.63) compared to traditional farmers it is Rs. 19.47. The transportation cost share was seen almost same, having around eight per cent each.

Prabhavathi *et al.* (2013) studied supply chain of red chillies in India. Two major channels have been identified and the analysis revealed that channel II is more efficient than the channel I. The study showed that farmers who bring good quality chillies mostly preferred channel-II over channel-I, but farmers who bring poor quality were preferring supply chain-I.

Thirumalesh and Bhagyalakshmamma (2014) examined the marketing of chilli production in Kurnool district revealed that the large proportion of chilli farmers sold their produce to the commission agents, followed by wholesale traders. The average price per quintal received by the growers in the study area varied between Rs.6,000 to Rs.4,000.

Hameedu (2014) examined the supply chain of cardamom in Kerala and observed that majority of the farmers were not conscious about the quality of the product. Marginal and small farmers always sold their produce, without sorting or drying. They normally sold their produce to the local traders who given reasonable price. Absence of grading system at producer's level and lack of access to market information were the major problems of cardamom cultivation in Kerala.

Shireesha (2015) in her study on "Influence of futures market on price behavior of turmeric in India" identified two important marketing channels for turmeric powder in domestic market. Channel I: Producer - Regulated Market - Commission agent – Wholesaler - Secondary Wholesaler cum Processor – Retailer – Consumer and Channel II: Producer - Village merchant - Regulated market - Commission agent - Wholesaler - Secondary wholesaler cum Processor - Retailer – Consumer. The producer's share in consumer's rupee was high in Channel I (50.56%) compared to Channel II (46.11%).

Noushad (2015) conducted a study on economics of production and marketing of small cardamom in Kerala. The study identified that the Channel-I: producer →

local/domestic trader's → wholesaler's → exporter's → consumer's and Channel-II: producer → auctioneer → licensed traders →wholesalers →exporter → consumers were the two major marketing channels of small cardamom in Idukki district which involves the movement of more than 80 per cent of the produce. They also noted that channel II is more efficient owing to the low marketing cost and low-price spread. Here the producer's receives maximum price because of auction.

Mathew *et al.* (2016) studied the economic analysis of ginger in Wayanad district of Kerala". Marketing costs, price spread, producer's share, marketing issues, etc., were analysed and suggested the effective remedial steps to strengthen ginger marketing. It was observed that most farmers (60%) sold their produce via., channel-I, indicating the most prominent channel in the study area of research. Marketing cost and margin analysis revealed that the producer 's share of consumer's rupee in channel-II (54.76%) was higher than that of channel-I (52.53%).

Meena *et al.* (2016) analysed the onion marketing in Rajasthan and revealed that among the identified two channels, Channel I was more efficient as the producer's share in consumer's rupee was higher (47.50%) when compared to channel II. The total cost of marketing in channel- I was 18.43 per cent of consumer price and 18.73 per cent of consumer's price in channel-II. The marketing margin was observed highest in channel-II (41.27 %) compared to channel-I (34.07 %).

Bagde *et al.* (2017) conducted a study on the marketing of betel leaves and identified three major marketing channels. The total marketing cost of Channel I (Producer-Consumer) was Rs.30 per kilogram, while it was Rs.66.00 and Rs.140.39 per kilogram, respectively in channel II (Producer-Retailer-Consumer) and channel III (Producer-Wholesaler- Retailer- Consumer). A high margin was observed in Channel III. In channels I and II, marketing efficiency was more than one, thus these channels in the marketing of betel leaf were more efficient than channel III.

Rohini and Murugananthi (2019) analysed the economics of turmeric production in Tamil Nadu. The computed BC ratio was 1.53, which indicated the profitability of turmeric cultivation in the study area. They identified three marketing channels for the produce. Among three, the third channel (please mention the channel) was efficient owing to the high producer's share in consumer's rupee.

Bishnoi *et al.* (2020) conducted a study on economics of turmeric production and farmers' perception of new marketing methods in the Samastipur district of Bihar. The study identified three major marketing channels. Channel-I: Farmers – Village trader – Wholesaler – Retailer – Consumer; Channel-II: Farmers – Retailers – Consumers; Channel-III: Farmers – Wholesalers – Retailers. Among all channel-II had more producer's share in consumer's rupee (68.61%) compared to channel-III (53.10%) and channel-I (31.30%).

2.4 STUDIES ON CONSTRAINS IN TURMERIC CULTIVATION AND MARKETING

Bhardwaj *et.al.* (2011) studied the challenges and constraints of marketing of Indian spices in India. The major problems faced by farmers were low productivity, poor product quality, poor post-harvest handling, insufficient mechanization of spice production and processing; and non-market orientation of agricultural extension. The problems of turmeric growers in Uttaranchal are inadequate price for producers, pest and disease problems and dependence on nature, poor availability of inputs and no proper crop insurance.

Yadav *et.al.* (2012) revealed that low and fluctuating prices, costly packing materials, high transportation cost, malpractices adopted in markets, high commission charges, non-availability of packaging materials, absence of open auction sale were the major constraints in the marketing of turmeric.

Singh *et.al.* (2012) analyzed the profitability of turmeric production in Punjab. They observed that severe infestation of weeds, lack of good planting material, scarcity of farm yard manure and labour, lack of market information and highly volatile prices were the major production and marketing constraints faced by the farmers.

Vinod (2013) studied an economic analysis of production, marketing and export performance of turmeric in Karnataka. Pest and disease attack, scarcity of labour during peak season, high production cost, and non-availability of quality planting materials were the major constraints faced by the turmeric farmers. Among these, scarcity of labour during peak season is the major constraint faced by majority of the farmers, as turmeric is a highly labour-intensive crop, more labour is required during planting, weeding, harvesting and processing. Even if labours are available, the labours demand more wage for doing various operations.

Mohan *et al.* (2013) studied the challenges of marketing of spices in India. They revealed that the present production of spices is around 3.2 million tonnes and valued at around four billion US dollars. India accounts for about 45 per cent (2, 50,000 tones) of the global spice exports, though exports constitute around eight per cent of the estimated annual production. The main challenge in the marketing of pepper, cardamom, coriander, ginger and turmeric in India is the inability to achieve the required development of the sector due to problems in marketing, supply chain, exports and post-harvest activities.

Bako *et al.* (2013) studied the factors influencing the adoption of ginger cultivation techniques in the Samaru zone of Kaduna state. The study reported that inadequate finance (43.30%), comparatively low ginger prices (37.30%) and farmer's conservatism (23.30%) were the major production constraints.

Ramappa (2013) analysed the conomics of arecanut cultivation in Shivamogga district of Karnataka. Lack of proper training on grading and storage, non-availability of organised local markets, exploitation by market intermediaries, labour problems, uncertainty of product demand, instability of prices, *etc.*, were the major production and marketing constraints faced by arecanut growers.

Nandeshwar *et al.* (2013) unveiled that high cost of inputs, losses due to climatic changes, uncertainty of prices, diseases and pest attacks were the prime restraints faced by vegetable growers during the production and marketing of vegetables.

Shehu *et al.* (2013) showed that inadequate funds (43.30%), poor prices (37.30%) and farmer's conservatism (23.30%) were the major constraints of ginger cultivation. They recommended the active role of extension agents in transferring technology to farmers and providing adequate access to low-cost agricultural credit facilities.

Vanrammawia and Thanga (2013) studied the marketing of ginger in Mizoram and reported that unorganized and non-transparent marketing channels, uncertain prices, ineffective market intervention by the state government were the major marketing constraints experienced by the farmers and traders.

Mohan *et al.* (2013) pointed out that poor productivity of spices, inferior product quality at farm level, inadequate surplus for exports and insufficient quantities of quality spices were the main challenges faced by the Indian farmers in the spice market.

Titilayo (2014) revealed that risk and uncertainty (81.56%), fertilizer inadequacy (80.31%), lack of modern agricultural equipment (76.25%) and poor credit facilities (74.1%) were the major restraints in ginger production.

Angles and Hosamani (2015) carried out the decomposition analysis to know the factors affecting turmeric output in selected south Indian states. The result revealed that the fluctuation in yield was the dominant factor affecting the output. They also gave some suggestions for stabilizing turmeric productivity like the development of location-specific varieties, the adoption of modern cultural practices and intensive cultivation.

Noushad (2015), conducted a study on economics of production and marketing of small cardamom in Kerala. Severe infestation of pest and diseases was the major problem faced by the cardamom farmers of Idukki district. While in the case of Wayanad, un availability of a HYV of cardamom suitable to Wayanad climatic condition was the major constraint faced by the farmer. This was the major factor which made a wide difference in productivity of cardamom between Wayanad and Idukki district and has got a score of 73.9.

Riku *et. al.* (2015) observed that poor transportation facility, small marketable surplus, lack of proper storage and processing facilities, poor government support, the problem of unnecessary deductions and lack of regulated market were the major marketing constraints encountered by the ginger farmers in the study area.

Jayanthi and Vaideke (2015) argued that improved extension contacts and mass media participation, enhanced government infrastructure, consortium of progressive farmers and proper storage facilities can overcome the production and marketing constraints of turmeric.

Kanagaraju and Venkatesan (2016) examined turmeric production and marketing in the district of Perambalur. Unfavorable prices, price fluctuations, high input costs, high wage rates, poor water availabilities, insufficient funding and proper government subsidies were the major limitations faced by the farmers in the production and marketing of turmeric.

Bheemudada (2016) identified the constraints in adopting improved Ginger cultivation techniques among the farmers. The majority of the farmers (90.83%) opined that lack of pest and disease-resistant varieties was the principal problem, followed by non-availability of labour (87.50 %), high cost of labour (85.00%) and shortage of chemical fertilizers (79.17%).

Lakshmi (2017) listed out major production and marketing constraints faced by the turmeric farmers in Kadapa district of Andhra Pradesh. Lack of adequate curing facilities (93.75%), shortage of labour during harvesting period (87.50%), weed infestation (81.25%), price fluctuations (100%) and lack of market information (93.75%) were the production and marketing constraints faced by the farmers.

Salunkhe *et al.* (2017) analysed the constraints in the production and marketing of Turmeric in Satara district of Maharashtra. The study found that climate change, unavailability of labour and lack of financial support were the major production restraints.

While price fluctuations, inadequate storage facilities, more number market intermediaries and lack of market information were the major marketing constraints.

Chinnadurai *et. al.* (2018) examined the economics of turmeric cultivation in Erode district of Tamil Nadu and revealed that ignorance about pest control measures was the main limitation faced by the farmers in turmeric production, while fluctuations in market prices were the major barrier in marketing.

Abeynayaka *et al.* (2020) examined the economics of turmeric production in major turmeric growing districts of Sri Lanka. The result unveiled that lack of knowledge, shortage of labour, price volatility, shortage of quality planting materials and inadequate market information were the major constraints faced by the farmers in the study area.

Jaiswal *et al.* (2021) conducted a study among the turmeric farmers in the Raigarh district of Chattisgarh and reported that shortage of labour and lack of availability of grinding machines as major production constraints.

Methodology

3. METHODOLOGY

This chapter presents the procedural details in selecting the sample, method of data collection and analytical techniques employed in attaining the objectives of the study. This chapter is presented under the following sub-headings.

3.1 Description of the study area

3.2 Sampling procedure

3.3 Nature and sources of data

3.4 Variables and their measurement

3.5 Analytical tools and techniques

3.1. DESCRIPTION OF THE STUDY AREA

A brief description of the study area is crucial for understanding the physical, economic and environmental conditions in the selected areas for the research work. In this view, different characters like topography, area, population, climate, soil types, land utilization pattern, landholding pattern, agriculture and administrative setup are discussed in the following sub-sections.

3.1.1. Kerala

Kerala state is located on the southwestern Malabar Coast of India and is surrounded by the Arabian Sea to the West, Karnataka to the North and Northeast, Tamil Nadu to the East and South. It is situated between 8^0 18' and 12^0 48' North latitude and 74^0 52' and 72^0 22' East longitudes. Kerala receives heavy rainfall through the southwest monsoon, which lasts from June to September and, it also receives rainfall from the northeast monsoon during October and December. The average annual rainfall was 2,923 mm and the state receives 120-140 rainy days per year. The average maximum daily temperature is around 37^0C, and the minimum temperature is around 19.80^0C. The major crops cultivated in Kerala are paddy, pulses, pepper, ginger, turmeric, rubber, cardamom, arecanut, banana, coconut, coffee, tea and tapioca. There are 14 districts in Kerala. Among

them, Palakkad district has the highest area under turmeric cultivation, and hence the district was purposively selected for the study. The political map of Kerala is given in Figure 1.

3.1.1.1 Palakkad

Topography

The study was conducted in the Palakkad district of Kerala. This district is located almost in the centre of the State and has no coastal line. It lies between north latitude 10° 46` and 10° 59` and east longitude 76° 28` and 76° 39`. It is bounded on the east by the Coimbatore district of Tamil Nadu, on the north and northwest by Malappuram district and, on the south by Thrissur district.

Area

Palakkad district consists of two revenue divisions, five taluks and 145 villages. The revenue divisions are Palakkad and Ottappalam. Palakkad, Alathur and Chittur taluks form the Palakkad revenue division and Ottappalam and Mannarghat taluks form the Ottappalam revenue division. The district has thirteen development blocks and 89 panchayats. The total area of the district is 4480 sq. km.

Population

The total population of the district is 28,09,934, of which the male population is 13,59,478 and female population is 14,50,456. The population density is 627 per square kilometre. The number of agricultural labourers in this district is 1,95,394.

Climate and Rainfall

The climate in the district is mild during most of the year except the summer months. In general, two types of climates were observed in the district. Similar to other districts of Kerala, Ottapalam, Alathur, and Mannarkad taluks experience a humid climate with a very hot season extending from March to June. While Palakkad and Chittur areas

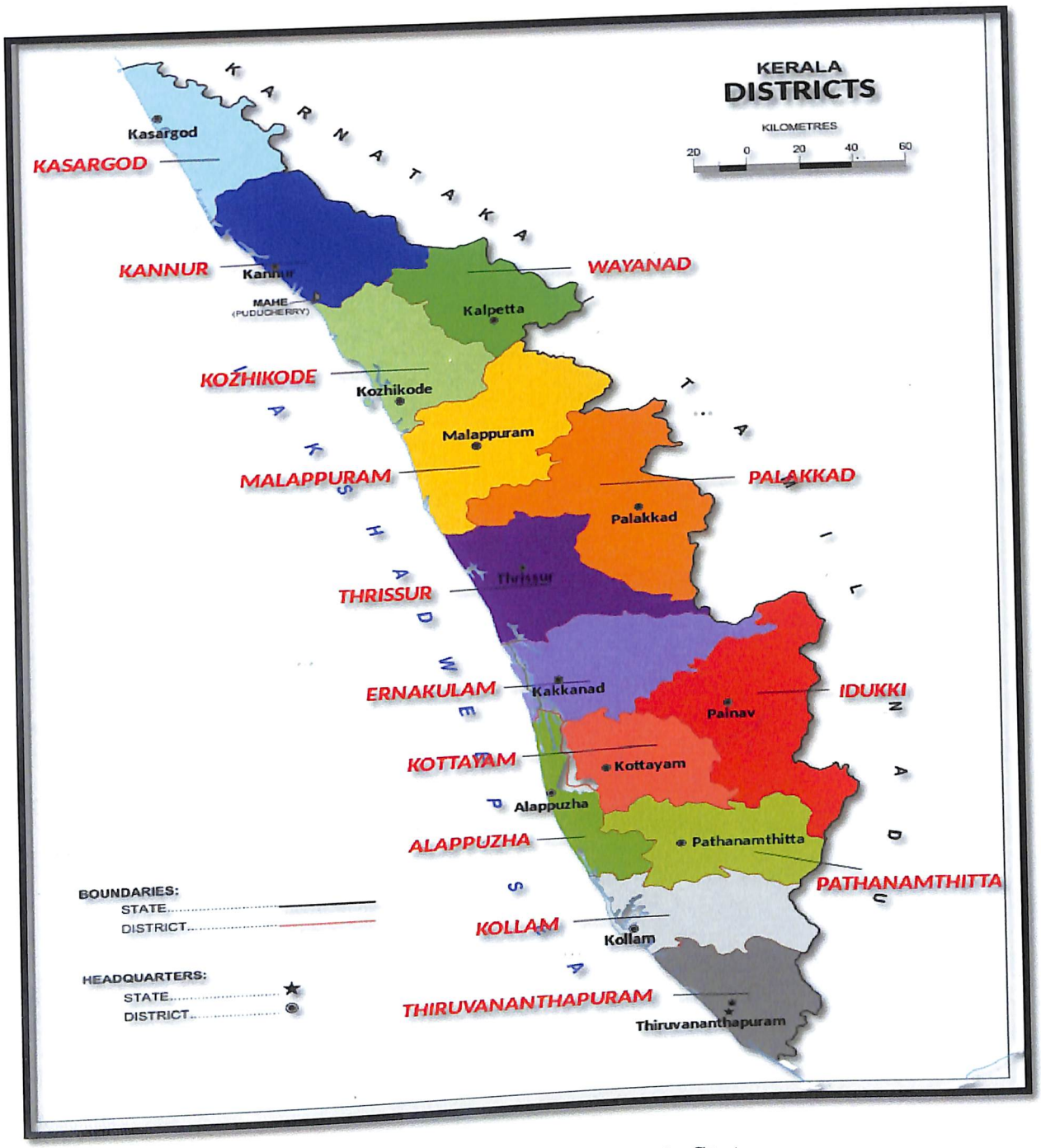


Figure 1: Political map of Kerala State

experience rather a dry climate similar to Tamil Nadu. The average annual rainfall of the district is 1831.3 mm.

Soils

Three types of soils predominantly occupied the district are, 1) laterite soils seen in Ottapalem, Alathur, Chittur and Palakkad taluks. 2) Virgin forest soil of Mannarkad taluk and 3) Black soils in chittur and attapady valley which is used for the cultivation of cotton.

Land Utilization Pattern

It was observed from the Table 3.1 that the total cropped area in the district was 60.81 per cent of the total geographical area. The net area sown was around 46.06 per cent and the area sown more than once was 14.76 per cent of the total geographical area. Forests accounted for 30.44 per cent of the area and the share of land put to non-agricultural uses was 10.83 per cent. The important crops grown in the districts are coconut, rubber, arecanut, jack fruit and mango. Coconut, rubber and arecanut accounted for 60.05, 11.05 and 5.17 per cent of total cropped area of the district, respectively. The cropping pattern is given in detail in table 3.2.

Cropping Pattern

It was observed from the Table 3.2 that of the total cropped area, cereals and millets accounted for about 28.51 per cent, followed by oilseeds (20.82%), plantation crops (16.03%) and fresh fruits (14.43%). Spices and condiments accounted around 6.41 per cent of total cropped area. Major spice crop grown in the districts were Arecanut, Pepper, Tamarind, Cardamom, Turmeric, Nutmeg, Ginger, etc.

Table 3.1. Land utilization pattern of Palakkad district (2018-19)

Particulars	Area (ha)	Percentage to total
Total geographical area	4,47,584	100.00
Forest	1,36,257	30.44
Land put to non-agricultural uses	48,460	10.83
Barren and uncultivable land	1,498	0.33
Land under miscellaneous tree crops	532	0.12
Cultivable waste	19,200	4.29
Fallow other than current fallow	10,918	2.44
Current fallow	8,838	1.97
Marshy land	0	0.00
Still water	15,337	3.43
Water logged area	0	0.00
Social forestry	404	0.09
Net area sown	2,06,139	46.06
Area sown more than once	66,055	14.76
Total cropped area	2,72,195	60.81

Source: GOK (2019)

Table 3.2 Cropping pattern of Palakkad district during 2018-19

	Area in hectares	Percentage to total cropped area
Cereals and millets	77,606	28.51
Pulse	664	0.24
Sugar crop	892	0.33
Spices and condiments	17,449	6.41
Fresh fruits	39,267	14.43
Dry fruits	1,130	0.42
Tapioca	1,725	0.63
Tubers	1,840	0.68
Vegetables	5,652	2.08
Oil seeds	56,667	20.82
Fibers, Drugs and Narcotics	61	0.02
Plantation crop	43,634	16.03
Other non-food crops	25,610	9.41
Total Cropped Area	2,72,195	100.00

Source: GOK,2019

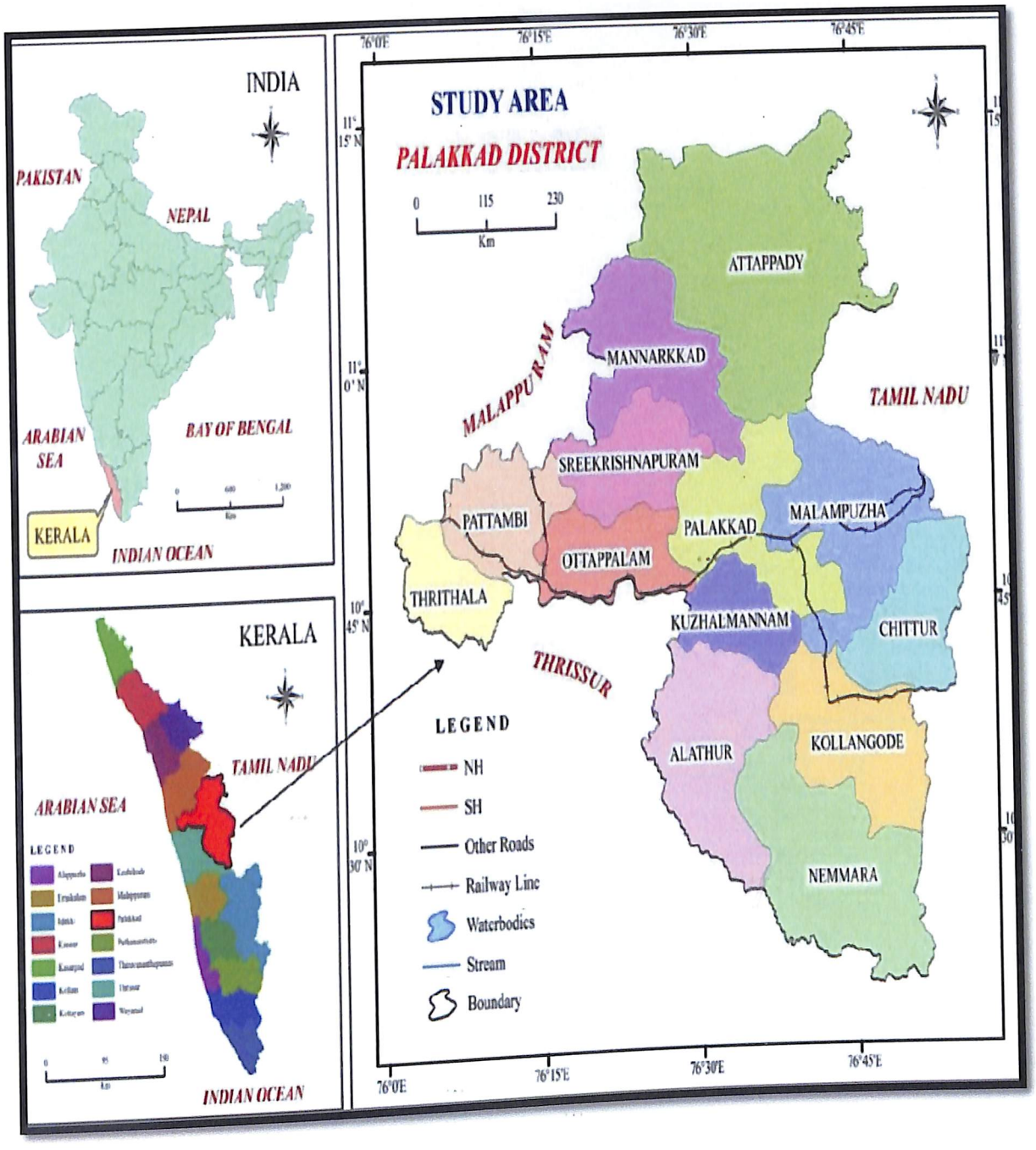


Figure 2: Political map of Palakkad district

Administration

The district is headquartered at Palakkad town with two revenue divisions and six taluks. The district comprises 157 villages, 13 block panchayats, 88 grama panchayats and 7 municipalities (GOK, 2019).

3.1.2 Andhra Pradesh

Andhra Pradesh lies between 12°41' and 19.07° North latitude and 77° and 84°40' East longitude and is bordered by Telangana, Chhattisgarh, and Orissa in the North, the Bay of Bengal in the East, Tamil Nadu to the South and Karnataka to the West. Andhra Pradesh has a coastline of around 974 km. The political map of Andhra Pradesh is given in Figure 3

3.1.2.1 Visakhapatnam

Topography

Visakhapatnam district is the north eastern coastal districts of Andhra Pradesh. It is bounded on the north partly by the Orissa state and partly by Vizianagaram district, on the south by east Godavari district, on the west by Orissa and on the East by the Bay of Bengal.

Area

The district have two distinct geographical divisions called Plains Division and Agency Division. The Agency Division consists of the hilly regions covered by Eastern Ghats with an altitude of about 900 meters.

Population

The population of the district is 42.91 lakhs as per 2011 census and this constituted 5.06 per cent of the population of the state. Out of the total population 21.40 lakhs are males and 21.52 lakhs are females The district has population density of 384 per sq.km. Compared to agency area plain area shows higher density (GOI, 2019).

Climate

The district has varying climatic conditions in different parts. Near coastal region, the air is moist, but it gets warmer towards the interior and cools down in the hilly areas. April, May and June are the warmest months. The temperature gets down with the onset of South West Monsoon and reached a mean minimum of 19.7°C by January thereafter temperature is increasing and reaches mean maximum of 34.2° C by the end of June during 2016-17.

Rainfall

The district receives annual normal rainfall of 1202 mm, of which south-west monsoon accounts for 765.5 mm of rainfall and north-east monsoon contributes 143.3 mm of rainfall during 2017-18.

Topography and Soils

Red loamy soil is the prominent soil type and is poor textured and easily drained soil. The soils in the coastal areas are Sandy loamy soils. Black cotton soils are also seen in the area of K.Kotapadu, Devarapalli, Cheedikada, Paderu and Hukumpeta Mandals. About 45 per cent of the soils in the district are low in organic content and 5 per cent of soils are less with phosphorous content.

Land Utilization Pattern

The total geographical area of the district is 11.16 lakh hectares, of this 33.98 per cent is cultivable area and 44.11 per cent is forest area. Of the remaining land, barren and uncultivable land accounted for about 13.04 per cent and land put to non-agricultural uses accounted for about 11.10 per cent. The particulars of land utilization pattern is explained in table 3.3.

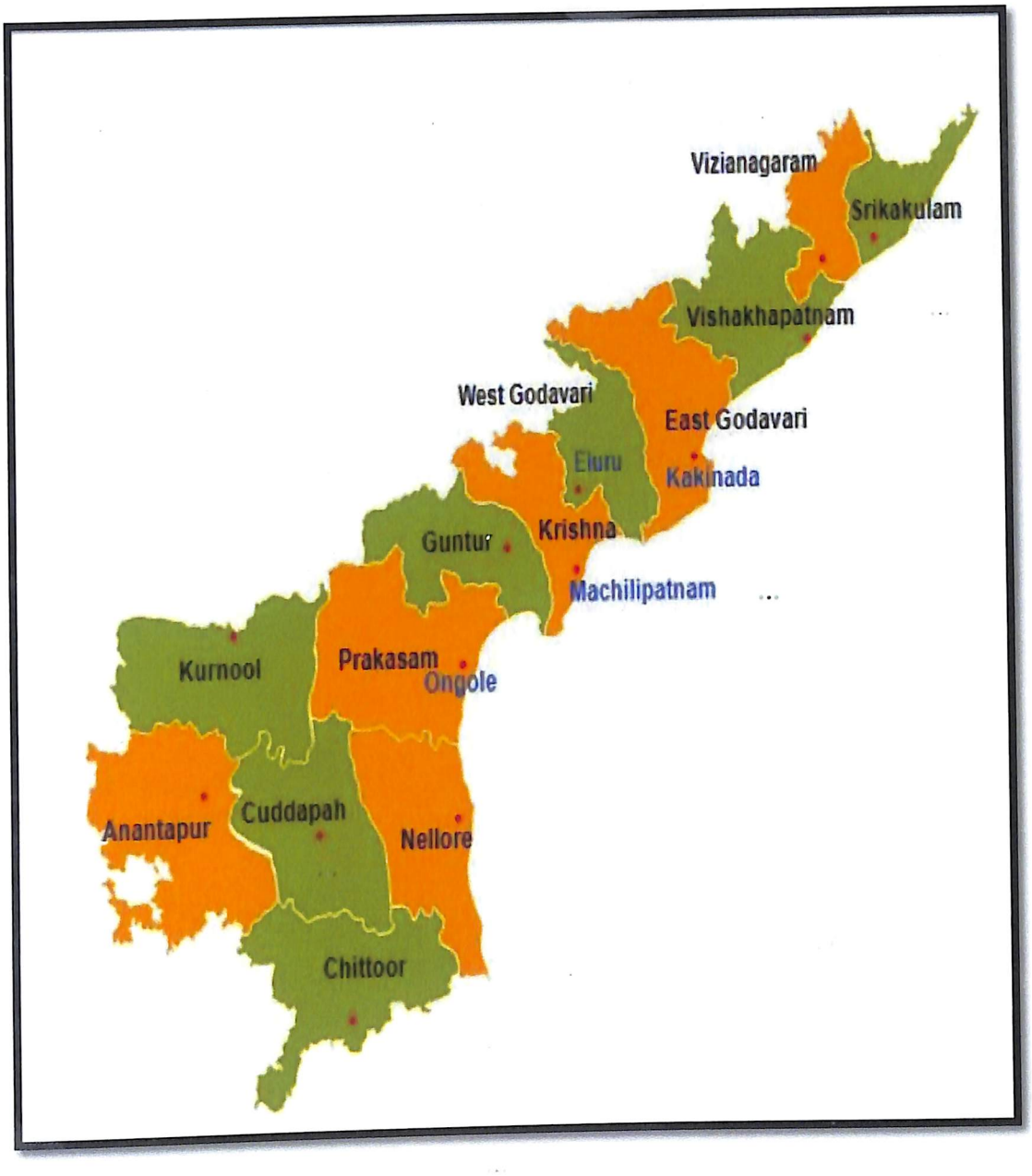


Figure 3. Political map of Andhra Pradesh

Cropping Pattern of Visakhapatnam District

The major crops grown in Visakhapatnam district were paddy, maize, ragi, rajma beans, green gram, black gram, sesamum, mango, papaya, guava, coconut, sugarcane and turmeric. Among all crops paddy crop accounted for the highest area (1,08,960 ha) followed by millets (32,501 ha), sugarcane (32,153 ha)), Pulses (24,757 ha), oilseeds (15,130 ha), mangoes (13,615 ha), coconut (7,226 ha), maize (7,008 ha), turmeric (5771 ha) and coffee (4,979 ha).

Table 3.3 Land Utilisation Pattern in Visakhapatnam District, 2017-2018

Category	Area in ha.	Percentage to the total geographical area
Total geographical area	11,16,100	100
Forest area	4,41,166	39.53
Net area sown	2,80,586	25.14
Total cropped area	3,39,759	30.44
Land put non agriculture use	1,11,078	9.95
Land under miscellaneous tree crops & groves not included in net area sown	32,202	2.89
Other fallow lands	40,305	3.61
Current fallows	67,508	6.05
Area sown more than once	59,173	5.30
Fish and prawn culture	271	0.02
Cropping intensity	1.21	

Source: GOAP, 2018.

Table 3.4 Cropping pattern of Visakhapatnam District, 2017-2018

Crop	Area in hectare	Percentage to the total cropped area
Paddy	1,08,960	32.07
Millets	32,501	9.57
Sugarcane	32,153	9.46
Pulses	24,757	7.29
Oil seeds	15,130	4.45
Mangoes	13,615	4.01
Vegetables	13,173	3.88
Coconut	7,226	2.13
Maize	7,008	2.06
Turmeric	5,771	1.70
Coffee	4,979	1.47
Other crops	74,486	21.92
Total cropped area	3,39,759	100

Source: GOAP, 2018

Administrative Profile

The district is headquartered in Visakhapatnam town with four revenue divisions. Visakhapatnam has 46 mandals, 3035 villages, one municipal corporation and two municipalities.

3.2. SAMPLING PROCEDURE

The study was conducted in Palakkad district of Kerala and Visakhapatnam district of Andhra Pradesh using both primary and secondary data. These districts were purposively selected due to the high acreage of turmeric cultivation in the selected states. From the selected districts, two block panchayaths were selected. The block thus selected were Alathur and Kuzhalmannam from the Palakkad district, and Chinthapalli and G Madugula blocks from Visakhapatnam district. These blocks were purposively selected as these blocks occupied the first and second position respectively, in terms of acreage and production. From the selected blocks, one panchayath was selected based on high acreage

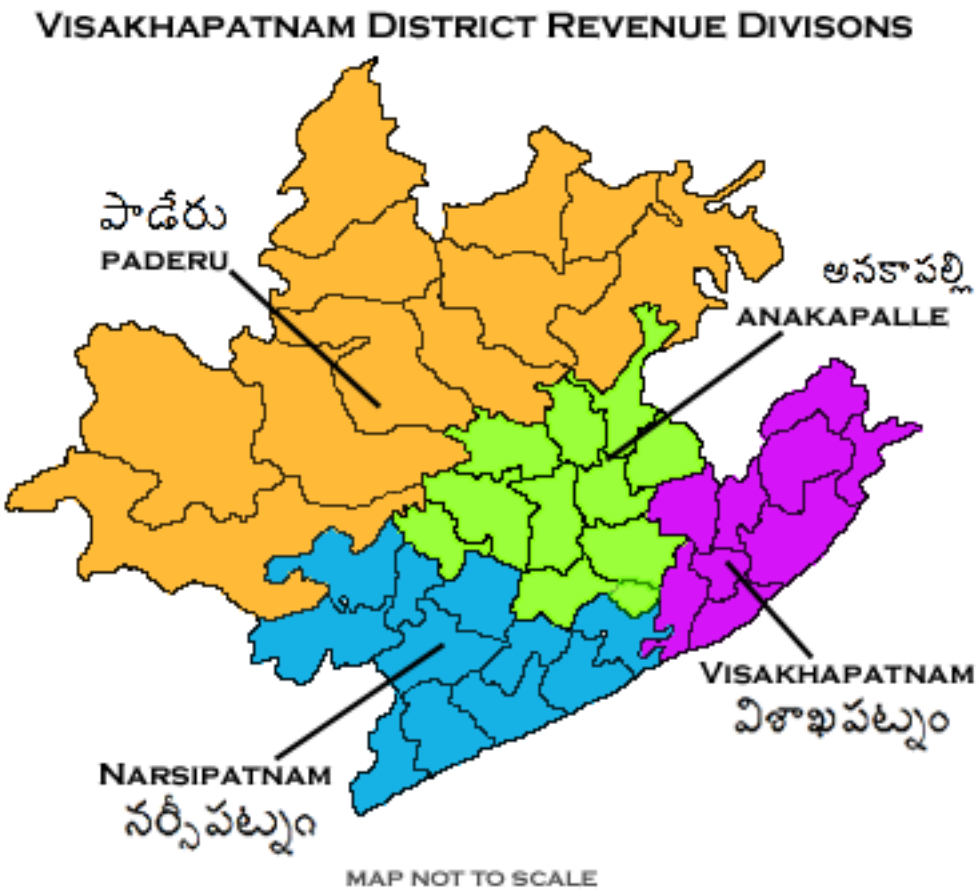


Fig. 4 Political map of Visakhapatnam

of turmeric cultivation. Thus the selected panchayaths were Kizhakkancherry from Alathur block and Peringottukurissi from Kuzhalmannam in Palakkad district. Tajangi from Chinthapalli mandal and Karakkapalli from G Madugulain Visakhapatnam district (AP). A comprehensive lists of turmeric farmers in each of the Panchayats were collected from the respective Krishi bhavans. A proportional sampling method is carried out based on the acreage and production of turmeric in Kerala and Andhra Pradesh. When compared to Kerala, acreage and production of turmeric were very high in Andhra Pradesh, hence more than two-third of the total respondents were selected from the Andhra Pradesh. So, of the total 100 farmers, 30 farmers were selected from Palakkad district and 70 farmers were selected from Visakhapatnam district. Hence in Palakkad, 15 farmers were randomly selected from each Panchayath and in Visakhapatnam, 35 farmers were selected from each district. So, the total sample size constituted 100 farmers. Apart from these, marketing related information was collected from 10 market intermediaries in Palakkad district and 20 market intermediaries in Visakhapatnam district. The total sample size of study was 130.

3.3 NATURE AND SOURCE OF DATA

Both primary and secondary data were used for analysing the specific objectives of the study. Secondary data pertaining to area, production and productivity of turmeric were collected from various sources like Spices Board, Department of Agriculture, Department of Horticulture, Kerala Agricultural University and other authentic sources.

The primary data for the present study was collected using well-structured and pretested schedules through a survey of 100 farmers and 30 market intermediaries. Of the total sample, 70 farmers were selected from Visakhapatnam and 30 farmers were selected from Kerala. The data pertaining to the cost details, yield, returns, price data of input and output, details of marketing, constraints in production and marketing were elicited from the turmeric farmers from Palakkad and Visakhapatnam districts. To find out the marketing efficiency of selected turmeric markets, data was collected from 30 market intermediaries through a well-structured schedule. The data pertaining to different marketing channels,

types of marketing, cost and margin associated with different marketing channels and constraints in marketing, etc. were elicited through personal interview method to have relevant, comprehensive and precise data.

3.3.1 Methods of Data Collection

The data were collected from the respondents through personal interview with the help of pre-tested schedules designed for the purpose to fulfil various objectives in the research study. The data on farm machinery, land holding, cropping pattern and area under turmeric cultivation of the selected respondents were collected. Data on annual maintenance cost of turmeric cultivation was also collected.

The data on marketing costs for important marketing channels of turmeric in the study area were also collected. In addition, an opinion survey was carried out to find out the constraints faced by the farmers in turmeric cultivation and marketing. At the time of the interview, every effort was made to prove the farmers that the study was being conducted solely for the purpose of research work. The data for the present study pertained to the agricultural year 2020-21.

3.4 VARIABLES AND THEIR MEASUREMENT

The data pertaining to the study were collected under the following headings and analysed using various tools.

3.4.1 Socio-Economic Status of the Farmers

Socio-economic characteristics of the farmers such as gender, age, education, occupation, farming experience and annual income were collected and categorized into various group.

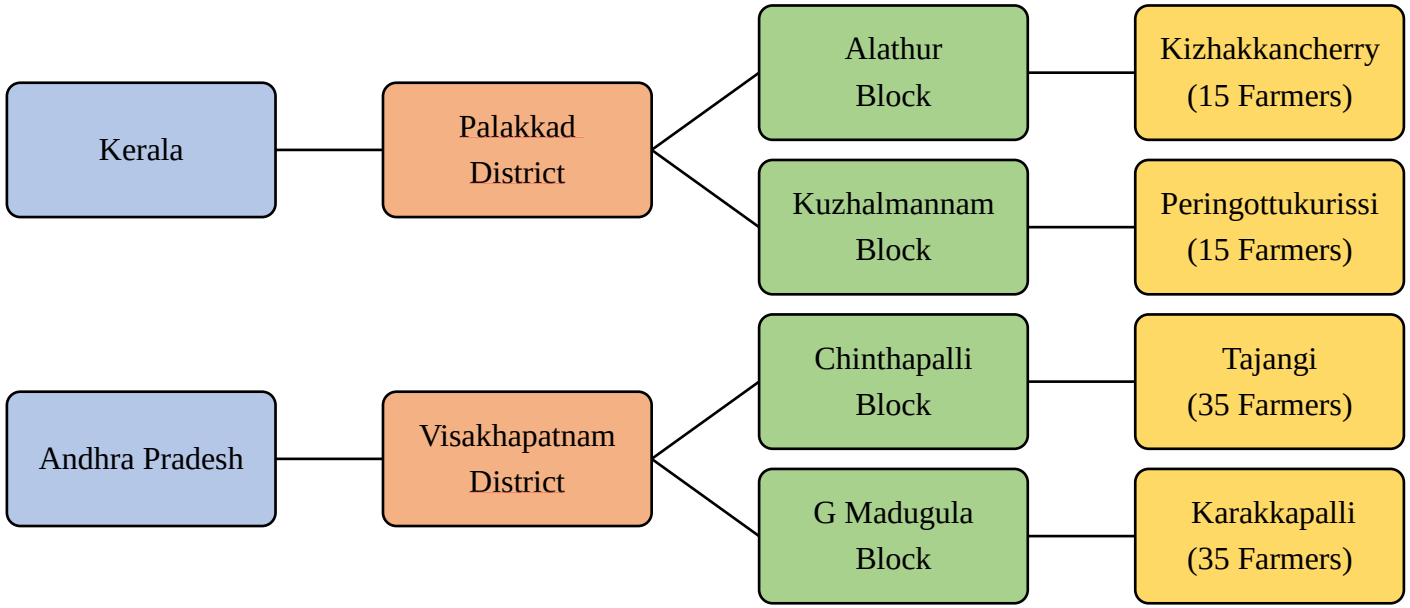


Figure 5: Sampling frame work for the study area

3.4.2 Quantity of Inputs

Quantity of inputs such as number of hired labour, family labour, permanent labour, quantity of chemical fertilizers, organic manures and plant protection chemicals were collected and used for analysing the cost of cultivation and resource use efficiency

3.4.3 Cost of Inputs

3.4.3.1 Cost of Manures and Fertilizers

This includes cost of organic manure and chemical fertilizers purchased by the farmers from the local dealers. Imputed value was used for valuing the manures produced in farmer's field.

3.4.3.2 Cost of Plant Protection Chemicals

The different pesticides, fungicides and insecticides were used by the farmers in order to reduce the risk from pest and diseases. The cost incurred in the purchase of plant protection chemicals were evaluated at the market price.

3.4.3.3 Cost of Machinery and Implements

The implements such as pump set for irrigation, weed cutter for weeding and turmeric harvesting machine for harvesting were used for turmeric cultivation. The cost incurred for the purchase of these implements were evaluated at the market price.

3.4.4 Cost of Labour

3.4.4.1 Cost of Family Labour

The cost incurred for family members involved in farming operation were imputed at the wage rate paid to the hired labour in that locality.

3.4.4.2 Cost of Hired Labour

Cost of hired labour mainly refers to the wages that was actually paid to the work rendered by them in the farm. The wage rate for men was₹700 and the wage rate for women ₹450 in Palakkad district whereas it was ₹300 for men and ₹200 for women in Visakhapatnam district.

3.4.4.3 Cost of Machine Labour

It involves the cost incurred in the maintenance of the machineries by employing some workers to carry out the maintenance work of the machines like fuel, power, lubricants, repair and other expenses which are included under the annual maintenance and repairs. Straight line method was used to find the depreciation of the machinery.

3.4.5 Land Revenue

This is the actual revenue rate that was paid by the farmers to the revenue department for their land that they possess. The revenue paid by farmers in the locality was ₹175 per acre per year in Palakkad and ₹120 in Visakhapatnam.

3.4.6 Interest on Working Capital

Working capital includes all expenses incurred by the farmer on seeds, manures, fertilizers, plant protection chemicals, herbicides, hired labour and machine labour. According to Central Statistical Organisation (2008), the interest on working capital can be calculated at 12 per cent per annum for half of crop duration. The study also used the same interest rate for calculating the interest on working capital.

3.4.7 Interest on Fixed Capital

Fixed capital refers to the values of the assets and equipment except land. The farmers borrow long term loan from the banking institution at the rate of 10 per cent per annum. So, the interest on fixed capital can be worked out with 10 per cent per annum.

3.4.8 Rental Value of the Leased in Land

It was the rent paid by the farmers to the leased land for cultivating crops for a year, so the rental value of the leased land was calculated as the rent paid per year. But none of the respondents have leased in land in the selected locality.

3.4.9 Rental Value of Owned Land

Rental value of owned land was calculated by taking the rent of land prevailed in the locality. It was 20,000 per hectare in Palakkad district, whereas 5000 per hectare in Visakhapatnam district.

3.4.10 Depreciation

Depreciation means loss in the value of the asset over a period of time, due to the wear and tear. Straight line method was used to calculate annual rate of depreciation of each of the machinery and implements, then the total depreciation allowance was calculated by aggregating.

Amount of depreciation = (Original cost of the asset-Junk value) /useful life of the asset

(Reddy *et al.*, 2016)

3.4.11 Quantity of Output

Quantity of dried turmeric produced is recorded as $kgha^{-1}$.

3.4.12 Marketing Cost

These include charges for weighing, loading and unloading, commissioning, rent etc, which were paid per quintal by market functionaries.

3.4.13 Marketing Margins

Marketing margins refer to the net shares to the different market intermediaries for a particular quantity of produce, after deducting marketing costs from gross marketing at each stage of marketing.

3.5 ANALYTICAL TOOLS AND TECHNIQUES

Statistical tools are employed for the analysis of collected data to get the meaningful conclusions. Different tools used in the present study are given below:

3.5.1 Percentages and Averages

Socio- economic characteristics of the respondents such as age, education, gender, family size, income, land holdings and year of experience in farming can be examined by using percentage and averages.

3.5.2. Trend in Turmeric Area, Production and Productivity

The exponential growth rates were worked out to compute the growth in area and production of turmeric. Growth rates were worked out for the overall study period (2000-01 to 2019-20) and two sub-periods, i.e., Period I (2000-01 to 2009-10) and Period II (2011-12 to 2019-20). While in Andhra Pradesh, due to the bifurcation of state in 2014 a drastic change was observed in the acreage and production. Here, the overall period is divided into two, Period I is from 2000-01 to 2012-13, and Period II is from 2013-14 to 2019 -20. As a result of Andhra Pradesh reorganisation act, the area and production data of Telangana is not included in the agriculture statistics of Andhra Pradesh since 2013-14.

$$Y_t = a\,(1+r)^t$$

$$= a\,b^t$$

Where,

Y_t= Dependent variable for which growth rate is to be estimated

a = Intercept

b = growth factor, b = 1+r

t = Time parameters

The exponential growth rate was worked out by transforming the equation to the log linear form as

$$\ln Y_t = \ln a + t \ln b + u$$

Where,

ln a = regression constant

ln b = regression co-efficient

u = error term

The ordinary least square was used to estimate the coefficient (b's). The exponential growth rate in percentage (G) was calculated using the relationship

$$G = \{(\text{Antilog of } b) - 1\} \times 100$$

3.5.3 Annual Maintenance Cost

Annual maintenance cost of turmeric farming can be worked out by the sum total of the various input cost used in the production activity. Cost of cultivation of turmeric for the year 2020-21 was worked out using cost concepts.

3.5.3.1 Cost Concepts and Income Measures

Cost A_1 includes

1. Cost of hired human labour
2. Cost of machine labour
3. Cost of seeds (both farm produced and purchased)
4. Cost of manures (owned and purchased)

5. Cost of fertilizers

6. Cost of plant protection chemicals and weedicides

7. Land revenue

8. Irrigation charges

9. Depreciation on machineries and implements

10. Interest on working capital

11.Miscellaneous expenses

Cost A_2: Cost A_1 + Rent paid for leased in land

Cost B_1: Cost A_1 + Interest on the value of owned fixed capital assets excluding land

Cost B_2: Cost B_1+ Rental value of owned land + rent paid for leased in land

Cost C: Cost B_1 + Imputed value of family labour

(Reddy *et al.*, 2016)

3.5.4 Returns

3.5.4.1 Gross Return

It can be worked out as the product of total quantity of turmeric per year with the unit price. The market price of turmeric during the study period was Rs.120 per kg in Palakkad district whereas it was Rs. 80 per kg in Visakhapatnam.

Gross return = Quantity of product x unit price

3.5.4.2 Net Returns

Net returns was worked out by deducting the annual maintenance cost (cost of cultivation) from the gross return.

Net returns = Gross return - cost of cultivation (Cost C)

3.5.5 Benefit- Cost Ratio

It is the ratio between gross return and total annual expenses incurred for the turmeric cultivation.

B-C ratio = Gross return/ Cost of cultivation (Cost C)

3.5.6 Income Measures

These are the returns over different cost concepts. Different income measures are derived using the cost concepts. These measures include farm business income, family labour income, net income and farm investment income, etc.

Farm business income = Gross income- cost A_1 / A_2

Family labour income = Gross income- cost B

Net Income = Gross income – cost C

Farm investment income = Farm business income- imputed value of family labour

(Reddy *et al.*, 2016)

3.5.7 Resource Use Efficiency

Resource use efficiency was estimated using Cobb-Douglas production function for the various resources used in the production process by the small and large farmers. This was carried out in order to know how the beneficiaries are allocating the resources that they possess and the allocation of resources by them so that we can say who is allocating the resource more efficiently.

The Cobb-Douglas production function for turmeric production in Palakkad district is given by:

$$Y = aX_1^{b_1}X_2^{b_2}X_3^{b_3}X_4^{b_4}X_5^{b_5}X_6^{b_6}X_7^{b_7}X_8^{b_8}X_9^{b_9}X_{10}^{b_{10}}e^n$$

This is modified into a log linear model by application of logarithm.

$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8 + b_9 \ln X_9 + b_{10} \ln X_{10} u$

The Cobb-Douglas production function for turmeric production in Visakhapatnam district is given by:

$$Y = aX_1^{b_1}X_2^{b_2}X_3^{b_3}X_4^{b_4}X_5^{b_5}X_6^{b_6}X_7^{b_7}X_8^{b_8}e^n$$

This is modified into a log linear model by application of logarithm.

$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + b_8 \ln X_8 u$

Where, Y= Yield (kg)

	Independent Variables of selected function (Palakkad District)	Regression coefficients		Independent Variables of selected function (Visakhapatnam District)	Regression coefficients
X_1	Area (Cents)	b_1	X_1	Area (Cents)	b_1
X_2	Quantity of seed (kg)	b_2	X_2	Quantity of seed (kg)	b_2

X_3	Quantity of Farm Yard Manure (FYM) (kg)	b_3	X_3	Quantity of Farm Yard Manure (FYM) (Kg)	b_3
X_4	Quantity of Urea (kg)	b_4	X_4	Quantity of Urea (Kg)	b_4
X_5	Quantity of Factompose (kg)	b_5	X_5	Quantity of Di-Ammonium Phosphate (Kg)	b_5
X_6	Quantity of Muriate of Potash (MoP) (kg)	b_6	X_6	Quantity of Muriate of Potash (MoP) (Kg)	b_6
X_7	Quantity of Lime (kg)	b_7	X_7	Number of labour (Man days)	b_7
X_8	Quantity of herbicide (mL)	b_8	X_8	Machine Hours	b_8
X_9	Quantity of pesticide (mL)	b_9			
X_{10}	Number of labour (man days)	b_{10}			

a = Intercept

$b_1 \ldots b_9$ = Regression coefficients of explanatory variables.

e^n= Stochastic error term

The Cobb-Douglas production function was estimated by using OLS (Ordinary Least Square) method assuming the error term (e) to be independently and normally distributed.

3.5.8 Marketing Efficiency of Selected Market

3.5.8.1 Marketing Channel

A marketing channel is a path through which the agricultural products move from the producer to the ultimate consumer through different intermediaries. The methodology described by Acharya and Agarwal (2016) was used to calculate marketing costs and marketing margins, price spread, producer's share in consumer's rupee and efficiency of the marketing channels.

3.5.8.2 *Marketing Cost*

Marketing cost is the real expenses incurred for moving the products from the production centre to the consumption centre. The marketing cost includes all the costs of performing various marketing functions carried out by the farmer and market intermediaries at different stages of marketing.

$$MC = C_p + C_{m1} + C_{m2} + \ldots\ldots + C_{mn}$$

Where,

MC = Total marketing cost

C_p= Cost incurred by the producers from the time the produce leaves the farm till he sell it, and

C_{mi} = Cost incurred by the i^{th} middleman in the process of buying and selling the product

3.5.8.3 Marketing Margin

The intermediaries earn some profit to remain in the trade after meeting the cost of different marketing functions. The marketing margin is the profit of the various market functionaries involved in moving the products from the initial stage of production to the end customer. The absolute value of marketing margin differs from channel to channel, market to market, and time to time.

Absolute margin of i^{th} middleman (Am_i)

$Am_i = Pr_i-(Pp_i + Cm_i)$

Where,

Pr_i = Sale price of i^{th} middleman

Pp_i = Purchase price of i^{th} middleman

Cm_i = Cost incurred in marketing for i^{th} middleman

3.5.8.4 Price Spread

Price spread is defined as the difference between the price paid by the consumer and the price received by the producer for the equivalent quantity of agricultural produce, expressed as a percentage of the consumer's price. Price spread comprises marketing costs and marketing margins. In the current study price spread was computed using the concurrent margin method.

Price spread= consumer price-producer price.

3.5.8.5 Producer's Share in the Consumer's Rupee

It is the price received by the producers expressed as a percentage of the consumer's price, the producer's share in consumer's rupee (Ps) may be expressed as follows

$P_s= (P_p/C_p) \times 100$

P_s= Producer's share in consumer's rupee (Percentage)

P_p= Producer's price

C_p = Consumer's price

3.5.8.6 Marketing Efficiency

The movement of goods from producers to consumers at the lowest possible cost, consistent with the provision of the services desired by the consumer, may be termed as efficient marketing. The efficiency of selected markets was estimated using both Shepherd's method and Acharya's method.

Shepherd's Method

ME=V/I

Where,

ME= Marketing efficiency

V= Consumer's price

I= Total marketing cost

Acharya's Method

MME=FP/MC+MM

Where,

FP= Net price received by the farmer

MC= Total Marketing costs

MM= Total marketing margin

3.5.9 Garrett's Ranking Technique

Garret ranking technique was employed for ranking the constraints of the respondents. This method helps to identify the notable constraints affecting the farmers. Through this method, the respondents were asked to rank the identified constraints. The ranks were then converted into mean scores (Garret ranking) for capturing a real picture of the constraint prevailing in the study area. In this method, the ranks assigned to different constraints were transformed into percentage using the formula

$$\text{Per cent position} = \frac{100 \times (R_{ij} - 0.5)}{N_j}$$

Where,

R_{ij}= Rank given for i^{th} factor by j^{th} individual

N_j= Number of factors ranked by j^{th} individual

Then, the percentage positions were transformed into scores on a scale of 100 points referring to the table given by Garrett and Woodworth (1969). From the scores so obtained, the mean score level was derived and constraints were ranked based on the mean score level.

Results and Discussion

4. RESULTS AND DISCUSSION

This chapter shows the presentation, discussion and interpretation of the results from the current study. The data collected for the study was aimed to draw meaningful conclusions based on the objectives. Primary data was analyzed separately with different statistical tools and the results are presented in this chapter under the following sections.

4.1 Socio-economic characteristics of respondents

4.2 Growth in area, production and productivity of turmeric

4.3 Economics of turmeric cultivation

4.4 Input use pattern in turmeric cultivation

4.5 Resource use efficiency in turmeric

4.6 Marketing of turmeric

4.7 Constraints faced by the farmers in production and marketing of turmeric

4.1 SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENTS

4.1.1 Socio-Economic Characteristics of the Respondents in Palakkad District

The primary data was obtained from 30 turmeric growers. The primary socio-economic characteristics such as age, gender, education, family size and occupation were tabulated and analysed using percentage analysis. The results of the analysis are presented below.

4.1.1.1 Age

The age-wise distribution of sample farmers is presented in table 4.1. Based on the data collected from the sample farmers regarding the age group, respondents were classified into three groups:< 35 years, 35-45 years and>45 years. It could be observed from the table that 70.00 per cent of the sample farmers were in the age group of above 45 years and 26.67 per cent of the sample farmers were in the age group of 35-45 and only 3.33 per cent farmers were in the age group of <35. The average age of respondents was 50.23 years. The involvement of young generation was very low in turmeric farming. The results are agreement with the findings of Santhya and Premavathi (2018) who reported that majority of the farmers were old age farmers. Thasnimol (2019) conducted a study on coconut cultivation of Kerala and reported that there were no farmers in the age group of <30 and it indicated the lack of enthusiasm among youngsters in taking farming as a profession, which is one of the major problems confronting the agricultural sector in Kerala state.

Table 4.1. Distribution of respondents based on age

Particulars	**Number of farmers**	**Percentage to the total**
<35 years	1	3.33
35-45 years	8	26.67
45-60 years	21	70.00
Total	30	100.00
Average age	**50.23**	

4.1.1.2 Gender

The gender wise distribution of respondents was presented in table 4.2. It was observed from the table that 80 per cent of the total respondents were male and the remaining 20 per cent were females.

Table 4.2. Distribution of respondents based on gender

Gender	Farmers	Percentage to the total
Male	24	80.00
Female	6	20.00
Total	30	100.00

4.1.1.3 Education

The educational level of the farmers and the adoption of modern cultivation practices were known to be positively related. The classification of the respondents according to educational status was presented in table 4.3. Based on the available data, the respondents were classified into five categories such as illiterate, those who have completed primary education, secondary education, pre-degree (HSC) and graduation. It was observed that the majority (50 %) of the farmers were educated up to the secondary level. Of the remaining farmers, 24 per cent farmers had completed only the primary level education, 13 per cent farmers had completed the pre-degree and 13 per cent farmers were graduates.

Table 4.3. Distribution of respondents based on educational status

Particulars	Number of farmers	Percentage to the total
Primary	7	24.00
Secondary	15	50.00
Pre-degree/ HSC	4	13.00
Graduation	4	13.00

Total	30	100.00

4.1.1.4 Family Size

The distribution of farmers based on the size of the family was presented in table 4.4. It could be observed from the table that about 83.33 per cent of the sample farmers belonged to the family size consisting of 4-6 members and 10 per cent of farmers had a family size of more than six members and about six per cent of the farmers had less than four members in their family. The average family size of the respondents was around five.

Table 4.4. Distribution of respondents based on family size

Size of family	**Number of farmers**	**Percentage to the total**
Small (<4)	2	6.67
Medium (4-6)	25	83.33
Large (>6)	3	10.00
Total	30	100.00
Average size	**5.23**	

The availability of labour for farm operations are supposed to increase with the number of family members. Even though the majority of the farmers came under the family size of four to six members, due to the lack of interest in farming the family labour participation was very low in the study area. In a similar line, Das and Mishra (2019) reported that medium-size farmers with four to six members are dominant in turmeric cultivation.

4.1.1.5 Occupational Status

Based on occupation, farmers were divided into two viz., those who consider agriculture as their main occupation and those who consider agriculture as a subsidiary occupation. The results were presented in table 4.5. It was evident from the table that 43.33 per cent of the farmers were dependent on agriculture as their main source of

family income and the remaining 55.67 per cent of the respondents considered agriculture as a subsidiary source of income.

Table 4.5. Distribution of respondents based on occupational status

Gender	Number of farmers	Percentage to the total
Agriculture as main occupation	13	43.33
Agriculture as a subsidiary occupation	17	56.67
Total	30	100.00

4.1.1.6 Experience in Farming

The distribution of sample farmers based on their experience in farming was presented in table 4.6. The farmers were divided into three categories based on their experience in farming as having less than 10 years, 10 to 20 years and more than 20 years. It was observed that almost 56.67 per cent of the farmers had experience less than 10 years and 33.33 per cent of farmers had experience between 10-20 years and 10 per cent of farmers had experience more than 20 years. The average farming experience of the respondents was 12.47 years.

Table 4.6. Distribution of respondents based on experience in turmeric farming

Experience in turmeric farming (years)	Number of farmers	Percentage to the total
Less than 10	17	56.67
10-20	10	33.33
More than 20	3	10.00
Total	30	100.00
Average	**12.47**	

4.1.1.7 Farm Size

The classification of sample respondents based on the size of landholding was given in table 4.7. The majority of the sample farmers (40%) were having a marginal landholding of less than one hectare. About 34 per cent of the farmers owned 1 to 2 ha of land and 26 per cent of the farmers owned 2-5 ha of land. The average landholding size of the farmer was 1.24 ha.

Table 4.7. Distribution of respondents based on land holding pattern

Area in hectares	Number of farmers	Percentage to the total
Less than 1	12	40.00
1-2	10	34.00
2-5	8	26.00
More than 5	0	0.00
Total	30	100.00
Average land of holding	1.24 ha	

4.1.2 Socio-Economic Characteristics of the Respondents in Visakhapatnam District

The primary data was obtained from 70 turmeric growers. The primary socio-economic characteristics such as age, gender, education, family size and occupation were tabulated and analysed using percentage analysis. The results of the analysis are presented below.

4.1.2.1 Age

Based on the data collected from the sample farmers regarding the age group, respondents were classified into three groups such as less than 35 years, 35-45 years and 45-60 years (table 4.8). The average age of the respondent was 56.42 years. Majority of the farmers (60%) were in the age group of 45-60 years and 26 per cent of farmers were in the age group of 35-45 years and the remaining 14 per cent were in the age group of less than 35.

Table 4.8. Distribution of respondents based on age

Age (Years)	Number of farmers	Percentage to the total
<35	10	14.00
35-45 years	18	26.00
45-60 years	42	60.00
Total	70	100.00
Average age	56.42 years	

4.1.2.2 Gender

The gender distribution of respondents was presented in table 4.9. It was found that 54 respondents were male and constituted about 77.00 per cent and the remaining 26 per cent of respondents were females.

Table 4.9. Distribution of respondents based on gender

Gender	Number of farmers	Percentage to the total
Male	54	77.00
Female	16	23.00
Total	70	100.00

4.1.2.3 Education

The education level of the farmers and the adoption of modern cultivation practices are known to be positively related. Based on the educational status, respondents were classified into five categories viz., illiterate, those who have completed primary education, secondary education, pre degree/HSC and graduation (table 4.10). Among all the farmers, four per cent farmers had completed their graduation, six per cent farmers had completed their pre degree, 27 per cent of sample farmers had completed secondary education, 29 per cent farmers had completed primary education and 34 per cent of

farmers were illiterate. As the study area is a hilly tribal region, the majority of the farmers were illiterates due to poor access to educational institutions.

Table 4.10. Distribution of respondents based on educational status

Educational status	**Number of farmers**	**Percentage to the total**
Illiterate	24	34.00
Primary Education	20	29.00
Secondary Education	19	27.00
Pre degree/HSC	4	6.00
Graduation	3	4.00
Total	70	100.00

4.1.2.4 Family Size

The distribution of selected farmers based on the size of the family was presented in table 4.11. The family size was classified into three categories *i.e.*, less than four members, four to six members and more than six members. About 64 per cent of the respondents belonged to medium size family having 4-6 members, 19 per cent of farmers belonged to the large family having more than six members and 17 per cent of farmers belonged to the small family. The average family size of the respondents was five.

Table 4.11. Distribution of respondents based on family size

Family size	**Number of Farmers**	**Percentage to the total**
Small (<4)	12	17.00
Medium (4-6)	45	64.00
Large (>6)	13	19.00

Total	**70**	**100.00**
Average size	**5**	

4.1.2.5 Occupational Status

Based on occupational status respondents were classified into two, those farmers who considered agriculture as their main occupation and those farmers who considered agriculture as their subsidiary occupation. The results were presented in table 4.12. In total respondents, almost 76 per cent farmers depended on agriculture as their main source of income and the remaining 24 per cent of the respondents considered agriculture as a subsidiary source of income.

Table 4.12. Distribution of respondents based on occupational status

Occupation	**Number of farmers**	**Percentage to the total**
Agriculture as main occupation	53	76.00
Agriculture as subsidiary occupation	17	24.00
Total	70	100.00

4.1.2.6 Experience in Farming

Based on experience in turmeric farming, farmers were classified into three categories, less than 10 years, 10 to 20 years and 21 to 30 years (table 4.13). Among farmers, 24 per cent of farmers had experience less than 10 years, 57 per cent had experience between 10-20 years and 19 per cent of farmers had experience between 21-30 years. The average farming experience of respondents was 16 years.

Table 4.13. Distribution of respondents based on experience in turmeric farming

Experience in turmeric farming (years)	Number of farmers	Percentage to the total
Less than 10	17	24.00
10-20	40	57.00
21-30	13	19.00
Total	70	100.00
Average	**16**	

4.1.2.7 Farm Size

Based on the land holding, the respondents were classified into four categories as shown in table 4.14. The majority of the farmers were having a marginal holding of less than one hectare (40 %). About 26 per cent of farmers had 1 to 2 ha of land, 25.50 per cent of the farmers owned 2-5 ha of land and the remaining 8.50 per cent of farmers had more than 5 ha of land.

Table 4.14. Distribution of respondents based on land holding pattern

Area in hectares	Number of farmers	Percentage to the total
Less than 1	28	40.00
1-2	18	26.00
2-5	18	25.50
More than 5	6	8.50
Total	70	100.00
Average land holding size	1.83 ha	

4.2 GROWTH IN AREA, PRODUCTION AND PRODUCTIVITY OF TURMERIC

4.2.1 Exponential Growth Rate of Area and Production of Turmeric in India

In India, the turmeric area has increased from 1,91,700 hectares in 2000-01 to 2,56,890 hectares in 2019-20 (Appendix 1). The exponential annual growth rate was used to compute the growth in area and production of turmeric. Growth rates were worked out for the overall study period (2000-01 to 2019-20) and two sub-periods, i.e., Period I (2000-01 to 2009-10) and Period II (2011-12 to 2019-20). In the case of turmeric area, the growth rate of the overall study period was 2.28 per cent. When compared to Period I (2000-01 to 2009-10), a high growth rate (2.69%) was observed during period II (2010-11 to 2019-20). A remarkable increase in turmeric area has been noticed during the Period II, and it has increased from 1,95,000 hectares in 2010-11 to 2,56,890 hectares in 2019-20.

Similarly, turmeric production has increased from 7,14,300 tonnes in 2000-01 to 9,46,230 tonnes in 2019-20. The growth rate for the overall study period was 3.24 per cent. A remarkable increase in production was observed during Period I, where production has increased from 7,14,300 tonnes in 2000-01 to 9,27,910 tonnes in 2009-10, and the growth rate was found to be 5.13 per cent. Due to the decline in turmeric production from 12,68,000 tonnes in 2010-11 to 9,46,230 tonnes in 2019-20, a negative growth rate was observed during Period II (-2.34%).

Table:4.15. Exponential growth rate of area and production of turmeric in India

Particulars	Period I (2000-01 to 2009-10)	Period II (2010-11 to 2019-20)	Overall period (2000-01 to 2019-20)
Area (%)	0.86	2.69	2.28
Production (%)	5.13	-2.34	3.24

4.2.2 Exponential Growth Rate of Area and Production of Turmeric in Kerala

In Kerala, the area under turmeric has been reduced from 4,127 hectares in 2000-01 to 2,277 hectares in 2019-20 (Appendix II) and witnessed a negative growth rate of -2.14 per cent. A notable decrease in the crop acreage was observed during Period I and the area has decreased from 4,127 hectares in 2000-01 to 2,438 hectares in 2009-10. Even though slight fluctuations were observed, the acreage of turmeric remains stable during Period II. The estimated growth rates for turmeric for Period I and Period II were -3.13 and -0.10 per cent, respectively.

Turmeric production has declined from 9,037 tonnes in 2000-01 to 6,653 tonnes in 2019-20. In Period I, there was a significant decline in production in line with the reduction in turmeric acreage, i.e., from 9,037 tonnes in 2000-01 to 6,066 tonnes in 2009-10. The estimated growth rate of turmeric production during Period I was -1.67 per cent. In Period II, the production level almost remains stable, and a slight increase was observed at the later part of Period II. The estimated annual growth rate for turmeric production in Period II was 1.26 per cent.

Table 4.16. Exponential growth rates of area and production of turmeric in Kerala

Particular	Period-I (2000-01 to 2009-10)	Period-II (2010-11 to 2019-20	Period-III (2000-01 to 2019-20)
Area (%)	-3.13	-0.11	-2.14
Production (%)	-1.67	1.26	-0.56

4.2.3 Exponential Growth Rate of Area and Production of Turmeric in Andhra Pradesh

In Andhra Pradesh, the turmeric area has decreased from 74,000 hectares in 2000-01 to 29,717 hectares in 2019-20 (Appendix III). In Andhra Pradesh, turmeric area was more in the Telangana region. So, after state bifurcation, a massive variation was observed in the turmeric area in Andhra Pradesh. The growth rate in area and production of turmeric in Andhra Pradesh was calculated for the years 2000-01 to 2019-20. Here, the

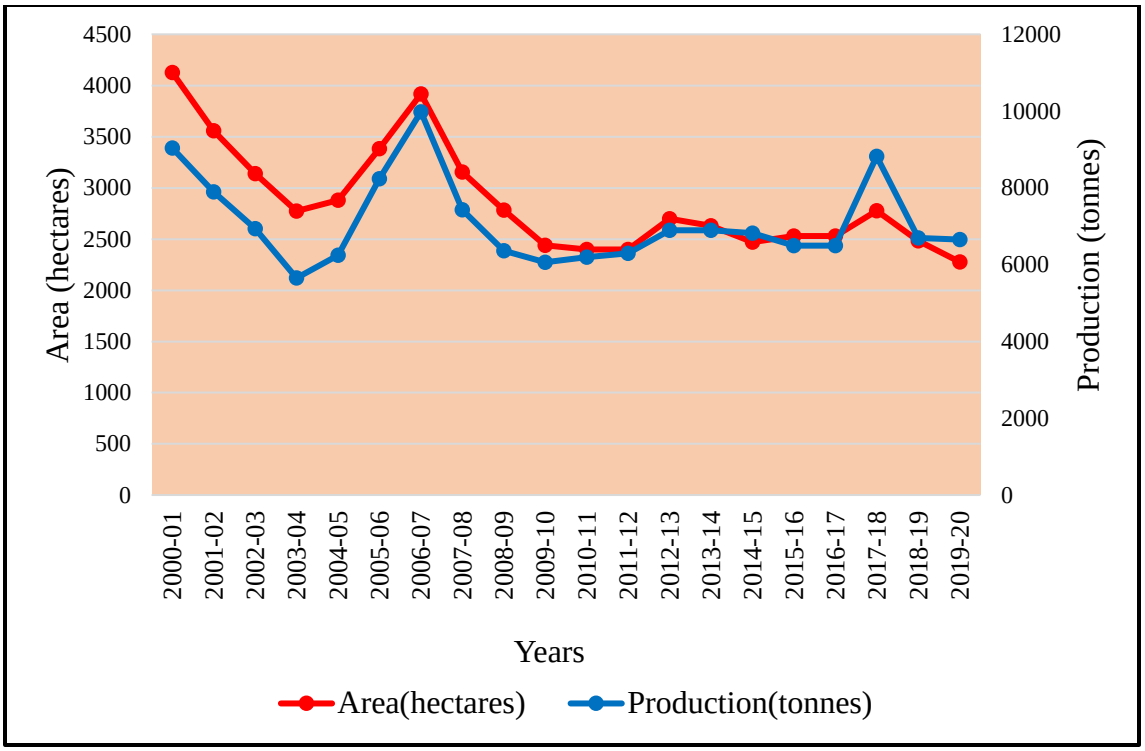


Fig.7 Area and production of turmeric in Kerala from 2000-01 to 2019-20

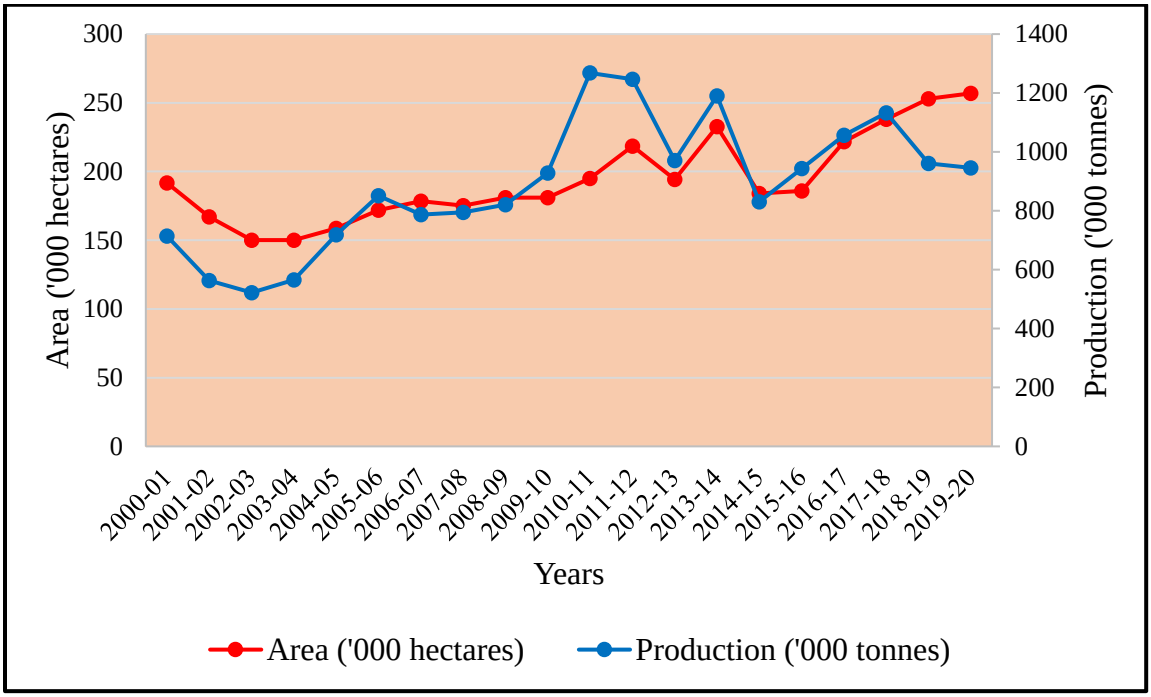


Fig.6 Area and production of turmeric in India from 2000-01 to 2019-20

overall period is divided into two, Period I is from 2000-01 to 2012-13, and Period II is from 2013-14 to 2019 -20. In Period I, the turmeric area has declined from 74,000 hectares in 2000-01 to 67,800 hectares in 2012-13 with a growth rate of 0.61 per cent. Even though a significant reduction in the acreage was observed after bifurcation, the turmeric area in Andhra Pradesh showed an increasing trend, and the area has increased from 17,820 hectares in 2013-14 to 29,717 hectares in 2019-20 and the annual growth rate was observed as 10.50 per cent.

In the case of production, turmeric production has declined from 3,76,000 tonnes in 2000-01 to 71,321 in 2019-20, this drastic reduction in production was mainly due to the Andhra Pradesh reorganisation act. As a result, from 2013-14 onwards, the area and production data of Telangana is not included in the agriculture statistics of Andhra Pradesh. So, the growth rate for the overall study period is -8.28 per cent. Even though a slight decline in the acreage was observed in Period I, the production of turmeric witnessed an increasing trend and the production has increased from 3,76,000 tonnes in 2000-01 to 4,23,220 tonnes in 2012-13 and accounting for a growth rate of 3.41 per cent. While in Period II, production has decreased from 1,51,910 tonnes in 2013-14 to 71,321 tonnes in 2019-20, and accounting for a negative growth rate of 13.73 per cent.

Table 4.17. Exponential growth rates of area and production of turmeric in Andhra Pradesh

Particular	Period-I (2000-01 to 2012-13)	Period-II (2013-14 to 2019-20)	Period-III (2000-01 to 2019-20)
Area (%)	0.61	10.50	-7.08
Production (%)	3.41	-13.73	-8.28

4.2.4 Exponential Growth Rate of Turmeric Productivity in India, Kerala and Andhra Pradesh

A significant reduction in turmeric productivity was observed in India. The all-India average productivity of turmeric was 4762 $kgha^{-1}$ during 2000-01 and it was

declined to 3931 $kgha^{-1}$ during 2019-20 (Appendix IV). The growth rate of productivity was -0.79, -1.72 and -1.66 per cent, respectively, for Period I, Period II and overall period. When compared to the productivity of Andhra Pradesh and all India average, the turmeric productivity of Kerala was very less. However, the productivity witnessed an increasing trend and it has increased from 2190 $kgha^{-1}$ in 2000-01 to 2922 $kgha^{-1}$ in 2019-20. The growth rates of turmeric productivity for Period I, Period II and overall study period were 1.51, 1.62 and 1.52 per cent, respectively (table 4.18). A large fluctuation in productivity was observed in Andhra Pradesh. In Andhra Pradesh, the productivity has decreased from 5082 $kgha^{-1}$ in 2000-01 to 2400 $kgha^{-1}$ in 2019-20. Though the productivity has shown a slight increase during Period I, a notable decrease in productivity was observed during Period II. In Period II, the productivity has decreased from 6740 $kgha^{-1}$ in 2010-11 to 2400 $kgha^{-1}$ in 2019-20. The growth rates of productivity were 4.25, -10.73, -1.27, per cent respectively for Period I, Period II and overall study period.

Table 4.18. Exponential growth rate of turmeric productivity in India, Kerala and Andhra Pradesh

	Productivity		
	Period-I (2000-01 to 2009-10)	**Period-II (2010-11 to 2019-20)**	**Period-III (2000-01 to 2019-20)**
India (%)	-0.79	-1.72	-1.66
Kerala (%)	1.51	1.62	1.52
Andhra Pradesh (%)	4.25	-10.73	-1.27

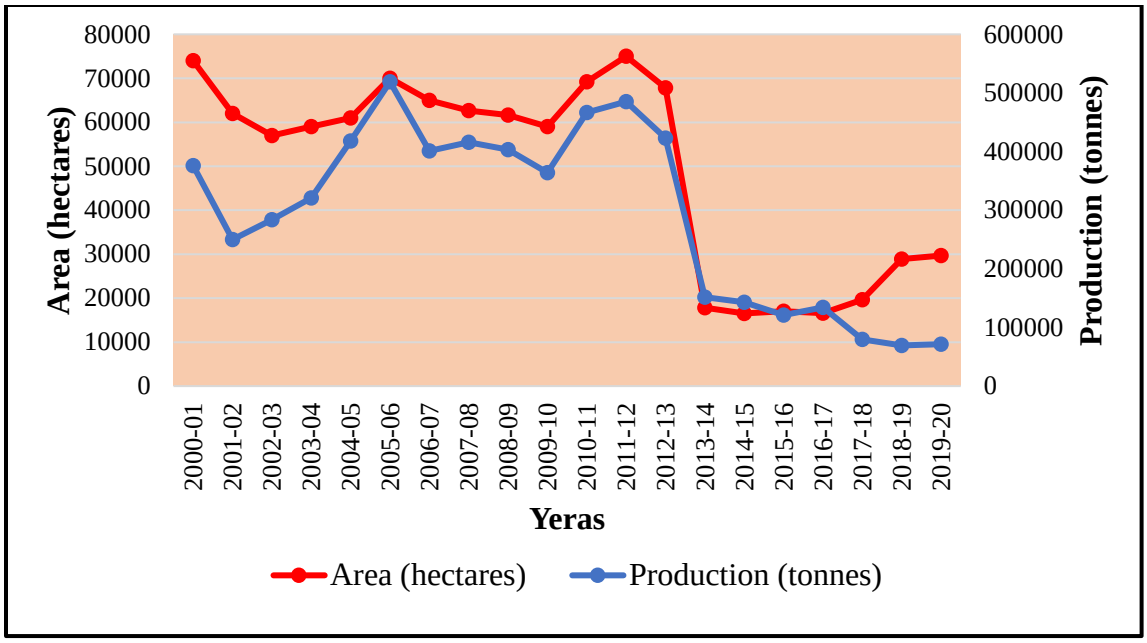


Fig.8 Area and production of turmeric in Andhra Pradesh from 2000-01 to 2019-20

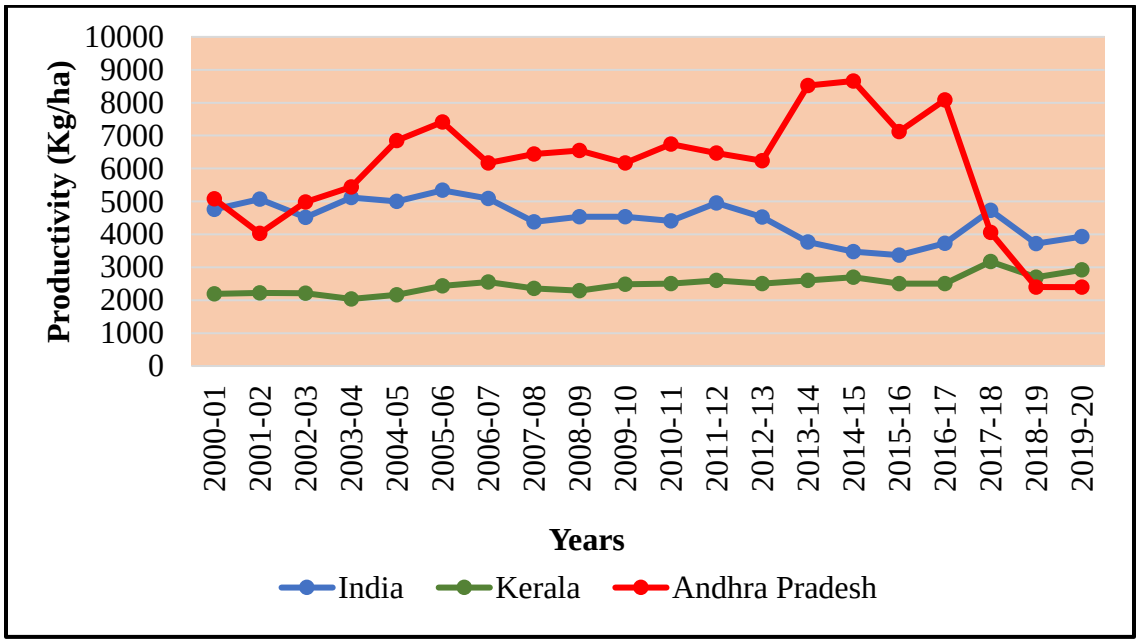


Fig.9 Productivity of turmeric in India, Kerala and Andhra Pradesh from 2000-01 to 2019-20

4.3 ECONOMICS OF TURMERIC CULTIVATION

The cost of cultivation refers to the total expenses incurred by the farmer per unit area. Costs and returns of turmeric cultivation per hectare were calculated separately for Palakkad and Visakhapatnam using cost concepts.

4.3.1 Costs and Returns of Turmeric Cultivation in Palakkad District

The profitability of any enterprise depends upon costs and returns. Generally, in any economic study total costs are discussed under two heads *viz.*, variable costs and fixed costs. In general, variable costs alone are considered to be the cost of cultivation by the farming community ignoring the fixed costs. The profit and loss were also worked out accordingly. Variable costs include expenses on labour employed to perform different cultivation practices and also expenses incurred on material inputs such as seed, farm yard manure, fertilizers, plant protection chemicals, etc. The fixed costs are depreciation on working assets, interest on fixed capital, rental value of owned land and land revenue. The costs and returns of turmeric production in Palakkad were presented in table 4.19.

The total cost of turmeric cultivation in Palakkad district was estimated to be Rs. 2,00,746 per hectare, and it includes total operational costs and total fixed costs. In total cost, operational cost accounted for the major share (86%) and the share of fixed cost was 14 per cent. The results are in line with the findings of Karthik and Amarnath (2014) and they also found that in the total cost of cultivation of turmeric, the share of operational cost was high (85.17%) when compared to the fixed cost (14.83%).

The expenditure towards the human labour was the major item of the cost in the cultivation of turmeric and it was Rs. 1,24,950 per hectare and it accounted the major share of operational cost (71.63%). It was inferred that the majority of the operations in turmeric farming are labour intensive. Chinnadurai *et al.* (2018) and Jaiswal *et al.* (2021) observed the same findings in Erode district of Tamil Nadu and Raigarh district of

Chhattisgarh and reported that in total operational cost the share of human labour accounted about 45.31 per cent and 32.70 per cent, respectively.

Human labour is required to perform various cultural practices viz; land preparation, planting, application of manures, fertilizers and plant protection chemicals, weeding, irrigation, harvesting, boiling, drying etc. Among the various operations, harvesting and land preparation were more laborious. The labour cost incurred for harvesting was Rs. 38,500 per hectare and it accounted for 22.07 per cent of total operational cost. Begum *et al.* (2019) also reported similar findings in Khagrachari district and concluded that harvesting was the major laborious operation in turmeric cultivation and it accounted about 20.19 per cent of the total cost. Similarly, the cost incurred for land preparation was Rs. 35,000 per hectare and it accounted for 20.07 per cent of the total operational cost.

In view of the high labour cost, some farmers in that area used machineries for land preparation and furrow making. Those farmers who were using machineries can reduce around 7.74 per cent of their total operational cost, but majority of the farmers were using human labour for land preparation. Small scale cultivation, fragmented nature of land holding and prevalence of intercropping limited the farmers to go for mechanisation.

In total material cost, seed cost accounted for the high share of about 16.12 per cent, followed by farm yard manure (4.18%), chemical fertilizers (2.41%) and soil ameliorants (1.72%). The use of plant protection chemicals was very meagre and it accounted to only 0.10 per cent. Most of the farmers in the study area opined that when compared to ginger, the incidence of pests and diseases was less in turmeric and the management of crop is easy.

In Palakkad district, the total fixed cost was Rs. 26,316 per hectare. Fixed cost includes land revenue, depreciation on farm implements, rental value of owned land and interest on fixed capital. In total fixed cost, the share of rental value of owned land was high and it was around 76 per cent, followed by depreciation (14.24%), interest on fixed

capital (9.09%) and land revenue (0.66%). A study conducted by Karthick and Amarnath (2014) in Tamil Nadu also reported the same findings that the share of rental value of owned land is 73.81 per cent of the total fixed cost.

Table 4.19. Economics of turmeric cultivation (Rs. ha^{-1}) in Palakkad district

S No.	Particulars	Amount (Rs.)	Percentage share in total operational costs
I. Operational costs			
A	**Cost of materials**		
1	Seed	28,110	16.12
2	Farm yard manure	7,288	4.18
3	Chemical fertilizers	4,206	2.41
4	Plant protection chemicals	168	0.10
5	Soil ameliorants	3,000	1.86
	Total material cost	**42,772**	**24.52**
B	**Cost of labour**		
6	Land preparation	35,000	20.07
7	Seed bed preparation, planting and basal dose of fertilizers	20,300	11.64
8	Intercultural operations	13,650	7.83
9	Irrigation	3,500	2.01
10	Harvesting	38,500	22.07
11	Curing (Boiling & drying	14,000	8.02
	Total labour cost	**1,24,950**	**71.63**
C	Interest on working capital	6,708	3.85
D	**Total Operational Cost (A+B+C)**	**1,74,430**	**100.00**

II. Fixed cost			
S No.	Particulars	Amount (Rs.)	**Percentage share in total fixed cost**
12	Land revenue	175	0.66
13	Depreciation	3,748	14.24
14	Rental value of owned land	20,000	76.00
15	Interest on Fixed Capital	2,392	9.09
E	**Total Fixed Costs**	**26,316**	100.00
G	**Total Costs**	**2,00,746**	

4.3.1.1 Cost Concepts in Turmeric Cultivation (Palakkad District)

Different Cost concepts were worked out in table 4.20. They are cost A_1, cost A_2, cost B_1, cost B_2 and cost C. In the study area, all farmers are cultivated turmeric in their own land, hence Cost A_1 and cost A_2 were same *i.e.,* Rs. 1,74,854. Cost B_1 and Cost B_2 were Rs. 1,77,246 and 1,97,246 per hectare respectively. Cost C was Rs. 2,00,746 per hectare.

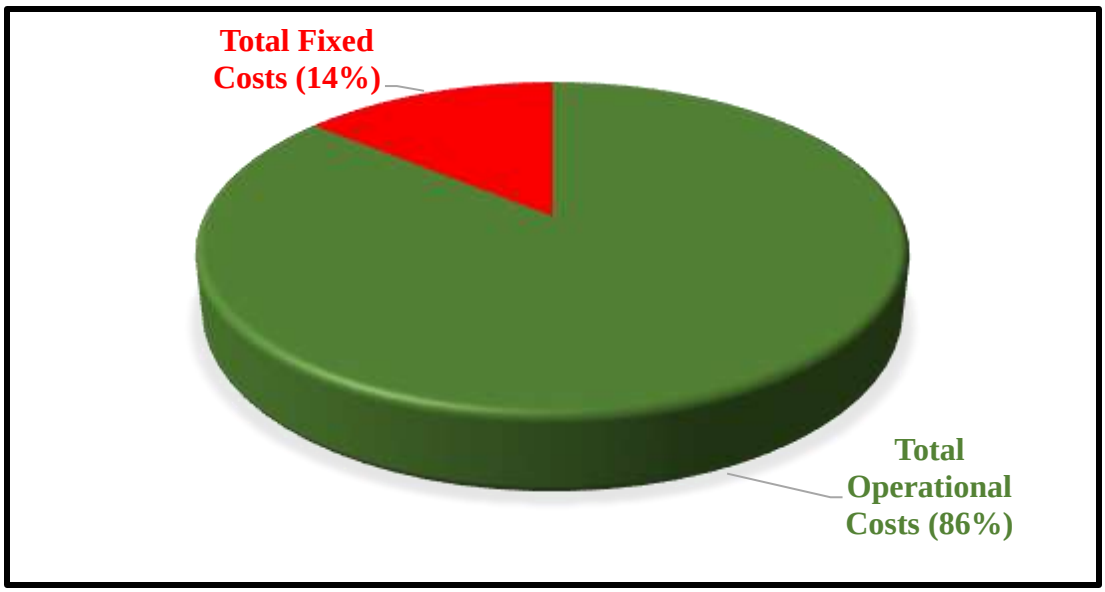


Fig.10 Total costs of turmeric cultivation in Palakkad district

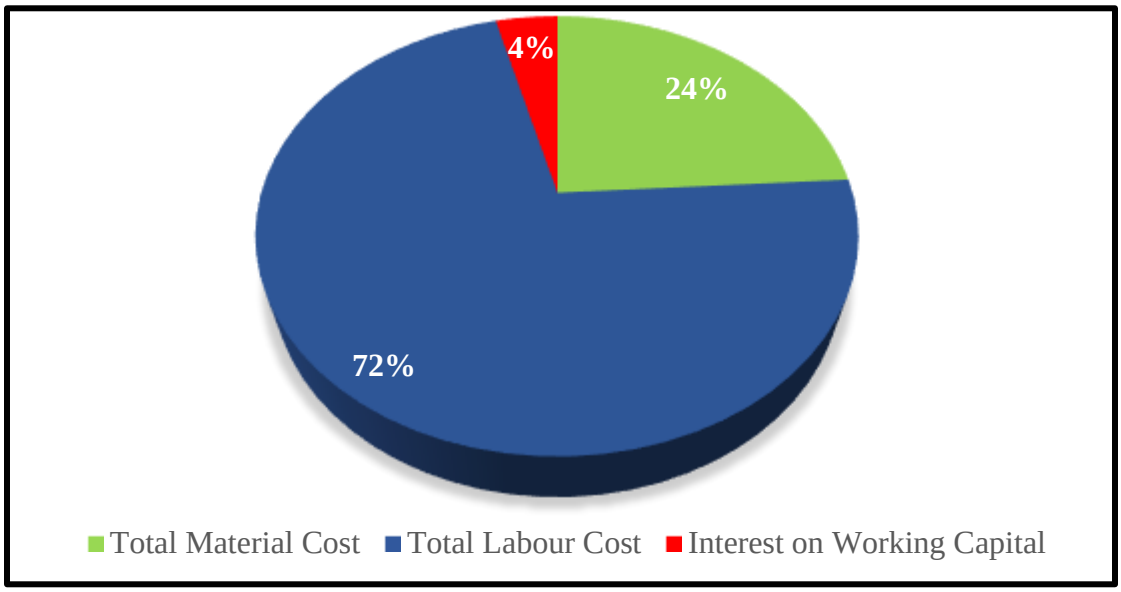


Fig.11 Total operational costs of turmeric cultivation in Palakkad district

Table.4.20. Cost of cultivation of turmeric in Palakkad district (Rs. ha^{-1})

	Particulars	Amount (Rs/ha)
A	**COST OF MATERIALS**	
	Seed	28,110
	Farm yard manure	7,288.65
	Chemical fertilizers	4,206
	Plant protection chemicals	168
	Soil ameliorants	3,000
	Total material cost	**42,772**
B	**Cost of labour**	
	Land preparation	35,000
	Seed bed preparation, planting and basal dose of fertilizers	20,300
	Intercultural operations	13,650
	Irrigation	0
	Harvesting	38,500
	Curing (Boiling & drying	14,000
	Total labour cost	**1,24,950**
C	Interest on working capital	6,708
D	Depreciation	3,748.43
E	Land revenue	175
1	**Cost A_1 (A+B+C+D+E)**	**1,74,854**
F	Rent paid for leased in land	0
2	**Cost A_2**	**1,74,854**
G	Interest on fixed capital	2,631.62
3	**Cost B_1 (cost A_1+G)**	**1,77,246**

H	Rental value of land	20,000
4	**Cost B_2 (cost B_1+H)**	**1,97,246**
I	Imputed value of family labour	3,500
5	**Cost C (Cost B_2+ Imputed value of family labour)**	**2,00,746**

4.3.1.2 Income Measures in Turmeric Cultivation (Palakkad District)

Table.4.21. Income Measures of turmeric cultivation in Palakkad district

S No.	Particulars	Value
1	Yield (kg/ha)	2,250
2	Price per kg (Rs)	120
3	Gross income (or) Gross returns (Rs/ha)	2,70,000
4	Farm business income (Gross income-cost A_1) (Rs/ha)	95,146
5	Family labour income (Gross income-cost B) (Rs/ha)	92,753
6	Net income/Profit (Gross income-cost C) (Rs/ha)	69253
7	Farm investment income (IV-Imputed value of family labour) (Rs/ha)	91,646
8	B-C Ratio at (cost C)	1.34

In the study area, the average yield of turmeric was 2,250 kg per hectare. The average price received by the farmers in the study area was Rs. 120 per kg. Gross income was estimated to be Rs. 2,70,000 per hectare. Farm business income was estimated to be Rs. 95,146 per hectare. The profit found in the study was Rs.69,253 per hectare. The farm investment income was Rs. 91,646. Finally, the Benefit-Cost ratio obtained was 1.34. This means that for every one-rupee invested the farmer got 1.34 rupees from his farm.

Similar results were found by Jaiswal *et.al* (2021) study on turmeric in Raigarh district of Chhattisgarh and they got BC ratio of 1.4.

4.3.2 Costs and Returns of Turmeric Cultivation in Visakhapatnam District

In Visakhapatnam district, the total cost of cultivation of turmeric was worked out to be Rs. 1,21,119 per hectare. In total cost, operational cost (Rs.1,10,825/ha) accounted for the major share of about 92 per cent and the fixed cost was Rs.10,293 per hectare accounting for only 8 per cent. In similar lines, Govindasamy *et. al* (2021) studied on turmeric in Coimbatore district of Tamil Nadu, also reported that variable cost accounted for the major share of about 74.57 per cent.

Human labour is required to perform various cultural practices *viz.*, trimming of bunds, sowing, weeding, manures and fertilizer application, irrigation, harvesting, curing, etc. The expenditure towards the human labour was the major item of the cost in the cultivation of turmeric amounting to Rs. 48,113.58 per hectare and accounted for 43.41 per cent of total operational cost. Chinnadurai *et al.* (2018) also found that the share of human labour cost was the major item in the variable cost and it accounted for 45.31 per cent of total operational cost. Praveen *et.al.* (2018) also got the same results in his study, an economic analysis of production and marketing of turmeric in Guntur district of Andhra Pradesh.

Among the various operations, harvesting and sowing were more laborious. The expenditure towards harvesting was Rs.12,925.64 ha^{-1} and it accounted for 11.66 per cent of total operational cost. Begum *et al.* (2019) also observed similar findings in Khagrachari district of Bangladesh and opined that harvesting alone required a significant percentage of the total labour force. To perform sowing operation, the cost incurred was Rs.9,420.41ha^{-1} and accounted for 8.50 per cent of total operational cost. The cost incurred for irrigation, weeding and fertiliser application were Rs. 9,149.70 ha^{-1}, Rs. 6,985.30ha^{-1} and Rs. 4,434.43 ha^{-1}, respectively.

Total material cost in turmeric cultivation was Rs. 44,699 and accounted for 40.33 per cent of total operational costs. In total material cost, seed cost accounted for the high share, followed by farm yard manure (5.05%), chemical fertilizers (1.80%), and fuel charges (2.05%).

Seed cost was the more expensive cost among all operational costs contributing to 31.43 per cent. Similar results were observed by Praveen *et. al* (2018) in their study and reported that around 31.70 per cent of total operational costs accounted for the seed. Begum *et.al.* (2019) also opined that the most expensive cost among all operational costs was seed or rhizome cost and it contributed around 31.96 per cent to total operational costs. Chinnadurai *et al.* (2018) also found that rhizome (seed) accounted for a greater share in the input expenditure (30.07 %). Most of the farmers in the study area depended on irrigation using motor pumps. These pumps are running with petrol. Average petrol charges to irrigate one hectare land in one crop season was contributing 2.05 per cent to the total operational cost.

In Visakhapatnam district, the total fixed cost was found to be Rs.10,293 per hectare, it includes land revenue, depreciation of farm implements, rental value of owned land and interest on fixed capital. In fixed cost, the share of rental value of owned land was high and it was around 48.57 per cent, followed by depreciation amount (41.17%), interest on fixed capital (9.09%) and land revenue (1.17%).

Table.4.22. Economics of turmeric cultivation (Rs. ha^{-1}) in Visakhapatnam district

SNo.	Particulars	Total value (Rs/ha)	Per cent share in total operational costs (%)
A	**COST OF MATERIALS**		
1	Seed	34,830	31.43
2	Farm yard manure	5,600.60	5.05
3	Chemical fertilizers	1,998.58	1.80
4	Petrol charges (Pump sets)	2,270.48	2.05

	Total material cost	**44,699.80**	**40.33**
B	**Cost of machine labour (Rs/ha)**	**13,750**	**12.40**

C	**Cost of labour**	**Family labour cost**	**Hired labour cost**	**Total cost**	**Percentage to total operational costs**
5	Land preparation (trimming of bunds)	0	703.43	703.43	0.63
6	Sowing	1,205.88	8,214.53	9,420.41	8.50
7	Weeding	663.75	6,321.55	6,985.30	6.30
8	Fertilizer application	703.43	3,731	4,434.43	4.00
9	Irrigation	0	9,149.70	9,149.70	8.25
10	Harvesting	1,996.39	10,929.25	12,925.64	11.66
11	Curing (Boiling & drying	1,170.15	3,324.53	4,494.68	4.05
	Total labour cost	**5,739.59**	**42,373.99**	**48,113.58**	**43.41**

D	**Interest on working capital**	**4,262**	**3.84**
E	**Total operational cost (A+B+C+D)**	**1,10,825**	**100.00**

	Particulars	**Total value (Rs)**	**Percentage to total fixed cost**
12	Land revenue	120	1.17
13	Depreciation	3,748.43	41.17
14	Rental value of owned land	5,000	48.57

15	Interest on fixed capital	935	9.09
F	**Total fixed costs**	10,293.38	100.00
G	**Total costs (E+F)**	**1,21,119**	

4.3.2.1 Cost Concepts in Turmeric cultivation (Visakhapatnam district)

Different cost concepts were worked out in table 4.23. They are cost A_1, cost A_2, cost B_1, cost B_2 and cost C. Cost A_1 and cost A_2 was same *i.e.*, Rs.1,09,444 per hectare because in the study area all the sample farmers cultivated in their own field. Cost B_1 and cost B_2 were Rs.1,10,380 and 1,15,380 per hectare respectively. Cost C was Rs. 1,21,119 per hectare.

Table.4.23. Cost of cultivation of turmeric in Visakhapatnam district (Rs. ha^{-1})

Sl. No.	Particulars	Amount ((Rs/ha)
A	**COST OF MATERIALS**	
1	Seed	34,830.00
2	Farm yard manure	5,600.60
3	Chemical fertilizers	1,998.58
4	Fuel charges	2,270.48
5	Soil ameliorants	3,000.00
	Total material cost	**44,699.80**
B	**Cost of machine labour (Rs/ha)**	**13,750.00**
C	**Cost of labour**	
6	Land preparation (trimming of bunds)	703.43
7	Sowing	8,214.53
8	Weeding	6,321.55
9	Fertilizer application	3,731.00
10	Irrigation	9,149.70

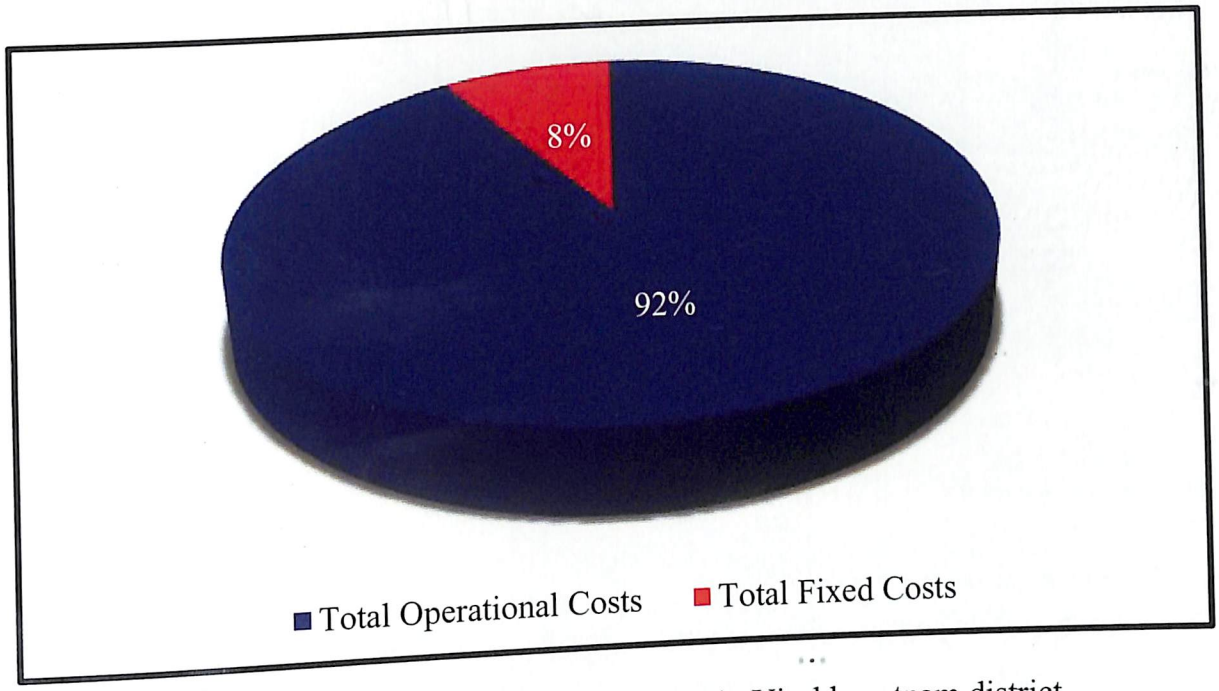


Fig.12 Total costs of turmeric cultivation in Visakhapatnam district.

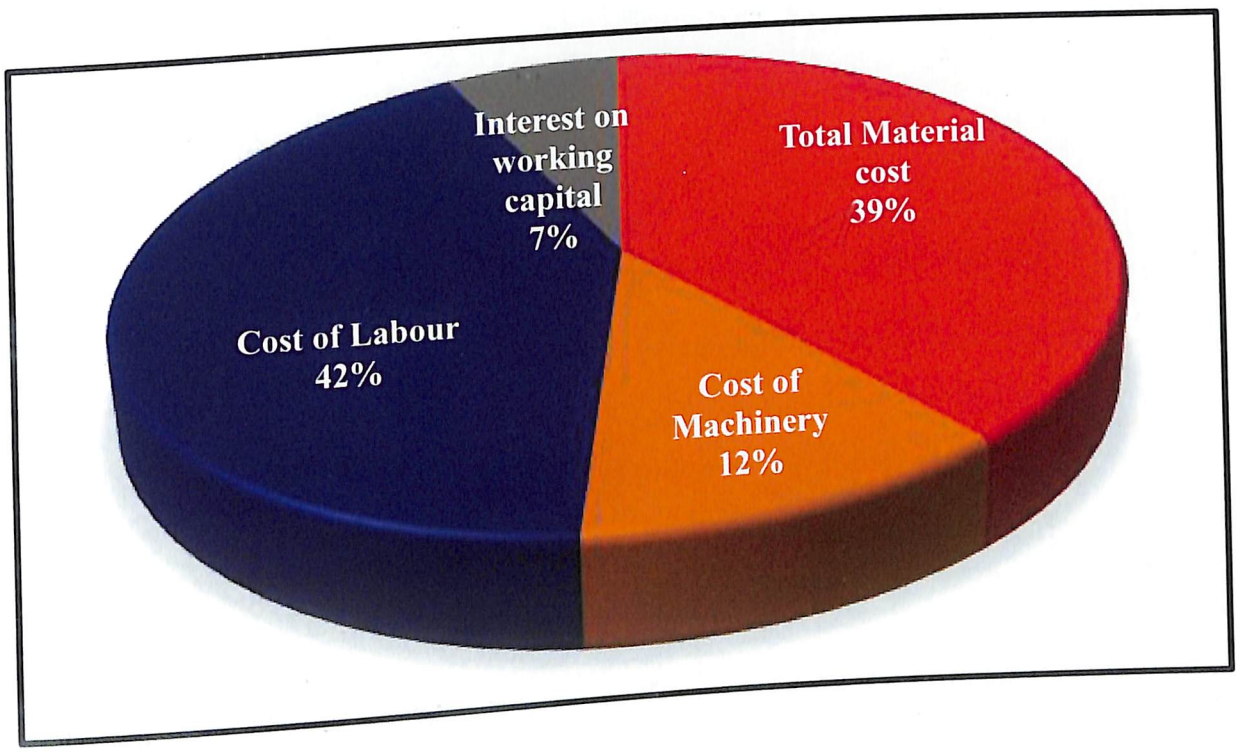


Fig.13 Total operational cost of turmeric cultivation in Visakhapatnam district

11	Harvesting	10,929.25
12	Curing (Boiling & Drying)	3,324.53
	Total labour cost	**42,373.99**
D	**Interest on working capital**	**4262.00**
E	Land revenue	120.00
F	Depreciation	4238.00
i	**Cost A_1 (A+B+C+D+E+F)**	**1,09,444.00**
G	Rent paid for leased in land	0
ii	**Cost A_2 (Cost A_1+G)**	**1,09,444.00**
H	Interest on fixed capital ...	935.80
iii	**Cost B_1 (Cost A_1+H)**	**1,10,380.00**
I	Rental value of land	5000.00
iv	**Cost B_2 (Cost B_1+I)**	**1,15,380.00**
J	Imputed value family labour	**5,739.59.00**
v	**Cost C (Cost B_2+J)**	**1,21,119.00**

4.3.2.2 Income Measures in Turmeric cultivation (Visakhapatnam district)

Table. 4.24. Income measures of turmeric cultivation in Visakhapatnam district

S No.	Particulars	Value
I	Yield (kg)	2,100
II	Price per kg (Rs)	80
III	Gross income (or) Gross returns (Rs/ha)	1,68,000
IV	Farm business income (Gross income-cost A_1) (Rs/ha)	58,555
V	Family labour income (Gross income-cost B) (Rs/ha)	57,619
VI	Net income (Gross income-cost C) (Rs/ha)	46,880
VII	Farm investment income (IV-Imputed value of family labour) (Rs/ha)	52,816

VIII	B-C Ratio (Gross income/cost C)	1.39

In the study area, average yield of turmeric was 2,100 kg per hectare. The average price received by farmers was Rs. 80 per kg. Gross income was Rs. 1,68,000 per hectare. Farm business income and family labour income were estimated to be Rs. 58,555 and 57,619 per hectare, respectively. The net income obtained by the farmers in the study area was Rs.46,880 per hectare. The farm investment income was Rs.52,816 per hectare. Finally, the Benefit-Cost ratio obtained was 1.39, indicating that for every one-rupee invested by the farmer, he was getting 1.39 rupees in return. Since, the BC ratio was greater than one, the production of turmeric was highly remunerative and profitable for the growers in the study area. Govindasamy *et al.* (2021) also observed a similar high BC ratio for turmeric farmers in the Coimbatore district of Tamil Nadu. In a similar line, Jaiswal *et al.* (2021) reported the same results in their study conducted in Raigarh district of Chhattisgarh where the BC ratio of turmeric cultivation was more than unity.

4.4 INPUT USE PATTERN IN TURMERIC CULTIVATION

4.4.1 Input Use Pattern of Turmeric Cultivation in Palakkad District

4.4.1.1 Human Labour Utilization in Palakkad District

Human labour is one of the important input services influencing the cost structure. Every cultural operation requires human labour for its successful operation. The use of this input service depends on the type and size of the enterprise. The operation-wise human labour utilization in turmeric cultivation is presented in table 4.25.

Land preparation was the prime operation. Most of the farmers in the study area used human labour for the land preparation, while very few farmers used tractors and hitachi. To prepare land, farmers employed 50 males per hectare, and it was accounted around 20.40 per cent to the total labour requirement.

In the study area, planting was usually done in a raised seedbed. The farmers employed 20 females and 18 females per hectare for seedbed preparations, sowing and

basal dose of fertilizer application and it accounted for 15.51 percent of the total labour requirement.

Intercultural operations include weeding, manuring and application of pesticide or herbicide. Weeds are removed one month after planting. Depending on the growth of weeds, two or more weedings were required during the entire crop period. Weed infestation was one of the factors for yield loss in turmeric. The cultural method (manual weeding) of weed control was the common practice followed by the farmers in the study area. Apart from that, farmyard manure, urea, rock phosphate and murite of potash were the commonly used chemical fertilizers in the study area. Most of the farmers used lime as a soil amendment. Generally, farmers have applied the required nutrients in three to four split doses. For doing all these operations, farmers employed 12 male and 15 female labours per hectare and it was accounted 11.02 per cent of the total labour.

Most of the farmers depended on rainfall for irrigation. In case of dry spell, farmers employed labourers to irrigate the field. For undertaking the irrigation, the labour requirement was five males per hectare and it accounted 2.04 per cent of total labour requirement.

Depending on the variety, the crop becomes mature and ready for harvest within eight or nine months after sowing. The indication of crop maturity is yellowing and drying of the leaves. During harvest, the leaves and stalk are cut close to the ground. The farmers irrigated the field two days before digging, which makes it easier to uproot the rhizome. Rhizomes were uprooted by hand using a digging fork. The whole clumps of rhizomes were carefully raised. Adhering soil was removed and the fibrous roots were trimmed off. The main rhizome is known as bulb and secondary ones are called fingers. To perform all these operations, farmers employed 25 males and 60 females per hectare, and it accounted for around 34.69 per cent of the total labour requirement. The curing operation was done in two days after harvesting. This process includes both boiling and curing. Farmers employed 40 labourers for this operation and it was accounted for around 16.32 per cent of total labour requirement.

On an average, the total human labour utilization was 245, this includes 112 male and 133 female labourers. These results are in line with the study of Prasanna Lakshmi (2017) on the economic analysis of production and marketing of turmeric in Kadapa district of Andhra Pradesh, which reported that 241 human labourers were required to cultivate turmeric per hectare.

Table 4.25. Operation wise human labour utilisation in turmeric cultivation (Palakkad district)

S No.	Particulars	Male	Female	Total
1	Land preparation including the side furrows	50	0	50 (20.40%)
2	Seed bed preparation, sowing and basal dose of fertilizer applications	20	18	38 (15.51%)
3	Intercultural operations (Weeding, manuring and pesticide/herbicide application)	12	15	27 (11.02%)
4	Irrigations *	5*	0	5 (2.04%)
5 ..	Harvesting	25	60	85 (34.69%)
6	Curing (Boiling and drying)	0	40	40 (16.32%)
	Total	112	133	245 (100.00%)

Note: Figures in parentheses indicate percentages to the total, * Family labour (farmers used the family labourers for the irrigation purposes, for all other operations they used hired labourers)

The major labour demanding operations were harvesting (34.69%), land preparation (20.41%), curing (16.32%) and intercultural operations (15.51%). Among total labour, 86.56 per cent was employed in these operations. Prasanna Lakshmi (2017) also reported the similar findings that the harvesting operation alone accounted 30.33 per cent of total labour utilization in turmeric cultivation.

4.4.1.2 The Operation-Wise Human Labour Utilization in Turmeric Cultivation in Visakhapatnam District

Land preparation was the prime operation and, it was performed using a tractor. First of all, the field was ploughed using a disc plough and, later cultivator was used to prepare ridges and furrows. Two male labourers were employed during tillage operations to make and trim the bunds, and this operation accounted for only 1.25 per cent of the total labour requirement.

In the study area, planting was done along the ridges and furrows. Altogether 33 labourers were utilized for the planting and it was accounted for around 20.05 per cent of the total labour requirement. Farmers mainly employed hired female labourers for this purpose.

Farmers used the service of 28 female labourers for weeding and earthing up operations. Most of them were hired female labours and 17.43 per cent of the total human labour was used for this activity.

Most of the farmers depended on rainfall for irrigation. During dry spells, farmers used hired labourers to irrigate their fields. For undertaking the irrigation, the farmer employed 26 hired male labourers per hectare, which accounted 16.30 per cent of the total labour requirement.

Harvesting operations includes leaf cutting, digging, collection of rhizomes and cleaning of rhizomes. Farmers mainly employed hired female labourers to perform the harvest. In total, the harvesting operation required 44 labourers, including 24 female and 14 male hired labourers and four male and two female family labourers. Harvesting operation alone accounted 27.72 per cent of total labour requirement.

Fifteen workers were employed for curing operation and, it was accounted for around 8.89 per cent of the total labour usage. Overall, the human labour used for cultivating turmeric in one-hectare area was 161.

When we compare all operations, the number of workers employed for harvest was high and, it was around 27.72 per cent of the total workforce, followed by transplanting (20.5%), weeding (17.43%), and irrigation (16.30%). A study conducted by Bhuvana (2020) in the Nirmal district of Andhra Pradesh also reported the same findings that harvesting was the major laborious work in turmeric production and was accounted for around 22.37 per cent of the total workforce.

Table.4.26. Operation wise human labour utilisation in turmeric cultivation (Visakhapatnam district)

S No.	Particulars	Family		Hired		Total
		Men	Women	Men	Women	
1	Land preparation	0	0	2	0	2 (1.25%)
2	Transplanting	2	2	10	19	33 (20.50%)
3	Weeding	0	3	0	25	28 (17.43%)
4	Fertilizer application	2	0	11	0	12.33 (7.90%)
5	Irrigation	0	0	26	0	26 (16.30%)
6	Harvesting	4	2	14	24	44 (27.72%)
7	Curing	3	1	7	4	15 (8.89%)
	Total	11	8	70	72	161 (100.00%)

Note: Figures in parentheses indicate percentages to the total.

4.4.2 Machinery Services

In Palakkad district, turmeric farm operations were usually carried out using manpower. Very few farmers were used machine power for preparing the land. Tractor was employed for land preparation operations including ploughing and making side furrows. Ploughing was done by running tractor for an hour and side furrows were done using Hitachi for an hour.

In Visakhapatnam district the majority of the farmers used machine power for the preparation of land. The farmers carried out two tillage operations, first tillage operation with cultivator and second with disc plough.

4.4.3. Material Inputs

4.4.3.1 Material Inputs Used in Turmeric Cultivation in Palakkad District

Production of farm commodities not only requires resource services, but also need material inputs like seed, manures, fertilizers, plant protection chemicals etc. The details of input utilisation by the turmeric farmers in the Palakkad district are presented in the table 4.27.

Table. 4.27. Material inputs used in turmeric cultivation in Palakkad district

S No.	Particulars	Quantity (kg)	Total cost (Rs)
1	Seeds	937	28,110
2	FYM	2915	7,288.65
3	Fertilizers		
i	Urea	31	184.68
ii	Factomphos	102	2,444.16
iii	MOP	87	1,577.16
4	Soil ameliorants		
	Lime	375	3,000.00
5	Herbicides		
	Glyphosate (ml)	150	67.50
6	Pesticides		
	Quinolphos (ml)	125	100.00
			42,772

In Palakkad, the average amount of seed used by the farmers was 937 kg per hectare and it costs around Rs. 28,110. The farmers were mostly using local seed for the planting purpose. Farmers usually applied farmyard manure during the preparation of seedbed, for one hectare area the average usage of farmyard manure was 2915 kg. Apart from farmyard manure, farmers also used chemical fertilisers like urea, factomphos and muriate of potash. Nitrogen requirement of the plant is mainly met from the application of urea and factomphos, and these together provided around 38.84 kg nitrogen. Similarly, phosphorous requirement of plant was met from factomphos and potash requirement was met from muriate of potash. The usage of urea, factomphos and muriate of potash were 31kg, 102 kg and 87 kg, respectively. Farmers also applied lime to the extent of 375 kg per hectare. Even though most of the farmers carried out the weeding manually, some farmers were used weedicide, especially glyphosate to an extent of 150 ml per hectare.

Turmeric plants are not prone to severe diseases. As a pest control measure farmers used 125 ml quinalphos.

4.4.3.2 Material Inputs Used in Turmeric Cultivation in Visakhapatnam District

Table.4.28. Material inputs used in Turmeric cultivation in Visakhapatnam district

Sl No	Particulars	Quantity (kg)	Cost (Rs.)
1	Seeds	1,393.21	11,716.50
2	Farm yard manure	3,730.00	7,288.65
3	Fertilizers		
i	Urea	43.98	184.68
ii	Di- Ammonium Phosphate (DAP)	46.42	2,444.16
iii	Muriate of Potash (MOP)	34.78	1,577.16
4	Fuel (L)	21.22	2,270.00
			44,699

The sample farmers used 1,393.21 kg of seeds per hectare. The actual use of farm yard manure was 3,730 kg per hectare and it cost around Rs. 7,288.65. The use of nitrogen by the sample farmers in terms of urea and DAP was 20.23 kg and 7.92kg, and the total application of nitrogen was 28.15 kg per hectare. The phosphorous and potash usage by farmers through Di- Ammonium Phosphate (DAP) was 21.35 kg and 46.42kg respectively, and through muriate of potash was 20.87 kg and 34.78 kg respectively per hectare of land. The recommended dose of NPK was 50,50 and 60 kg per hectare. Fuel was used to run the motor pumps for irrigating the field and cost incurred for the fuel is Rs.2,270.

4.5 RESOURCE USE EFFICIENCY

4.5.1 Resource Use Efficiency in Palakkad District

In farming, the resources are scarce and farmers have limited access to these resources with their poor financial status. Here the prime goal of the farmer is to maximise the output with available resources. Hence, they will judiciously use their resources to earn maximum income from farming. The study examined the input-output relationship and the resource-use efficiency in turmeric production using Cobb Douglas production function. The regression coefficients of different inputs used in the production function were estimated and the results are presented in table 4.29.

It could be observed from the table that inputs viz.X_1 (area) and X_{10} (No. of labourers) were significant at one per cent level, whereas X_6 (farmyard manure) was significant at five per cent level and X_5 (Muriate of potash) was significant at 10 per cent level and these inputs were positively influenced towards the dependent variable. The value of the coefficients indicated that an increase in usage of area, number of labourers, farmyard manure and muriate of potash by one per cent from the existing mean level would increase the yield of turmeric by 0.64, 0.59, 0.09 and 0.05 per cent, respectively. The coefficients of X_4 (factomphos) and X_7 (lime) were also found to be significant at 10 per cent level, but negatively related with the dependent variable, indicating that a one per cent increase in the usage of these inputs would decrease the yield by 0.04 and 0.09 per cent, respectively.

The adjusted coefficient of multiple determination (R^2) was 0.95 and it depicted that 95 per cent of variations in the turmeric yield was contributed by all the factors together in the model. The summation of beta coefficients ($\sum bi$) provides information about the return to scale, where the value was 1.31, indicating the increasing returns to scale, *i.e.,* if all the resources in the fitted model increased by one per cent, output increased by about 1.31 per cent.

Table. 4.29. Resource use efficiency of turmeric production in Palakkad district

S No.	Variables	Regression Coefficients	Standard Error	P- Values
1	Regression constant	1.01	0.38	0.016
2	Area	0.64***	0.17	0.001
3	Seed	0.06	0.06	0.296
4	Urea	0.01	0.008	0.334
5	Factamphos	-0.04*	0.02	0.067
6	Muriate of Potash (MOP)	0.05*	0.03	0.084
7	Farm Yard Manure (FYM)	0.09**	0.05	0.052
8	Lime	-0.09*	0.05	0.079
9	Herbicide	-0.01	0.01	0.555
10	Pesticide	-0.0003	0.01	0.966
11	Labour	0.59***	0.19	0.006
12	R Square	0.97		
13	Adjusted R Square	0.95		
14	Standard Error	0.11		
15	**∑bi**	**1.31**		
16	**Total observations**	**30**		

*Significance at 10 per cent level.
**Significance at 5 per cent level.
***Significance at 1 per cent level.

4.5.1.1 Allocative Efficiency of Turmeric Production in Palakkad District

Here Marginal Value Product (MVP) of each factor was compared with its Marginal Factor Cost (MFC). MVP/MFC ratio indicated the potential of inputs for its continued use, higher value (greater than unity) shows greater potentiality for additional use. The negative ratio indicates the excessive use of input and suggests a reduction in the current level of input usage. If MVP = MFC then the resource is said to be allocated efficiently or optimally. The ratios were calculated only for the significant resources in the production of turmeric and are presented in table 4.30.

The variables muriate of potash, farmyard manure and human labourers were having greater potentiality for additional use as their MVP/MFC ratios were greater than unity. The ratios of MVP/MFC in the case of muriate of potash, farmyard manure and human labour were 12.3, 6.65 and 1.44 respectively, which means that each additional rupee spent on these inputs is added Rs.12.3, Rs.6.65 and Rs.1.44, respectively to the returns from turmeric. This implies that there was an under-utilization of these resources in the cultivation of turmeric in the study area.

The variables like factomphos and lime, the MVP/MFC ratio found to be less than one, i.e., -5.93 and -3.19, indicating that every additional rupee spent on factomphos and lime would decrease rupees -5.93 and -3.19 respectively to the returns in the production of turmeric. The result implied that there was an overutilization of these resources in the cultivation of turmeric in the study area.

Table.4.30. Comparison of marginal value product of inputs with their factor cost in turmeric cultivation (Palakkad district)

S No.	Variables	Geometric mean	Regression Coefficients	MVP	MFC	k =MVP/MFC	
1	Factamphos (kg)	13.85	-0.04	165.52	27.92	-5.93	Over utilized
2	Muriate of Potash (kg)	13.00	0.05	223.80	18.13	12.3	Under utilized
3	Farm Yard Manure (kg)	355.87	0.09	16.61	2.49	6.65	Under utilized
4	Lime (kg)	189.87	-0.09	-31.98	10	-3.19	Over utilized
5	Labour (man days)	49.29	0.59	736.06	510	1.44	Under utilized

*Significance at 10 per cent level.
**Significance at 5 per cent level.
***Significance at 1 per cent level.

4.5.2 Resource Use Efficiency of Turmeric in Visakhapatnam District

The resource use efficiency of turmeric in Visakhapatnam district was estimated using Cobb Douglas production function and was reported in the table 4.31. It was observed from the table that the area and seeds were found to be significant at five per cent level, whereas machine service was significant atone per cent level.

The coefficients of the variables X_1 (area), X_2 (seed) and X_8 (machine service) were 0.53,0.41 and 0.62, respectively. The co-efficient of area, seed and machine service indicate that a one per cent increase in the usage of these inputs increases the mean yield of turmeric by 0.53, 0.41 and 0.62, respectively.

The adjusted R square value of the fitted production function was 0.96, which depicted that 96 per cent variation in the yield was contributed by all the factors together in the model. The information about the returns to scale is provided by the value of ∑**bi,** where the value was 1.65 and it indicated the increasing returns to scale, *i.e.,* if all the resources increased by one per cent, output increases by 1.65 per cent.

Table. 4.31 Resource use efficiency of turmeric production in Visakhapatnam district

S No.	Variables	Coefficients	Standard Error	P-value
1	Regression constant	3.04	1.42	0.036
2	Area	0.53**	0.21	**0.01**
3	Seed	0.41**	0.18	**0.02**
4	Urea	0.01	0.01	0.17
5	Di-Ammonium phosphate	0.003	0.004	0.42
6	Muriate of potash	-0.004	0.005	0.39
7	Farm yard manure	0.02	0.07	0.73
8	Labour	0.05	0.14	0.69
9	Machine	0.62***	0.09	**0.00**
10	R Square	0.96		
11	Adjusted R Square	0.95		
12	Standard Error	0.12		
13	**∑bi**	**1.65**		
14	Observations	70		

4.5.2.1 Allocative Efficiency of Turmeric Production in Visakhapatnam District

To examine the economic efficiency of resource use, the Marginal Value Product (MVP) of each factor is compared with its Marginal Factor Cost (MFC) and the results are presented in the table 4.32. The ratios were calculated only for the significant variables in the fitted production function. The variables seed and machine service were

having greater potentiality for further use as their MVP/MFC ratios were greater than unity. The ratios of MVP/MFC in the case of seed and machine were 2 and 5.76, respectively, indicating that every additional rupee spent on seed and machine would add Rs.2 and Rs. 5.76 to the returns in the production of turmeric. This implies that there was an under-utilization of these resources in the cultivation of turmeric in the study area.

Table. 4.32. Comparison of marginal value product of inputs with their factor cost in turmeric cultivation (Visakhapatnam district)

S No.	Variables	Geometric mean	Regression coefficient	MVP	MFC	k=MVP/MFC	
1	Seed (kg)	811.89	0.41	34830	25	2	Under utilized
2	Urea (kg)	0.54	0.01	NS	-	-	-
3	Machine (kg)	3	0.62	13750	3437	5.76	Under utilized

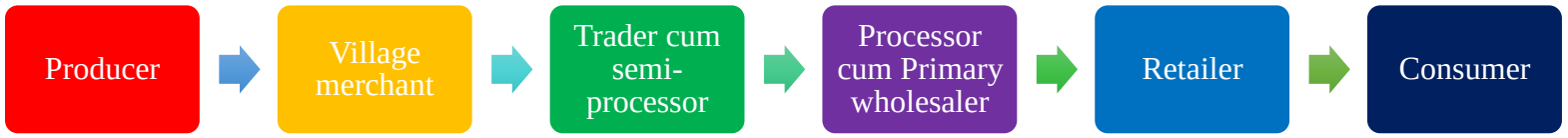
4.6 MARKETING OF TURMERIC

4.6.1 Marketing of Turmeric in Palakkad District

4.6.1.1 Marketing Channels

Marketing channels are the chain of intermediaries through which commodity move from producer to consumer. The length of the channel varies with the type, quantum and degree of perishability of the products. In Palakkad district, two major marketing channels of turmeric have been identified and shown in Fig.14. The main marketing intermediaries were village merchants, traders cum semi-processors, processors cum primary wholesalers and retailers. Channel II was the predominant marketing channel in the study area. In channel-II, producers directly sell their produce to the traders cum semi-processors, then to processors cum primary wholesalers, then to retailers and finally to the consumers. While in channel I, farmers sold their products to

Channel-I



Channel-II

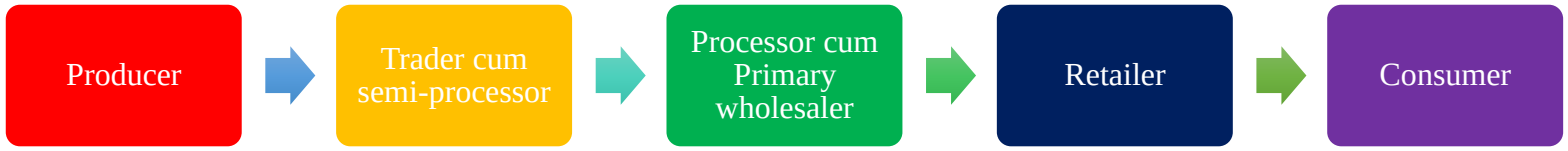


Fig.14 Major marketing channels of turmeric in Palakkad district

the village merchants, then to the trader cum-semi processor, then to the processor cum wholesaler, retailer and finally to the consumers.

4.6.1.2 Marketing Costs, Margin and Price Spread

The cost of marketing is a serious concern for farmers as high marketing costs will challenge the interests of both farmers and consumers. Marketing costs consist of all the items of expenses incurred in transferring goods from the producer to the ultimate consumer. In the process of marketing, commodities move through the intermediaries and, finally it reach to the consumers. Every service or function of the intermediaries involves some cost, similarly intermediaries also make some level of profit to remain in the trade. Studies on marketing margins and costs are important, as they reveal the costs incurred by each agency in different channels and the share of each agency in the total cost.

Marketing costs and margins of the two marketing channels identified in the study area were worked out to assess the share of different functionaries involved and ultimately the producer's share in consumer's rupee and are shown in table 4.33. It was observed from the table that the marketing cost of turmeric was slightly higher in Channel I when compared to channel-II and it was around 15.69 and 15.00 per cent of the consumer's purchase price, respectively. In channel I, of the total marketing cost, the cost incurred by the processor cum primary wholesaler is highest (6.67% of consumer's purchase price), followed by trader cum semi-processor (3.89%), retailers (2.78 %) and village merchants (2.36 %). Similarly, in Channel II, the cost incurred by the processor cum wholesaler was highest (6.67% of consumer purchase price), followed by trader cum semi-processor and retailer, both were incurred 2.78 per cent of consumers purchase price.

The total marketing margin was highest in Channel I, and it was around 23.19 per cent of the consumer's purchase price. Where the total margin earned by the processors cum wholesaler was highest (10 per cent of consumer's purchase price), followed by retailers (8 %), traders cum semi-processors (5.00 %) and village merchants (3.19%). In the case of channel II, the marketing margin was about 21.11 per cent of the consumer

purchase price, here also the share of processor cum wholesaler was highest (10.00%), followed by retailer (8.00 %) and trader cum semi-processor (6.10%).

The difference between the price paid by the consumer and the price received by the producer for an equivalent quantity of farm output is known as price spread in the marketing of agricultural commodities. The producer's share in consumer's rupee varied from channel to channel and was high in channel II (66.67%), whereas in channel-I it was 61.11 per cent.

The analysis of marketing costs and margins revealed that the producer was getting higher share of consumer's rupee in channel-II (66.67%) than that of channel I (61.11%). The price spread was relatively lower when farmers directly sell their produce to the traders cum semi-processing units. Similar results were also observed by Shireesha (2015) in her study on "Influence of futures market on price behaviour of turmeric in India". The processor cum wholesaler who performs both processing and marketing activities realized higher profit margin compared to village merchants, trader cum semi-processors and retailer. Further, it was observed that there was no difference between the two marketing channels regarding costs incurred and margins realized by the processor cum primary wholesaler and retailer.

Table. 4.33. Price spread of turmeric marketing in Palakkad district (For one quintal of turmeric)

S No	Market Intermediaries	Channel-I (Rs/Qtl)	Per cent to consumer purchase price	Channel-II (Rs/Qtl)	Per cent to consumer purchase price
1	**Farmer sale price**	11,000	61.11	12,000	66.67
	Market cost	0		500	2.77
	Net price	11,000		11,500	63.89
2	**Village merchant**				
	Purchase price	11,000	61.11	-	
	Marketing cost	425	2.36	-	
	Margin	575	3.19	-	
3	**Traders cum Semi processor**				
	Purchase price	12,000	66.67	12,000	66.67
	Marketing cost	700	3.89	500	2.78
	Margin	900	5.00	1,100	6.10
4	**Processor cum Primary wholesalers**				
	Purchase price	13,600	75.56	13,600	
	Marketing cost	1,200	6.67	1,200	6.67
	Margin	1,800	10.00	1,800	10.00
5	**Retailer**				
	Purchase price	16,600	92.22	16,600	92.22
	Marketing cost	500	2.78	500	2.78
	Margin	900	8.00	900	8.00

6	**Consumer purchase price**	18,000	100.00	18,000	100.00
7	**Total marketing cost**	**2,825**	**15.69**	**2,700**	**15.00**
8	**Total marketing margin**	**4,175**	**23.19**	**3,800**	**21.11**

From the figure 16, it can be observed that 80 per cent of people marketed their produce through channel-II and the remaining 20 per cent marketed through channel-I

4.6.1.3 Marketing Efficiency

The marketing efficiency was computed using both Shepherd's method and Acharya's method and the results are presented in table 4.34. It was observed from the table that the index of marketing efficiency was higher in Channel-II due to the less number of intermediaries associated with marketing.

Table. 4.34. Marketing efficiency of turmeric in Palakkad district

Particulars	**Channel-I**	**Channel-II**
Marketing Efficiency (Shepherd's Index)	**2.57**	**2.77**
Acharya's method	**1.57**	**1.77**

4.6.2 Marketing of Turmeric in Visakhapatnam District

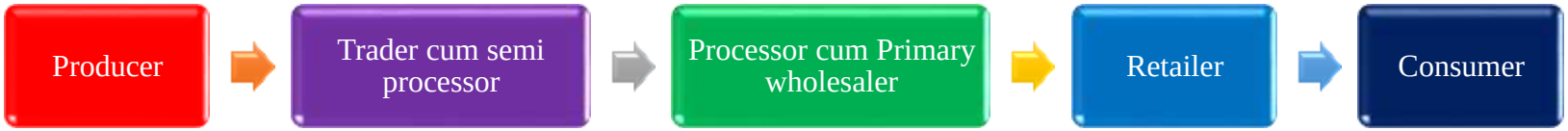
4.6.2.1 Marketing Channels

In Visakhapatnam district, three marketing channels were identified and shown in Fig.15 The main marketing intermediaries were village merchants, trader cum semi processors, processors cum primary wholesalers, retailers. Channel-I was the predominant marketing channel in the study area.

In channel-I, Producers sell their produce to the village merchant, then to trader cum semi processor, then processor cum primary wholesaler, then retailer and finally to the consumers. Whereas in channel-II, farmers directly sold their produce to the trader

Channel-I

Channel-II



Channel-III

Fig.16 Major marketing channels of turmeric in Visakhapatnam district.

cum semi processors, then processor cum primary wholesalers, then retailers and finally to the consumers. While in channel-III, traders mostly came from Kerala and purchase turmeric from farmers at higher rates than above channels. After that trader cum semi processors sell their produce to processor cum primary wholesalers, then retailers and finally to the consumer.

4.6.2.2 Marketing Costs, Margin and Price Spread

This knowledge eventually aids us in identifying the causes of high marketing expenditures as well as viable solutions to reduce them. The expenses and margins of the three marketing channels identified in the study area were calculated in order to determine the proportion of various functionaries involved and ultimately the producer's share of the consumer's rupee and are shown in below table 4.35. It was observed from the table that the marketing cost of turmeric was slightly higher in Channel-I, compared to channel-II and Channel-III, it was around 21.88, 20.66 and 19.39 per cent of the consumer's purchase price, respectively. In channel-I, of the total market cost, the cost incurred by the trader semi processor was highest (10.71 per cent of consumer's purchase price), followed by processor cum primary wholesalers (7%), retailers (2.55 %) and village merchants (1.62 %). Similarly in channel-II, the cost incurred by the trader cum semi processor was highest (10.71 per cent of consumer's purchase price), followed by processor cum primary wholesalers (7%) and retailers (2.55 %). Whereas in channel-III also trader cum semi processor was incurred highest cost (10.28per cent of consumer's purchase price), followed by processor cum primary wholesalers (6.61%) and retailers (2.5%).

The total marketing margin was highest in channel-I, and it was around 32.80 per cent of consumer purchase price. Where the total margin earned by the trader cum semi processors was highest (14.87 % per cent of consumer's purchase price), followed by processor cum primary wholesalers (9.99 %), retailers (5 %) and village merchants (2.83%). In the case of channel-II, the marketing margin was about 28.75 per cent to the consumer purchase price, here also trader cum semi processors was highest (13.65 % per

cent of consumer's purchase price), followed by processor cum primary wholesalers (9.99 %) and retailers (5 %). Whereas in channel-III, the marketing margin was about 25.06, here also trader cum semi processors was highest (11.11 per cent of consumer's purchase price), followed by processor cum primary wholesalers (8.94 %) and retailers (5 %).

The producer's share in consumer's rupee varied from channel to channel and was higher in channel III (55.56%) whereas in Channel-I and Channel-II was 45.33 and 50.99 per cent.

The analysis of marketing costs and margins revealed that the producer was getting higher share of consumer's rupee in channel-III (55.56%) than that of channel-I (45.33%) and Channel-II (50.99). The price spread was relatively lower when farmers directly sell their produce to the traders cum semi processing units. The trader cum semi processors export produces to different areas like Tamil Nadu, Kerala and Bangalore in channel-I and II. The Processor cum wholesaler who performs processing activities, marketing activities such as processing the dry turmeric into powder form, weighing, packing and distribution of turmeric powder to the retailers realized higher profit margin compared to village merchants, traders cum semi processors and retailers. Further, it is observed that there was no difference between the two marketing channels regarding costs incurred and margins realized by the trader cum semi processors, processor cum primary wholesalers and retailers.

Table: 4.35. Price spread of turmeric marketing in Visakhapatnam (1 quintal)

S No.	Particulars	Channel-I **(Rs/Qtl)**	Per cent to consumer purchase price	Channel-II **(Rs/Qtl)**	Per cent to consumer purchase price	Channel-III **(Rs/Qtl)**	Per cent to consumer purchase price
1	**Producer sale price**	8,000	45.33	9,000	50.99	10,000	55.56
2	**Village merchant**						
	Purchase price	8,000		-		-	
	Market cost	285	1.62	-		-	
	Margin	500	2.83	-		-	
3	**Trader cum semi processor**						
	Purchase price	8,785		9,000		10,000	
	Market cost	1,890.4	10.71	1,890	10.71	1,850	10.28
	Margin	2,624	14.87	2,410	13.65	2,000	11.11
4	**Processor cum primary wholesaler**						
	Purchase price	13,299.4		13,300		13,850	
	Market cost	1,235.5	7	1,235.5	7	1,190	6.61
	Margin	1,764	9.99	1,764	9.99	1,610	8.94

5	**Retailer**						
	Purchase price	16,298.9		16,299.5		16,650	
	Market cost	450.65	2.55	450.65	2.55	450	2.5
	Margin	900	5	900	5	900	5
6	**Consumers purchase price**	17,650	100	17,650	100	18,000	100
7	Total marketing cost	3,861.55	21.88	3,576.15	20.26	3,490	19.39
8	Total marketing margin	5,788	32.80	5,074	28.75	4,510	25.06

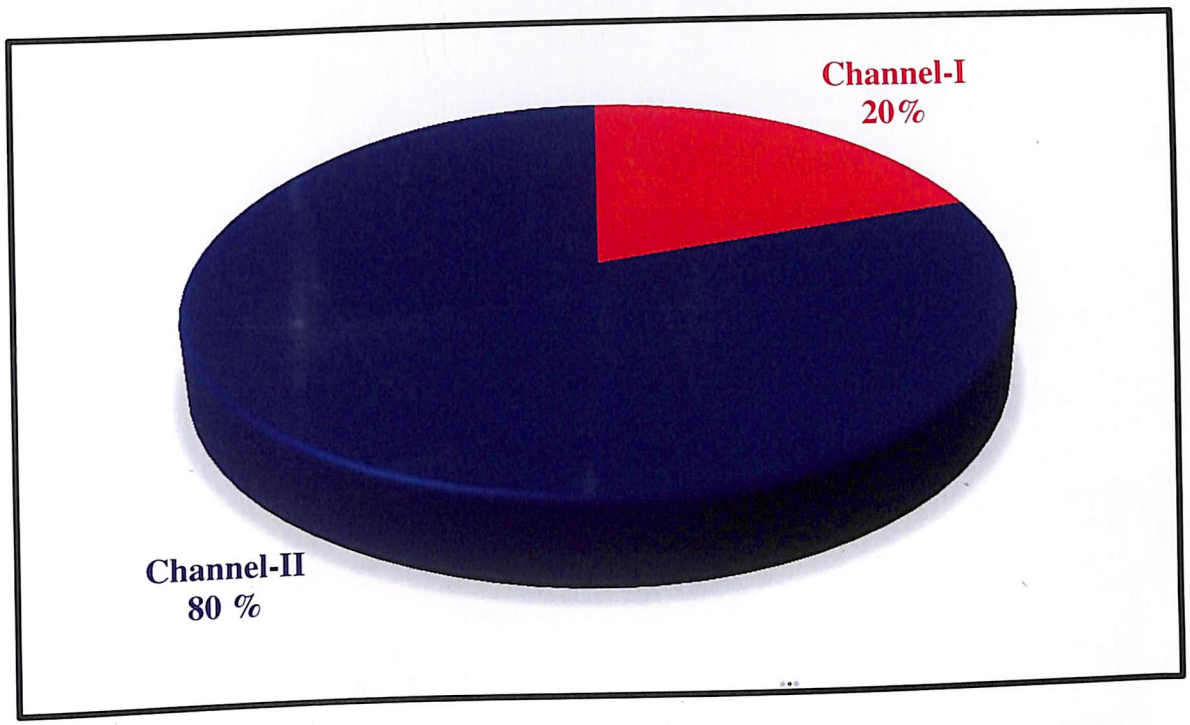


Fig.16 Percentage share of turmeric marketed through various channels in Palakkad district

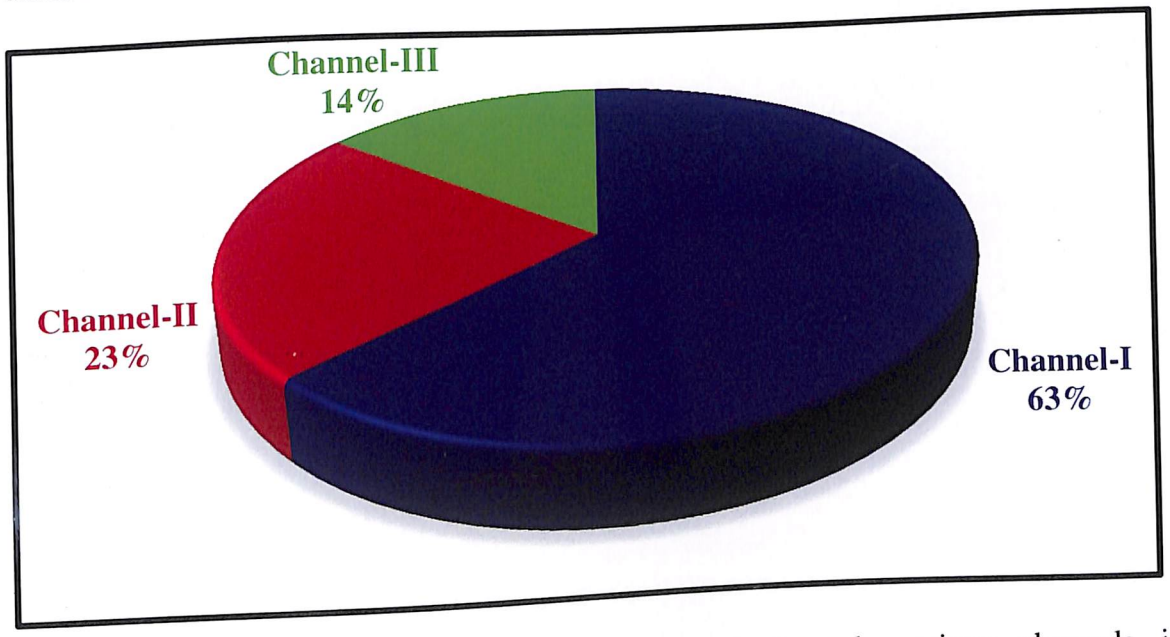


Fig. 17 Percentage share of turmeric marketed through various channels in Visakhapatnam district

From Fig.17 we can observe that 63 per cent of farmers marketed their produce through Channel-I, followed by channel-II (23%) and channel-III (14%). Even though farmer received less price in channel-I, they mostly sold their produce to village merchants as they were providing loans to the farmers for the cultivation of crop and their family requirements.

4.6.2.3 Marketing Efficiency in Visakhapatnam District

The marketing efficiency was computed using Shepherd's index and the results presented in table 4.36. The index of marketing efficiency was higher in Channel-III (2.25) indicating that the channel-III was more efficient than Channel-I (2.57) and Channel-II. Rohini and Murugananthi (2019), who studied the economics of turmeric production in Tamil Nadu, obtained similar results. The inefficiency of Channel-I and Channel-II were due to the presence of a greater number of intermediaries, and their high marketing margins compared to channel-III.

Table. 4.36. Marketing Efficiency of turmeric in Visakhapatnam

Particulars	**Channel-I**	**Channel-II**	**Channel-III**
Marketing Efficiency (Shepherd's Index)	1.88	2.04	**2.25**
Acharya's method	0.83	1.04	**1.25**

4.7 CONSTRAINTS FACED BY THE FARMERS IN PRODUCTION AND MARKETING OF TURMERIC

According to the farmers' opinion, when compared to other major spices, the management of turmeric crop is easy. The crops are not prone to diseases and pest attacks. Here listed out and ranked some of the production and marketing constraints faced by the farmers in both Palakkad and Visakhapatnam districts.

4.7.1 The Production and Marketing Constraints Faced by the Farmers in Palakkad

4.7.1.1 Production constraints faced by the farmers in Palakkad district

The major constraints faced by the farmers were listed out and ranked based on the responses from the farmers in the study area. Garrett's ranking technique was employed to study the constraints and the results are presented in table 4.37.

Table. 4.37. Constraints in production of turmeric in Palakkad district

S No.	Constraint /Problem	Garrett's mean score	Rank
1	High wage rate	72.50	1
2	Shortage of labour during main operations (land preparation, sowing and harvesting)	64.50	2
3	Inadequate processing facilities	41.67	3
4	Lack of suitable mechanization	38.67	4
5	Lack of credit facilities	35.67	5

The high wage rate was identified as the prime constraint in turmeric cultivation by the respondent farmers with Garrett's score of 72.50 per cent. Similar result was reported in a study conducted in Kollam district among the vegetable growers by Chandran and Podikunju (2021). In the study they reported that due to the shortage of labourers in the locality, the existing labourers demanded higher wages. Labour shortage

(64.50) was the second most important constraints identified by the farmers. In similar lines, Karthick *et al.* (2013); Salunkhe *et al.* (2017) and Abeynayaka *et al.* (2020) also observed that the non-availability of labourers during sowing and harvesting was the major problem found among turmeric farmers. The high demand for labour during planting and harvesting time increased the cost of cultivation as well. The other constraints identified by the farmers were inadequate processing facilities (41.67), lack of mechanisation (38.67) and lack of adequate finance (35.67). Haneef *et al.* (2019) also observed that lack of enough credit was one among the important constraints faced by half of the organic farmers in Uttarakhand region.

4.7.2 Constraints in Marketing of Turmeric in Palakkad District

When it comes to the marketing constraints price fluctuation was perceived as the most severe constraint with Garrett's score, 69.80. Most of the farmers in the study area opined that during harvesting time, due to the inflow of turmeric from Erode, the domestic market price of turmeric used to come down. Some farmers opined that if harvesting can be made possible the turmeric before the inflow of turmeric from Erode, they will get comparatively better price. This result was in conformity with the results of Chinnadurai *et al.* (2018) and the study reported that price fluctuation was a major constraint of turmeric marketing in Erode district of Tamil Nadu.

Kumar *et al.* (2018) made a similar observation in Himachal Pradesh and reported that fluctuations in market price and unorganised marketing were the major constraints in ginger production. Inadequate storage and processing facilities were perceived as the second most important marketing constraint faced by the farmers with a Garrett's score, 57.60 per cent. Majority of the farmers in the study area sell dried turmeric due to the less price of fresh turmeric. However, the drying and curing process itself were laborious and the farmer have to incur additional expenditure for the same.

Table. 4.38. Constraints in marketing of turmeric in Palakkad district

S No.	Constraint /Problem	Garrett's mean score	Rank
1	Price fluctuations	69.8	1
2	Inadequate storage and processing facilities	57.6	2
3	Lack of market information	38.5	3
4	High charges of commission agents	36.4	4

Similar results were observed by Abeynayaka *et al.* (2020) and observed that price fluctuations were the major problem faced by the turmeric farmers in Sri Lanka.

Bhuvana (2020) also observed that high price fluctuations and improper storage facilities were the major constraints faced by the turmeric farmers. The results indicate the need for development and promotion of storage facilities and it would indirectly help to stabilize the prices.

4.7.3 Constraints in Production of Turmeric in Visakhapatnam District

Table. 4.39. Constraints in production of turmeric in Visakhapatnam district.

S No.	Constraint /Problem	Garrett's mean score	Rank
1	Lack of remunerative price for the crop	68.97	1
2	Lack of Machinery / equipment	60.36	2
3	Lack of irrigation facilities	48.7	3
4	Inadequate curing facilities	39.01	4
5	Lack of adequate finance	33.43	5

The lack of remunerative price for the crop was a major constraint in turmeric cultivation by the respondent farmers with Garrett's score, 68.97 per cent. In the study area lack of machinery /equipment was the second most problem faced by the farmer with Garretts's score, 60.36. The study area was inhabited by tribal population and the farmers are cultivating crops traditionally. Hence, it is required to provide essential mechanization through subsidy policies by the government. The other constraints identified are lack of irrigation facilities (48.70), inadequate curing facilities (39.01) and lack of adequate finance. In addition, most of the farmers are availing credit from local merchants, so the farmers have to sell their produce in return to those merchants due to compulsion.

So, government has to provide credit support to the farmers to meet their credit requirement for cultivating the crop and motivate the farmers towards institutional credit, which could reduce the distress sales.

Bhuvana (2020) observed similar result i.e., lack of adequate finance as one of the major problems for the turmeric farmers in Nirmal district of Telangana.

4.7.4. Constraints in Marketing of Turmeric in Visakhapatnam District.

Table.4.40. Constraints in marketing turmeric in Visakhapatnam district

S No.	Constraint /Problem	Garrett's mean score	Rank
1	Price fluctuation	65.30	1
2	Inadequate storage and processing facilities	56.20	2
3	High charges of commission agents	41.00	3
4	Lack of market Information	38.50	4

When it comes to marketing constraints, price fluctuation was the major constraint with Garrett's score 65.3, inadequate storage and processing facilities were the second most important marketing constraint faced by the farmers with Garrett's score of

56.20. The other constraints faced by the farmers in marketing of turmeric were high charges of commission agents (41.00) and lack of market information (38.50).

This result was in conformity with the results of Inbasekar (2011) who listed price fluctuation as the foremost problem in the marketing of turmeric in Warangal district of Telangana.

Chinnadurai *et al.* (2018) also observed uncertainty in prices and lack of proper storage facilities as the major problems faced by the turmeric farmers in their study.

Salunkhe *et al.* (2017) also found price fluctuations and inadequate storage facilities as the major constraints faced by the turmeric farmers in Satara district of Maharastra.

As a result of pricing instability and a lack of suitable storage facilities, many farmers were forced to sell their produce shortly after harvest. As a result, substantial storage facilities are required.

Moreover, the results indicated the need for development and promotion of storage facilities which could indirectly help to stabilize the prices.

Table.41. A comparison of major findings in the production and marketing of turmeric in Palakkad and Visakhapatnam districts.

S No.	Palakkad (Kerala)	Visakhapatnam (Andhra Pradesh)
1	All the selected farmers were educated.	34 per cent of the farmers were illiterate.
2	Majority of the farmers (56.67%) considered agriculture as a subsidiary occupation.	Majority of the farmers (76.00 %) considered agriculture as the main occupation.
3	Cost of cultivation of turmeric was very high in Palakkad district i.e., Rs. 2,00,746/ha	Cost of cultivation of turmeric was low in Visakhapatnam district (Rs.1,21,119/ha) when compared to

		Palakkad district.
4	High labour cost was observed in Palakkad district i.e., Rs.1,24,950/ha. The main reasons: i. Major operations such as land preparation and seed bed preparation were mainly done by human labour. ii. High wage rate prevailed in the study area (Rs. 700 per day for male and Rs. 450 per day for female).	When compared to Palakkad district, the labour cost incurred by the farmers in Visakhapatnam district was low, i.e., Rs.48,113/ha. The main reasons: i. Land preparation was carried out by machine labour. ii. Low wage rates prevailed in the Visakhapatnam district (Rs. 300 per day for male and 200 per day for female).
5	Observed yield of turmeric was 2,250 kg/ha.	Observed yield of turmeric was 2,100 kg/ha. The comparatively less yield of turmeric was due to the traditional cultivation practices followed by the farmers.
6	Price per kg of turmeric was Rs. 120	Price per kg. of turmeric was Rs.80
7	Gross income: Rs.2,70,000/ha	Gross income: Rs.1,68,00/ha. The less gross income was mainly due to the low price of turmeric in the study area.
8	Net income: Rs. 69,253/ha	Net income: Rs. 46,880/ha
9	B-C ratio: 1.34	B-C ratio:1.39
10	Factors like area, labour, and farm yard manure were found to be significantly and positively influenced the yield of turmeric	Factors like machine labour, area and seed were significantly and positively influencing the yield of turmeric.
11	Return to scale (∑**bi**): 1.31 Indicating increasing return to scale	Return to scale (∑**bi**): 1.65 Indicating increasing return to scale.

	Marginal productivity analysis showed that resources like farm yard manure, labour and muriate of potash were underutilized and there was a great potentiality for the additional usage of these resources, whereas the resources like factomphos and lime were over-utilized in Palakkad district.	In Visakhapatnam district, seed and machine service were having greater potential for further use as these resources were underutilized in the study area.
12	Two major marketing channels were identified. Channel-I (Producer → village merchant → trader cum semi processor → processing unit cum primary wholesaler → retailer → consumer) Channel-II (Producer → trader cum semi processor → processing unit cum primary wholesaler → retailer → consumer) Among the identified channels, Channel-II was the most preferred channel among the farmers.	Three major marketing channels were identified. Channel-I (Producer → village merchant → trader cum semi processor → processor cum primary wholesaler → retailer → consumer) Channel-II (Producer → trader cum semi processor → processor cum primary wholesaler → retailer → consumer) Channel-III (Producer → trader cum semi processor (Mostly traders from Kerala) → processor cum primary wholesaler → retailer → consumer) Even though Channel I was the most preferred channel in the study area, Channel III was the most efficient

		channel.
13	Marketing efficiency was more in Channel-II i.e., 2.77	Marketing efficiency was more in Channel-III i.e., 2.25
14	High wage rate and shortage of labour during main operations were the major production constraints experienced by the turmeric farmers.	Lack of remunerative price for the crop and lack of machinery/ equipment were the major production constraints faced by the turmeric farmers.
15	Price fluctuations and inadequate storage and processing facilities were the major issues in marketing.	Price fluctuations and inadequate storage and processing facilities were the major marketing issues.

Summary and Conclusions

5. SUMMARY AND CONCLUSIONS

Turmeric (Curcuma longa L.), an ancient and sacred spice of India known as 'Indian saffron', is an important commercial spice. Indian turmeric is considered the best in the world because of its high curcumin content. In India, the majority of the farmers are growing local varieties and it is cultivated in an area of 1,93,395 ha with a production of 10,51,160 tonnes. India dominates the world production scenario contributing 78 per cent. In the case of export, turmeric ranks third in the total exports of spices from India. In India, southernmost states like Telangana, Karnataka and Andhra Pradesh together contribute around 60 per cent of total production. Andhra Pradesh occupied the third position in the acreage and fifth position in production. Visakhapatnam district is the prime one in the cultivation of turmeric in Andhra Pradesh. It alone occupies an area of about 11,286 hectares, with a production of about 1,35,432 tonnes during 2018-19. Similarly, the area and production of cured turmeric in Kerala were 2,778 ha and 8,822 tonnes, respectively, during 2018. In Kerala, Palakkad district has the largest area and production of turmeric, with 655 ha and 2,366 tonnes, respectively.

The present study entitled "An economic analysis of production and marketing of turmeric in Kerala and Andhra Pradesh" aimed to suggest appropriate and specific recommendations on the production and marketing-related aspects to the turmeric farmers in Kerala and Andhra Pradesh to help the farmers to realise better income from their produce. The specific objectives of the study were to study economics, input use pattern and resource use efficiency of turmeric cultivation in Kerala and Andhra Pradesh, to estimate the marketing efficiency and to analyse the constraints in the production and marketing of turmeric.

Both primary and secondary data were used to examine the specific objectives of the study. Palakkad district of Kerala and Visakhapatnam district of Andhra Pradesh was purposively selected as it was the major producer of turmeric in Kerala and Andhra Pradesh, respectively. Alathur and Kuzhalmannam blocks of Palakkad district and Chinthapalli and G Madugula blocks of Visakhapatnam districts were purposively selected based on high acreage and production of turmeric. From the selected block

panchayaths, one grama panchayath was purposively selected based on high acreage and production of turmeric. Finally, 35 farmers were randomly selected from the selected panchayats in Visakhapatnam district and 15 farmers were randomly selected from the selected panchayats in Palakkad district. Proportional sampling method was adopted to select the appropriate sample size from the selected districts. Apart from these 10 market intermediaries from Palakkad district and 20 from Visakhapatnam district were selected to elicit market-related information, thus making the total sample size of the study 130.

The socio-economic characteristics of the sample respondents were analysed using averages and percentage analysis. In Palakkad district, the majority of the farmers (70%) were in the age group of 45-60, whereas in Visakhapatnam district 60 per cent of the respondents belonged to the age group 45-60. In Palakkad district, all the farmers were literates, while in Visakhapatnam district 34 per cent of the farmers where illiterates as the study area was a hilly tribal region with less access to educational institutions. Considering the total number of respondents, almost 55.67 per cent of the respondents considered agriculture as a subsidiary source, remaining 43.33 per cent of respondents considered agriculture as the main occupation in Palakkad district. While in Visakhapatnam district, 76 per cent of the respondents were considered agriculture as the main occupation. In Palakkad district, most of the respondents were small (34%) and marginal farmers (40%), similar results were also observed in Visakhapatnam district i.e., small farmers accounted for 40 per cent and marginal farmers accounted for 26 per cent of the total respondents.

The economics of turmeric production in Palakkad and Visakhapatnam were calculated using cost concepts. The total operational cost of turmeric was Rs. 1,74,430 in Palakkad district, and it was around Rs. 1,14,022 in Visakhapatnam district. In Palakkad district, 71.63 per cent of the total operating expenditure was utilized for labour wages, and in Visakhapatnam district, it was 42.19 per cent. The low wages of the workers in the Visakhapatnam region was the main reason for the low share of labour costs. The total fixed cost for the cultivation of turmeric was Rs. 26794 in Palakkad, and it was Rs. 10480 in Visakhapatnam. The gross income from turmeric was

Rs. 2,70,000 in Palakkad district, whereas it was Rs. 1,68,000 in Visakhapatnam district.

The total cost of turmeric cultivation (Cost C) in Palakkad and Visakhapatnam districts was observed to be Rs. 2,00,746 ha-1 and Rs. 1,21,119 ha-1, respectively. The cost of cultivation based on Cost A2 was Rs.1,74,853 ha-1 and Rs.1,09,444 ha-1, respectively, for Palakkad and Visakhapatnam districts. The net returns at cost C were Rs. 68,775 ha-1 and Rs. 43,589 ha-1, respectively, for Palakkad and Visakhapatnam districts.

Though the yield and unit price of output were higher in the Palakkad district, the computed Benefit-Cost (BC) ratio remains the same in both districts i.e., 1.34 in Palakkad and 1.35 in Visakhapatnam district. The high wage rate of labour, in turn, increases the labour cost and thereby increases the total cost of cultivation in Palakkad district.

Analysis of input use patterns in turmeric cultivation revealed that the total labour required to perform various operations in turmeric cultivation was 241 man-days and 160 man-days, respectively, for Palakkad and Visakhapatnam districts. In the Visakhapatnam district, land preparation was mainly done by machine, but in the Palakkad district, land preparation was carried out by laborers. This is the reason for the large difference in the total labour requirement between these two districts. In Palakkad district, the major labour absorbing operation was harvesting and it accounted for about 34.69 per cent of total labour requirement, followed by land preparation, curing, and intercultural operations. Similarly, in the Visakhapatnam district, harvesting operation also required a greater number of labourers and it accounted for 27.72 per cent of the total workforce, followed by planting, weeding, and irrigation.

Resource use efficiency in turmeric cultivation was estimated using the Cobb-Douglas production function, and it was fitted separately for Palakkad and Visakhapatnam districts. In Palakkad district, the independent variables like area, number of labourers, farmyard manure and muriate of potash were significantly and positively affected the yield of turmeric. While in Visakhapatnam district, area, seed and machine service were significantly and positively influenced the turmeric yield.

Allocative efficiency was examined to know whether the resources in the farm were efficiently utilized or not. Marginal productivity analysis showed that resources like farm yard manure, labour and muriate of potash were underutilized and there was a great potentiality for the additional usage of these resources, whereas the resources like factomphos and lime were over-utilized in Palakkad district. Similarly, in the Visakhapatnam district, seed and machine service were having greater potential for further use as these resources were underutilized in the study area.

Stable markets and lucrative product prices are the major driving forces that determine the persistence in the production and productivity of any farm product. However, the turmeric market in Kerala has been experiencing large fluctuations in price, and the product gets very low price in the market. So, it is worthwhile to study the efficiency of market by analysing different channels for turmeric marketing. Traders cum semi processors, processors cum primary wholesalers and retailers were the major marketing mediators found in the Palakkad district. The marketing cost and marketing margin of Channel I was 15.69 and 23.19 respectively, and for Channel II, it was 15.00 and 21.00 per cent respectively. Among the two identified channels, channel-II (Producers → Trader cum semi processors → Processor cum primary wholesaler → Retailers) was the most preferred channel among producers due to its relatively low marketing cost, marketing margin and high marketing efficiency.

Even though marketing mediators are the same, three marketing channels were identified in the Visakhapatnam district. Among three, Channel I (Producer → Village merchant → Trader cum semi processor → Processor cum semi wholesaler → Retailer → Consumer) was the predominant marketing channel in the study area. The total marketing costs and marketing margins were 21.88 per cent and 32.80 per cent of consumer's purchase price in Channel I, whereas in channel II it was 20.26 per cent and 28.75 per cent of consumer's purchase price and in Channel III it was 19.39 per cent and 25.06 per cent of consumer's purchase price. Although Channel I was the dominant marketing channel, Channel III was the most efficient channel due to its low marketing cost and marketing margin.

A detailed assessment and interpretation of the constraints faced by turmeric farmers are needed to improve the net return, socio-economic status and to identify policy implications. Garrett's ranking method was used for the constraint analysis. The

ranking procedure was performed separately for both production and marketing. High wage rates and shortage of labour were considered as the major production constraints faced by the turmeric farmers in Palakkad district, while in Visakhapatnam district, lack of remunerative price and lack of suitable machinery services for different operations were the major production constraints faced by the farmers. In the case of marketing, price fluctuations and inadequate storage and marketing facilities were the important constraints faced by the farmers and traders.

POLICY IMPLICATIONS

The policy recommendations for Palakkad district

- Turmeric cultivation is found to be profitable in Palakkad district, hence government may take suitable measures to bring more land under turmeric cultivation through area expansion programmes and such other programmes.
- At present, most of the resources were sub-optimally utilized in the study area, hence providing proper awareness regarding the optimum usage of inputs to get maximum profit.
- Proper government intervention is needed to form Farmer Producer Organizations (FPOs) and the FPOs might come forward to take up value addition of turmeric.
- Measures can be taken to strengthen the infrastructural facilities in the major producing areas.
- To address the problem of labour shortage, incorporate agricultural operations in MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act) programme.
- The problem of non-availability of labour may also be addressed with the use of low-cost machinery hence policies may be formulated to provide suitable machinery for the farmers through respective Krishi Bhavans.
- To reduce the price fluctuation, the government may fix some lower price limit for turmeric and allow the price to vary above this.
- An electronic marketing platform may be introduced for marketing which may eliminate the involvement of marketing mediators.

The policy recommendations for Visakhapatnam district

- Turmeric cultivation was also found profitable in Visakhapatnam district, hence government may take suitable measures to bring more area under turmeric cultivation through area expansion programmes.
- Compared to other districts of Andhra Pradesh, Visakhapatnam district has low productivity. So, productivity has to be enhanced through the cultivation of improved varieties and the adoption of recommended package of practices.
- Strengthen the infrastructure facilities near the production sites and facilitating the farmers to perform on farm post-harvest handling operations through the formation of several Farmer Producer Organisations (FPOs).
- Awareness may be given to the farmers for the optimum use of inputs to get maximum income.
- Provide proper skill training to the farmers for the post-harvest operations through RARS/ KVK/ Department of Agriculture.
- To reduce the price fluctuation, the government may fix some lower price limit for the turmeric and allow the prices to vary above this.
- Establishment of regulated market in the Visakhapatnam district may help the farmers to realize better price for the produce by eliminating the involvement of market mediators.
- Better access to credit at lower/ subsidized rate of interest from the financial institutions.

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Appendices

APPENDIX-I

Area and production of turmeric in India from 2000-01 to 2019-20

S No.	Year	Area (hectares)	Production (tonnes)
1	2000-01	1,91,700	7,14,300
2	2001-02	1,67,100	5,62,800
3	2002-03	1,50,100	5,22,200
4	2003-04	1,50,100	5,64,900
5	2004-05	1,58,700	7,18,100
6	2005-06	1,72,000	8,51,700
7	2006-07	1,78,490	... 7,86,750
8	2007-08	1,75,280	7,94,400
9	2008-09	1,81,100	8,21,200
10	2009-10	1,80,960	9,27,910
11	**2010-11**	1,95,000	12,68,000
12	2011-12	2,18,600	12,46,220
13	2012-13	1,94,200	9,71,100
14	2013-14	2,32,670	11,89,890
15	2014-15	1,84,000	8,30,000
16	2015-16	1,85,900	9,43,300
17	2016-17	2,21,780	10,56,100
18	2017-18	2,37,960	11,32,720
19	2018-19	2,52,980	9,60,730
20	2019-20	2,56,890	9,46,230

APPENDIX-II

Area and Production of turmeric in Kerala from 2000-01 to 2019-20

S No.	Year	Area (hectare)	Production (tonnes)
1	2000-01	4,127	9,037
2	2001-02	3,558	7,895
3	2002-03	3,140	6,938
4	2003-04	2,774	5,652
5	2004-05	2,881	6,244
6	2005-06	3,384	8,237
7	2006-07	3,917	9,980
8	2007-08	3,155	7,434
9	2008-09	2,782	6,360
10	2009-10	2,438	6,066
11	2010-11	2,400	6,200
12	2011-12	2,400	6,300
13	2012-13	2,700	6,900
14	2013-14	2,630	6,900
15	2014-15	2,470	6,820
16	2015-16	2,530	6,500
17	2016-17	2,530	6,500
18	2017-18	2,778	8,822
19	2018-19	2,483	6,693
20	2019-20	2,277	6,653

APPENDIX-III

Area and Production of turmeric in Andhra Pradesh from 2000-01 to 2019-20

S No.	Year	Area (hectares)	Production (tonnes)
1	2000-01	74,000	3,76,000
2	2001-02	62,000	2,50,000
3	2002-03	57,000	2,84,000
4	2003-04	59,000	3,21,000
5	2004-05	61,000	4,18,000
6	2005-06	70,000	5,19,000
7	2006-07	65,000	4,01,000
8	2007-08	62,630	4,16,063
9	2008-09	61,607	4,03,228
10	2009-10	59,000	3,64,000
11	2010-11	69,200	4,66,900
12	2011-12	75,000	4,85,000
13	2012-13	67,800	4,23,220
14	2013-14	17,820	1,51,910
15	2014-15	16,530	1,43,230
16	**2015-16**	17,020	1,21,120
17	2016-17	16,600	1,34,100
18	2017-18	19,620	79,730
19	2018-19	28,921	69,410
20	2019-20	29,717	71,321

APPENDIX-IV

Productivity of Turmeric in India, Kerala and Andhra Pradesh from 2000-01 to 2019-20

Productivity (kg/hectare)				
S No.	Year	India	Kerala	Andhra Pradesh
1	2000-01	4,762	2,190	5,082
2	2001-02	5,074	2,218	4,032
3	2002-03	4,511	2,209	4,982
4	2003-04	5,114	2,037	5,440
5	2004-05	5,000	2,167	6,852
6	2005-06	5,337	2,434	7,414
7	2006-07	5,092	2,547	6,169
8	2007-08	4,382	2,356	6,438
9	2008-09	4,535	2,286	6,545
10	2009-10	4,532	2,488	6,169
11	2010-11	4,408	2,500	6,740
12	2011-12	4,952	2,600	6,470
13	2012-13	4,525	2,500	6,240
14	2013-14	3,763	2,600	8,520
15	2014-15	3,479	2,700	8,660
16	**2015-16**	3,368	2,500	7,120
17	2016-17	3,726	2,500	8,080
18	2017-18	4,734	3,170	4,060
19	2018-19	3,721	2,695	2,399
20	2019-20	3,931	2,922	2,400

APPENDIX-V

GARRETT RANKING CONVERSION TABLE

The conversion of orders of merits into units of amount of "socres"

Percent	Score	Percent	Score	Percent	Score
0.09	99	22.32	65	83.31	31
0.20	98	23.88	64	84.56	30
0.32	97	25.48	63	85.75	29
0.45	96	27.15	62	86.89	28
0.61	95	28.86	61	87.96	27
0.78	94	30.61	60	88.97	26
0.97	93	32.42	59	89.94	25
1.18	92	34.25	58	90.83	24
1.42	91	36.15	57	91.67	23
1.68	90	38.06	56	92.45	22
1.96	89	40.01	55	93.19	21
2.28	88	41.97	54	93.86	20
2.69	87	43.97	53	94.49	19
3.01	86	45.97	52	95.08	18
3.43	85	47.98	51	95.62	17
3.89	84	50.00	50	96.11	16
4.38	83	52.02	49	96.57	15
4.92	82	54.03	48	96.99	14
5.51	81	56.03	47	97.37	13
6.14	80	58.03	46	97.72	12
6.81	79	59.99	45	98.04	11
7.55	78	61.94	44	98.32	10
8.33	77	63.85	43	98.58	9
9.17	76	65.75	42	98.82	8
10.06	75	67.48	41	99.03	7
11.03	74	69.39	40	99.22	6
12.04	73	71.14	39	99.39	5
13.11	72	72.85	38	99.55	4
14.25	71	74.52	37	99.68	3
15.44	70	76.12	36	99.80	2
16.69	69	77.68	35	99.91	1
18.01	68	79.17	34	100.00	0
19.39	67	80.61	33		
20.93	66	81.99	32		

APPENDIX-VI

PRIMARY DATA SCHEDULE

AN ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF TURMEIC IN KERALA AND ANDHRA PRADESH

1. GENERAL INFORMATION

1. Name of the farmer:
2. Age:
3. Sex:
4. Address and phone number:
5. Block/ Mandal:
6. Panchayat:
7. Phone number:
8. Years of experience in farming:

9. **Family Details**

S No	Name	Gender (M/F)	Age	*Education	**Occupation		Annual income	
					Primary	Secondary	Primary	Secondary
1								
2								
3								
4								
5								
6								

*01-Primary,02-Secondary, 03-Pree- degree/HSC, 04-Diploma, 05-Graduate, 06-Post Graduate

**1-Agriculture, 2-Public sector, 3-Private sector, 4-Self employed

2. INVENTORY OF RESOURCES: LAND

S.NO	PARTICULARS	
1.	Total owned area (ha)	
2	Leased in land (ha)	
3	Leased out land (ha)	
4	Total land (ha)	
5.	Net cropped area	
6.	Area under turmeric	
7.	Value of owned land	
8.	Land revenue	

3. Asset position

S. No.	Particulars	Number	Value (₹)	Year of construction/ purchased	Purchase value (₹)	Present value (₹)	Depreciation (₹)
	Farm building						
	Farm Machinery						

4. LIVESTOCK

S. No.	Types of animal	Total Number	Annual Expenditure (₹)	Annual income (₹)	Net Return (₹)
1	Cow				
2	Goat				
3	Sheep				
4	Pig				
5	Poultry				

5. Crop Details

S. No.	Particulars	
1	Total area under turmeric	
2	Type of planting followed	
3	Variety	
4	Spacing adopted	
5	Harvest	
6	Price (Rs/q)	

6. Source of irrigation

S. No.	Source	Area irrigated for turmeric
1	Canal	
2	Tanks/ Ponds	
3	Wells/ Bore wells	
4	Pump set (Electric/ Diesel/ Solar)	
5	Micro irrigation (Sprinkler/ Drip)	

B) Production of Turmeric

1. Operation wise labor requirement for Turmeric crop:
   a. Area: .... ha
   b. Crop Duration in Months: .....
   c. Variety: .....

2. Operational costs:

S. No.	Operation	Number	Human labor				Bullock (pair day)	Machine (power hours)
			Hired male (man-day)	Hired female (man-day)	Family male (man-day)	Family female (man-day)		
1	Land Preparation							
	a. Ploughing							
	b. Harrowing& planking							
	c. Preparation of Ridges & furrows (or) Seed bed preparation							
2	Application of manure (FYM)							
3	Seed treatment							
4	Sowing							
5	Basal dose of fertilizer							
6	Irrigation							
7	Application of fertilizer							
8	Interculture operations							
	a. Weeding							
	b. Hoeing							
	c. Earthing up							
	d. Mulching							
9	Spraying of fungicide/pesticide/insecticide							

10	Cutting of leaves before harvesting							
11	Harvesting							
12	Separation of fingers from mother rhizome							
13	Curing							
	a. boiling							
	b. Drying							
	c. Polishing& coloring							
14	Grading							
15	Packing							
	Total							

3. Use of physical inputs in Turmeric production

SNo	Particulars	Unit	Quantity	Rate/Unit	Value
1	Seed (Rhizomes)	Kg			
2	FYM	Tons			
3	Neem cake				
4	Type of fertilizers	Bag (45 kg)			
i)	Urea				
ii)	Single Super Phosphate (SSP)				
iii)	Muriate of Potash (MOP)				
iv)	DAP				
v)	Mixed Fertilizers				
vi)	Others				
5	Plant Protection chemicals	Kg/lit			
i)					
ii)					
iii)					
iv)					
6	Any other				

4. Yield of Turmeric crop

S.NO	Particulars	Quantity harvested (q)	Rate/q	Value (Rs)
1	Dried turmeric			

5. Information about disposal of turmeric:

S. No.	Details	Weight	Value
1	Total yield of turmeric		
2	Turmeric sold		
3	Turmeric kept for seed purpose		
4	Turmeric kept for home purpose		

6. Production constraints in turmeric cultivation:

S No.	Constraints/ Problems	Rank
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

SCHEDULE-II
MARKETING OF TURMERIC

1. Schedule of Producer:

General information
Name of Market
Distance (km)
Experience

2. Marketing channels in AP and Kerala states

a. Channel 1 –

b. Channel 2 –

c. Channel 3 –

d. Specify other channels if any?

3.Do you know through which channel your produce will reach to ultimate consumer?

e. Channel 1 –

f. Channel 2 –

g. Channel 3 –

h. Specify other channels if any?

i. Reasons for sales to the local trader/ wholesaler/ consumer/commission agents/agencies

4.Marketing cost incurred in available channels from producer to ultimate consumer

a. Channel 1 –

b. Channel 2 –

c. Channel 3 –

5. What is the sale price of producer in different channels?

6. What is the purchase price by ultimate consumer in different marketing channels?

7. Cost of marketing incurred by producer

Sl.no	Item of cost	Channel-l	Channel-II	Channel-III
1	Packing material			
2	Loading charges			
3	Transport charges			
4	Unloading charges			
5	Hamali charges			
6	Storage charges			
7	Prophylactic measures			
8	Commission charges			
9	Market fees			
	Sub total			

8. Retention and marketed surplus of grain (q/farm)

Sl.no	Particulars	Qty	Percent
1	Production of main produce of farm		
2	a) Retained for family consumption		
	b) Retained for seed		
	c) Damage		
	d) Other		
	e) Total retention		
3	Marketed surplus		
	a) Channel-1		
	b) Channel-11		
	c) Channel- III		
	Total		

SCHEDULE OF VILLAGE TRADER

General Information
Name: Age:
Name of Market:
Experience:

1. Price paid and received by village trader:

From whom produce purchased	Quanti ty	Price/q paid (Rs)	To whom sold	Price/q Received (Rs)
			...	

2. Cost incurred by village trader

Sl. No	Items of cost	Amount (Rs/q)
1	Labor charges	
2	Commission charges	
3	Transportation charges	
4	Weighing charges	
	Sub total	

SCHEDULE OF COMMISSION AGENT CUM WHOLESALER

General Information
Name: Age:
Name of Market
Experience:

1. Price paid and received by Wholesaler:

From whom produce purchased	Quanti ty	Price/q paid (Rs)	To whom sold	Price/q Received (Rs)

2. Cost incurred by Commission Agent cum Wholesaler

Sl. No	Items of cost	Amount (Rs/q)
1	Loading and unloading charges	
2	Transport to mandi	
3	Weighing, packing and cover cost	
4	Spoilage cost	
5	Distribution	
6	Sales tax	
7	Agricultural marketing cess	
	Sub total	

SCHEDULE OF RETAILER

General Information
Name: Age:
Name of Market
Experience:

1. Price paid and received by Retailer:

From whom produce purchased	Quanti ty	Price/q paid (Rs)	To whom sold	Price/q Received (Rs)

2. Cost incurred by Commission Agent cum Retailer

Sl. No	Items of cost	Amount (Rs/q)
1	Labour charges	
2	Commission charges	
3	Transportation charges	
4	Weighing charges	
	Sub total	

MARKETING CONSTRAINTS

Sl. No.	Constraints/ Problems	Rank
1		
2		
3		
4		
5		
6		
7		
8		

Suggestions to improve production and marketing of turmeric cultivation

APPENDIX-VII

SECONDARY DATA SCHEDULE

1. Area and production of turmeric in India data from 2000-01 to 2019-20

S No.	Year	Area (hectares)	Production (tonnes)
1	2000-01		
2	2001-02		
19	2018-19		...
20	2019-20		

2. Area and production of turmeric in Kerala data from 2000-01 to 2019-20

S No.	Year	Area (hectares)	Production (tonnes)
1	2000-01		
2	2001-02		
19	2018-19		
20	2019-20		

3. Area and production of turmeric in Andhra Pradesh data from 2000-01 to 2019-20

S No.	Year	Area (hectares)	Production (tonnes)
1	2000-01		
2	2001-02		
19	2018-19		
20	2019-20		

4. Productivity data of turmeric in India, Kerala and Andhra Pradesh from 2000-01 to 2019-20

Productivity (kg/hectare)				
S No.	Year	India	Kerala	Andhra Pradesh
1	2000-01			
2	2001-02			
19	2018-19			
20	2019-20			

Abstract

ABSTRACT

The present study entitled "An economic analysis of production and marketing of turmeric in Kerala and Andhra Pradesh" was carried out in Palakkad district of Kerala and Visakhapatnam district of Andhra Pradesh. The specific objectives of the study were to study economics, input use pattern and resource use efficiency of turmeric cultivation in Kerala and Andhra Pradesh, to estimate the marketing efficiency and to analyse the constraints in production and marketing of turmeric.

Both primary and secondary data were used to examine the specific objectives of the study. Palakkad district and Visakhapatnam district were purposively selected as these districts were the major producer of turmeric in Kerala and Andhra Pradesh, respectively.Alathur and Kuzhalmannam blocks of Palakkad district and Chinthapalli and G Madugula blocks of Visakhapatnam districts were purposively selected based on high acreage and production of turmeric. From the selected block panchayath, one grama panchayath was selected based on high acreage and production of turmeric. Finally, 35 farmers were randomly selected from the selected panchayats in the Visakhapatnam district, and 15 farmers were randomly selected from the selected panchayats in the Palakkad district. Apart from these, 10 market intermediaries from Palakkad district and 20 from Visakhapatnam district were selected to elicit market-related information.

The total operational cost of turmeric was Rs. 1,74,430 in Palakkad district and Rs. 1,14,022 in Visakhapatnam district. In total operational cost, 71.63 per cent was attributed to the labour cost in Palakkad district, whereas it was 42.19 per cent in Visakhapatnam district. The low share of labour cost was mainly due to the low wage rate prevailing in the Visakhapatnam region. The total fixed cost for the cultivation of turmeric was Rs. 26,794 in Palakkad and Rs. 10,480 in Visakhapatnam. The gross income from turmeric was Rs. 2,70,000 in Palakkad district, whereas it was Rs. 1,68,000 in Visakhapatnam district.

The total cost of cultivation (cost C) of turmeric incurred by the farmers in Palakkad and Visakhapatnam districts was observed to be Rs. 2,01,224ha^{-1} and Rs.

1,24,410ha^{-1} respectively. The net return at cost C for Palakkad and Visakhapatnam farmers was Rs. 68,775 ha-^{1} and Rs. 43,589 ha-^{1}, respectively. The estimated Benefit-Cost (BC) ratio was almost equal in both districts i.e., 1.34 in Palakkad and 1.35 in Visakhapatnam district.

Analysis of input use patterns in turmeric cultivation revealed that the total labour required to perform various operations in turmeric cultivation was 241 man-days and 160 man-days, respectively, for Palakkad and Visakhapatnam districts. In Palakkad district, the major labour absorbing operation was harvesting and it accounted for about 34.69 per cent of total labour requirement, followed by land preparation, curing, and intercultural operations. Similarly, in the Visakhapatnam district, harvesting operation also required more number labours and it accounted for 27.72 per cent of the total workforce, followed by planting, weeding, and irrigation.

Resource use efficiency in turmeric cultivation was estimated using the Cobb-Douglas production function, and it was fitted separately for Palakkad and Visakhapatnam districts. In Palakkad district, the independent variables like area, number of labourers, farmyard manure and muriate of potash were significantly and positively affected the yield of turmeric. While in Visakhapatnam district, area, seed and machine service were significantly and positively influenced the yield of turmeric.

Allocative efficiency was examined to know whether the resources in the farm were efficiently utilized or not. Marginal productivity analysis showed that resources like farmyard manure, labour and muriate of potash were underutilized, whereas the resources like factomphos and lime were over-utilized in Palakkad district. Similarly, in the Visakhapatnam district, seed and machine services were having greater potentiality for further use as these resources were underutilized in the study area.

Among the two identified channels in Palakkad district, channel-II (Producers - Trader cum semi processors - Processor cum primary wholesaler- Retailers) was the most preferred channel among producers due to its relatively low marketing cost, marketing margin and high marketing efficiency. Three marketing channels were identified in the Visakhapatnam district. Among three, Channel I (Producer- village merchant- trader cum semi processor- processor cum semi wholesaler- retailer- consumer) was the predominant marketing channel in the study area. Although Channel I was the dominant marketing channel, Channel III (Producer- trader cum semi processor- processor cum semi wholesaler- retailer- consumer) was the most efficient channel due to its low marketing cost and marketing margin.

High wage rates and shortage of labour were considered as the major production constraints faced by the turmeric farmers in the Palakkad district. While in Visakhapatnam district, lack of remunerative price and lack of suitable machinery services for different operations were the major production constraints faced by the farmers. In the case of marketing, price fluctuations and inadequate storage and marketing facilities were the important constraints faced by the farmers and traders.

Turmeric cultivation is found to be profitable in both districts, hence government may take suitable measures to bring more land under turmeric cultivation through area expansion programmes and such other programmes. To address the problem of labour shortage, incorporate agricultural operations in the 'MGNREGA' programme and may also be addressed with the use of low-cost machinery hence policies may be formulated to provide suitable machinery for the farmers through respective Krishi Bhavans. Strengthen the infrastructure facilities near the production sites and facilitate the farmers to perform on-farm post-harvest handling operations through the formation of several Farmer Producer Organisations (FPOs). The establishment of a regulated market in the Visakhapatnam district may help the farmers to realize a better price for the produce by eliminating the involvement of market mediators.

അബ്സ്ട്രാക്റ്റ്

കേരളത്തിലെയും ആന്ധ്രാപ്രദേശിലെയും മഞ്ഞളിന്റെ ഉൽപാദനത്തിന്റെയും വിപണനത്തിന്റെയും സാമ്പത്തിക വിശകലനം എന്ന പഠനം കേരളത്തിലെ പാലക്കാട് ജില്ലയിലും ആന്ധ്രാപ്രദേശിലെ വിശാഖപട്ടണം ജില്ലയിലുമാണ് നടത്തിയത്. കേരളത്തിലെയും ആന്ധ്രാപ്രദേശിലെയും. മഞ്ഞൾ കൃഷിയുടെ സാമ്പത്തികശാസ്ത്രം, വിഭവ ഉപയോഗരീതി, വിഭവ വിനിയോഗ കാര്യക്ഷമത എന്നിവ പഠിക്കുക, വിപണന കാര്യക്ഷമത വിലയിരുത്തുക, മഞ്ഞളിന്റെ ഉൽപാദനത്തിലും വിപണനത്തിലും ഉള്ള പരിമിതികൾ വിശകലനം ചെയ്യുക എന്നിവയായിരുന്നു പഠനത്തിന്റെ പ്രത്യേക ലക്ഷ്യങ്ങൾ .

പഠനത്തിന്റെ നിർദ്ദിഷ്ട ലക്ഷ്യങ്ങൾ പരിശോധിക്കാൻ പ്രാഥമികവും ദ്വിതീയവുമായ വിവരങ്ങൾ ഉപയോഗിച്ചു. കേരളത്തിൽ മഞ്ഞൾ ഉല്പാദനത്തിൽ മുൻപന്തിയിൽ നിൽകുന്ന പാലക്കാട് ജില്ലയും ആന്ധ്രാപ്രദേശിൽ മഞ്ഞൾ ഉല്പാദനത്തിൽ മുൻപന്തിയിൽ നിൽകുന്ന വിശാഖപട്ടണം ജില്ലയും പഠനത്തിനുവേണ്ടി ആസൂത്രിതമായി തിരഞ്ഞെടുത്തു. മഞ്ഞളിന്റെ വിസ്തൃതിയും ഉൽപാദനവും കണക്കിലെടുത്ത് പാലക്കാട് ജില്ലയിലെ ആലത്തൂർ, കുഴൽമന്ദം ബ്ലോക്കുകളും വിശാഖപട്ടണം ജില്ലയിലെ ചിന്തപ്പള്ളി, ജി മാഡുഗുള ബ്ലോക്കുകളും. തിരഞ്ഞെടുത്തു. തിരഞ്ഞെടുത്ത ബ്ലോക്ക് പഞ്ചായത്തിൽ നിന്ന് ഉയർന്ന വിസ്തൃതിയും മഞ്ഞൾ ഉൽപാദനവും അടിസ്ഥാനമാക്കി ഒരു ഗ്രാമപഞ്ചായത്തിനെ തിരഞ്ഞെടുത്തു. ഒടുവിൽ വിശാഖപട്ടണം ജില്ലയിലെ തിരഞ്ഞെടുത്ത പഞ്ചായത്തുകളിൽ നിന്ന് 35 കർഷകരെയും പാലക്കാട് ജില്ലയിലെ തിരഞ്ഞെടുത്ത പഞ്ചായത്തുകളിൽ നിന്ന് പതിനഞ്ച് കർഷകരെയും തിരഞ്ഞെടുത്തു. കൂടാതെ വിപണനവുമായി ബന്ധപ്പെട്ട വിവരങ്ങൾ ശേഖരിക്കാൻ പാലക്കാട് ജില്ലയിൽ നിന്നുള്ള പത്ത് വിപണന ഇടനിലക്കാരെയും വിശാഖപട്ടണം ജില്ലയിൽ നിന്ന് ഇരുപത് ഇടനിലക്കാരെയും തിരഞ്ഞെടുത്തു.

മഞ്ഞളിന്റെ മൊത്തം പ്രവർത്തനച്ചെലവ് പാലക്കാട് ജില്ലയിൽ 1,74,430 രൂപയും. വിശാഖപട്ടണം ജില്ലയിൽ 1,14,022 രൂപയും ആയിരുന്നു. പാലക്കാട് ജില്ലയിൽ മൊത്തം പ്രവർത്തനച്ചെലവിന്റെ 71.63 ശതമാനവും വിനിയോഗിച്ചത് വേതനത്തിനുവേണ്ടിയാണ്. എന്നാൽ വിശാഖപട്ടണം ജില്ലയിൽ തൊഴിലാളികളുടെ വേതനത്തിനുവേണ്ടി മൊത്തം പ്രവർത്തന ചെലവിന്റെ 42.19 ശതമാനമാണ് വിനിയോഗിച്ചത്.. വിശാഖപട്ടണം മേഖലയിൽ നിലനിന്നിരുന്ന കുറഞ്ഞ വേതനമാണ് തൊഴിൽ ചെലവിന്റെ കുറഞ്ഞ പങ്കിൽ കുറവ് വരാനുള്ള പ്രധാന കാരണം. മഞ്ഞൾ കൃഷിക്ക് വേണ്ടിയിരുന്ന സ്ഥിരം ചിലവ് പാലക്കാട് ജില്ലയിൽ 26,794 രൂപയും, വിശാഖപട്ടണം ജില്ലയിൽ 10,480 രൂപയും ആയിരുന്നു. മഞ്ഞളിൽ നിന്നുള്ള മൊത്തവരുമാനം പാലക്കാട് ജില്ലയിൽ 2,70,000 രൂപയും. വിശാഖപട്ടണം ജില്ലയിൽ 1,68,000 രൂപയും ആയിരുന്നു

ഒരു ഹെക്ടർ മഞ്ഞളിന്റെ മൊത്തം ഉല്പാദനചെലവ് (കോസ്റ്റ് സി) പാലക്കാട് ജില്ലയിലും വിശാഖപട്ടണം ജില്ലയിലും യഥാക്രമം . 2,01,224 രൂപയും 1,24,410 രൂപയും ആയിരുന്നു. അതുപോലെ പാലക്കാട് ജില്ലയിലെ കർഷകർക്കും വിശാഖപട്ടണം ജില്ലയിലെ കർഷകർക്കും ഒരുഹെക്ടറിൽനിന്ന് കിട്ടിയിരുന്ന അറ്റാദായം 68,775 രൂപയും 43,589 രൂപയും ആയിരുന്നു കണക്കാക്കിയ ആനുകൂല്യ-ചെലവ് (ബിസി) അനുപാതം രണ്ടു ജില്ലകളിലും ഏകദേശം തുല്യ മായി വന്നു. അതായത് പാലക്കാട് ജില്ലയിൽ 1.34 ഉം വിശാഖപട്ടണം ജില്ലയിൽ 1.35 ഉം.

മഞ്ഞൾ കൃഷിയിൽ വിവിധ പ്രവർത്തനങ്ങൾ നടത്താൻ ആവശ്യമായ മൊത്തം തൊഴിലാളിക ളുടെ എണ്ണം പാലക്കാട് ജില്ലയിലും, വിശാഖപട്ടണം ജില്ലയിലും യഥാക്രമം ഇരുന്നൂറ്റി നാൽ പ്പത്തിയൊന്ന് തൊഴിൽ ദിനങ്ങളും 160 തൊഴിൽ ദിനങ്ങളും ആണെന്ന് മഞ്ഞൾ കൃഷിയിലെ വിഭവ ഉപയോഗരീതി വിശ കലനം ചെയ്തതിൽ നിന്ന് കണ്ടെത്തി. പാലക്കാട് ജില്ലയിൽ പ്രധാനമായും തൊഴിലാളികളെ വിനിയോഗിച്ചത് വിളവെടുപ്പായിരുന്നു, മൊത്തം തൊഴിലാളികളുടെ 34.69 ശതമാനം വിളവെടുപ്പിനുവേണ്ടി ഉപയോഗിച്ചു, കൂടാതെ നിലമൊരുക്കൽ, ക്യൂറിംഗ്, ഇടവേള പ്രവർത്തനങ്ങൾ എന്നിവയ്ക്കാണ് മനുഷ്യാധ്വാനം കൂടുതലായി വേണ്ടി വന്നിരുന്നത്. അതുപോലെ, വിശാഖപട്ടണം ജില്ലയിലും, വിളവെടുപ്പിനു തന്നെയായിരുന്നു കൂടുതൽ തൊഴിലാളികളെ ആവശ്യമായി വന്നത്, ഇത് മൊത്തം തൊഴിലാളികളുടെ 27.72 ശതമാനമാണ്, കൂടാതെ നടീൽ, കളകൾ നീക്കം ചെയ്യൽ, ജലസേചനം എന്നിവയാണ് കൂടുതൽ തൊഴിലാളികളെ ആവശ്യമായി വന്ന മറ്റു പ്രവർത്തങ്ങൾ.

കോബ്-ഡഗ്ലസ് പ്രൊഡക്ഷൻ ഫംഗ്ഷൻ ഉപയോഗിച്ച് മഞ്ഞൾ കൃഷിയിലെ വിഭവ ഉപയോഗ കാര്യക്ഷമത കണക്കാക്കി, പാലക്കാട് ജില്ലക്കും, വിശാഖപട്ടണം ജില്ലക്കും വേണ്ടി വെവ്വേറെ ഫംഗ്ഷൻ ആണ് ഇതിനു വേണ്ടി ഉപയോഗിച്ചത്. പാലക്കാട് ജില്ലയിൽ വിള, വിസ്തീർണ്ണം, തൊഴിലാളികളുടെ എണ്ണം, ചാണക വളം, മ്യൂറിയേറ്റ് ഓഫ് പൊട്ടാഷ് എന്നീ ഘടകങ്ങൾ മഞ്ഞളിന്റെ ഉല്പാദനത്തെ ഗുണപരമായി സ്വാധീനിച്ചു. എന്നാൽ വിശാഖപട്ടണം ജില്ലയിൽ, വിള വിസ്തീർണ്ണം, വിത്ത് ഉപയോഗം, യന്ത്രത്തിന്റെ സേവനം എന്നീ ഘടകങ്ങൾ മഞ്ഞളിന്റെ ഉല്പാദനത്തെ ഗുണപരമായി സ്വാധീ നിച്ചു

കൃഷിയിത്തിലെ ലഭ്യമായ വിഭവങ്ങൾ കാര്യക്ഷമമായി വിനിയോഗിച്ചോ ഇല്ലയോ എന്നറിയാൻ അലോക്കേറ്റീവ് കാര്യക്ഷമത വിശകലനം ചെയ്തു. മാർജിനൽ പ്രൊഡക്ടിവിറ്റി അനാലിസിൽ നിന്നും പാലക്കാട് ജില്ലയിൽ ചാണക വളം, മ്യൂറിയേറ്റ് ഓഫ് പൊട്ടാഷ് എന്നീ വിഭവങ്ങൾ വേണ്ടത്ര വിനിയോഗിച്ചിട്ടില്ലെന്നും എന്നാൽ ഫാക്ടോംഫോസ്, കുമ്മായം തുടങ്ങിയ വിഭവങ്ങൾ അമിതമായി വിനിയോഗിച്ചെന്നും ചൂട്ടിക്കാട്ടി. അതുപോലെ വിശാഖപട്ടണം ജില്ലയിൽ, വിത്തും യന്ത്ര സേവനവും വേണ്ടത്ര

വിനിയോഗിച്ചിട്ടില്ലെന്നും അതുകൊണ്ട് ഈ വിഭവങ്ങളുടെ കൂടുതൽ ഉപയോഗത്തിനുള്ള സാധ്യത ഉണ്ടെന്നും നിരീക്ഷിച്ചു..

പാലക്കാട് ജില്ലയിൽ കണ്ടെത്തിയ രണ്ട് വിപണന ചാനലുകളിൽ താരതമ്യേന കുറഞ്ഞ വിപണന ചെലവും വിപണന മാർജിനും ഉയർന്ന വിപണന കാര്യക്ഷമതയും കാരണം, ചാനൽ -II (ഉത്പാദകർ - ട്രേഡർ കം സെമി പ്രോസസർമാർ - പ്രോസസർ കം പ്രൈമറി ഹോൾസൈലേഴ്സ് - റീട്ടെയിലർമാർ) ആയിരുന്നു ഉത്പാദകർക്ക് ഏറ്റവും ഇഷ്ടപ്പെട്ട ചാനൽ. വിശാഖപട്ടണം ജില്ലയിൽ മൂന്ന് മാർക്കറ്റിംഗ് ചാനലുകൾ കണ്ടെത്തി. കണ്ടെത്തിയ മൂന്ന് ചാനലുകളിൽ I (പ്രൊഡ്യൂസർ - വില്ലേജ് മർച്ചന്റ് - ട്രേഡർ കം സെമി പ്രോസസർമാർ - പ്രോസസർ കം സെമി ഹോൾസൈലേഴ്സ് - റീട്ടെയിലർ - ഉപഭോക്താവ്) ആയിരുന്നു പഠന മേഖലയിലെ പ്രധാന മാർക്കറ്റിംഗ് ചാനൽ. ചാനൽ I പഠന മേഖലയിലെ പ്രധാന മാർക്കറ്റിംഗ് ചാനലാണെങ്കിലും, കുറഞ്ഞ വിപണന ചെലവും മാർക്കറ്റിംഗ് മാർജിനും കാരണം ചാനൽ III (പ്രൊഡ്യൂസർ - ട്രേഡർ കം സെമി പ്രോസസർ -പ്രോസസർ കം സെമി ഹോൾസൈലേഴ്സ് - റീട്ടെയിലർ - ഉപഭോക്താവ്) ആയിരുന്നു ഏറ്റവും കാര്യക്ഷമമായ ചാനൽ. ഉയർന്ന കൂലിയും തൊഴിലാളികളുടെ കുറവുമാണ് പാലക്കാട് ജില്ലയിലെ മഞ്ഞൾ കർഷകർ നേരിടുന്ന പ്രധാന ഉൽപാദന പരിമിതികളായി കണക്കാക്കുന്നത്, വിശാഖപട്ടണം ജില്ലയിൽ, മഞ്ഞളിന് ഒരു ലാഭകരമായ വില ലഭ്യമാകാത്തതും അനുയോജ്യമായ യന്ത്രങ്ങളുടെ സേവനങ്ങളുടെ അഭാവവുമാണ് കർഷകർ നേരിടുന്ന പ്രധാന ഉൽപാദന പരിമിതികൾ, വിലയിലെ ഏറ്റക്കുറച്ചിലുകളും സംഭരണ-വിപണന സൗകര്യങ്ങളുടെ അപര്യാപ്തതയുമാണ് കർഷകരും വ്യാപാരികളും നേരിടുന്ന പ്രധാന തടസ്സങ്ങൾ.

ഈ പഠനത്തിൽ നിന്ന് രണ്ട് ജില്ലകളിലും മഞ്ഞൾ കൃഷി ലാഭകരമാണെന്ന് മനസ്സിലായി, അതിനാൽ പ്രദേശ വിപുലീകരണ പരിപാടികളിലൂടെയും മറ്റ് പരിപാടികളിലൂടെയും കൂടുത ൽ ഭൂമി മഞ്ഞൽ കൃഷിക്ക് കീഴിൽ കൊണ്ടുവരാൻ സർക്കാർ ഉചിതമായ നടപടികൾ കൈക്കൊള്ളണം. കാർഷിക പ്രവർത്തനങ്ങൾ 'MGNREGA' പദ്ധതിയിൽ ഉൾപ്പെടുത്തിയും കുറഞ്ഞ ചെലവിലുള്ള യന്ത്രങ്ങളുടെ ഉപയോഗത്തിലൂടെയും തൊഴിലാളികളുടെ അഭാവം ഒരുപരിധി വരെ പരിഹരിക്കാം, അതുകൊണ്ട് കർഷകർക്ക് അനുയോജ്യമായ യന്ത്രങ്ങൾ അതത് കൃഷിഭവനുകൾ മുഖേന നൽകുന്നതിനുള്ള നയങ്ങൾ രൂപീകരിക്കണം. നിരവധി ഫാ ർമർ പ്രൊഡ്യൂസർ ഓർഗനൈസേഷനുകളുടെ (എഫ്പിഒ) രൂപീകരണത്തിലൂടെ ഉൽപാദന സ്ഥലങ്ങൾക്ക് സമീപമുള്ള അടിസ്ഥാന സൗകര്യങ്ങൾ ശക്തിപ്പെടുത്തുകയും വിളവെടുപ്പിന് ശേഷമുള്ള പ്രവർത്തനങ്ങൾ നടത്താൻ കർഷകർക്ക് സൗകര്യമൊരുക്കുകയും ചെയ്യുക. വിശാഖപട്ടണം ജില്ലയിൽ നിയന്ത്രിത വിപണി സ്ഥാപിച്ചാൽ മധ്യസ്ഥരുടെ ഇടപെടൽ ഒഴിവാക്കി ഉത്പന്നങ്ങൾക്ക് മെച്ചപ്പെട്ട വില കണ്ടെത്താൻ കർഷകരെ സഹായിച്ചേക്കാം.