

# **“A Study on the Supply Chain of Turmeric”**

*A dissertation submitted to the School of Maritime Management, Indian  
Maritime University in the partial fulfillment of*

**Master of Business Administration**

**in**

**International Transportation and Logistics Management**

**By**

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UNDER THE SUPERVISION AND GUIDANCE OF

**Dr. EMIL MATHEW**

*(Assistant Professor)*



**SCHOOL OF MARITIME MANAGEMENT**

**INDIAN MARITIME UNIVERSITY**

*(A Central University under the Ministry of Ports, Shipping and Waterways)*

**CHENNAI CAMPUS**

**May:2024**

**SCHOOL OF MARITIME MANAGEMENT  
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**CHENNAI CAMPUS**



**Certificate**

This is to certify that the project report titled " **A STUDY ON THE SUPPLY CHAIN OF TURMERIC**" submitted to the School of Maritime Management, Indian Maritime University, Chennai Campus in partial fulfillment of the requirement for awarding the degree, MBA in International Transport and Logistics Management is a work of **SARAN A (Reg.No. 2203305033)**

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## DECLARATION

I, **SARAN A**, do hereby declare that the dissertation entitled "**A Study on the Supply Chain of Turmeric**" is exclusively a bonafide work done by me under the supervision and guidance of **Dr. Emil Mathew**, Assistant Professor, School of Maritime Management and is submitted to Indian Maritime University in partial fulfilment of the requirement for the award of the degree of Master of Business Administration.

I further declare that no part of this report has been previously submitted to any other university or academic body for the award of any degree or diploma.

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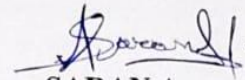
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I am grateful for the motivation and support from my friends and family and I sincerely appreciate the help from all our loved ones in getting this project finished.

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**Date: 10/05/2024**



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# **CHAPTER 1**

## **INTRODUCTION**

# CHAPTER 1

## A STUDY ON THE SUPPLY CHAIN OF TURMERIC

### 1.1 INTRODUCTION

A mainstay of the Indian economy, agriculture contributes roughly 15% to the GDP. Even though its contribution has decreased over time, it remains the nation's largest economic sector. Recently, there's been a renewed focus on agriculture, with both the government and private entities investing in its growth. However, inefficiencies plague the agricultural supply chain, resulting in substantial losses of crops and produce across the country due to inadequate storage and transportation facilities.

Spices, including seeds, fruits, roots, and bark, add flavor, color, and sometimes preservation qualities to food. Unlike herbs (leafy green plant parts), spices come from various plant structures. Many spices, like turmeric, possess antimicrobial properties.

The spice trade, a network connecting ancient civilizations across Asia, Northeast Africa, and Europe, thrived for centuries. Spices like cinnamon, cardamom, ginger, pepper, and turmeric were prized and commercially valuable in the Eastern world since ancient times. Kerala, India, nicknamed "the land of spices," was a major destination for explorers and traders, including Christopher Columbus and Vasco da Gama.

Among these spices, turmeric holds a special place. Cultivated in India for millennia, turmeric is known as "Indian saffron" due to its vibrant color. This golden spice, a member of the ginger family, is a perennial herbaceous plant with underground rhizomes (root-like structures). Farmers harvest these rhizomes annually and use some for replanting the following season.

Turmeric boasts a rich history in Asian medicine, particularly Siddha medicine. Initially used as a dye, its medicinal properties were later discovered. The commercial part of the turmeric plant is its rhizome, which thrives in specific soil conditions and temperatures. It cannot tolerate waterlogging or overly alkaline soil.

Beyond its medicinal uses, turmeric adds flavour and colour to food, finds applications in cosmetics, and takes around 7-9 months to mature. Planting typically occurs between May and August, with

harvests arriving between December and March (or February to May depending on the variety). Interestingly, India is the world's largest producer, consumer, and exporter of turmeric.

In 2022-23, India cultivated turmeric on over 324,000 hectares, producing a staggering 11.61 million tonnes, accounting for over 78% of global production. The country boasts over 30 turmeric varieties grown across more than 20 states. Maharashtra, Telangana, Karnataka, and Tamil Nadu are the leading producers.

India dominates the global turmeric trade with a whopping 62% share. During 2022-23, the country exported over 153,400 tonnes of turmeric and related products, valued at a significant USD 207.45 million, through more than 380 exporters. Key export destinations include Bangladesh, the United Arab Emirates, the United States, and Malaysia. With ongoing efforts, India aims to reach a target of USD 1 billion in turmeric exports by 2030.

**Figure:1.1 Turmeric production and trade of India**

<b>Year</b>	<b>Import of turmeric of India in tonnes</b>	<b>Export of turmeric from India in tonnes</b>	<b>Production of turmeric in India in tonnes</b>
2013-14	7,284.02	78,360.18	1092630
2014-15	9,654.21	90,738.10	846250
2015-16	15,922.27	88,465.87	967060
2016-17	14,466.69	125,116.19	925270
2017-18	17,126.67	111,774.77	863460
2018-19	31,039.84	138,920.39	929967
2019-20 (Apr-Oct)	20,534.01	75,225.57	-

**Source: Spices board and department of commerce**

## **1.2 Benefits of Turmeric**

Turmeric has many uses in daily life. Its uses include:

### **1.2.1 A. Medicinal uses**

A vibrant spice with a long history in traditional medicine, turmeric's popularity has surged in recent years due to its potential health benefits. This ginger relative adds color and depth to curries and

countless dishes, but its uses extend far beyond the kitchen. Renowned for its anti-inflammatory properties, turmeric has been used for centuries to address an array of ailments, from liver and digestive issues to skin problems and wound healing. Curcumin, the key active ingredient in turmeric, is thought to be the driving force behind these diverse therapeutic effects.

- **Digestive Disorders:** Struggling with post-meal discomfort or sluggish digestion? Look no further than turmeric, the golden spice with a surprising digestive punch. Turmeric boasts carminative properties, acting as a natural remedy for gas and bloating, leaving you feeling light and comfortable. Additionally, it functions as a cholagogue, stimulating bile production in the liver. This bile is crucial for breaking down fats, making those heavy meals and rich dishes much easier to digest. Whether you experience chronic digestive issues or occasional bloating, turmeric can be your digestive ally. Enjoy it in its natural form sprinkled on dishes, or take it as an extract or digestive bitters (containing a blend of herbs with similar properties) for an extra boost.
- **Liver Diseases:** Turmeric is beneficial its influence on liver. Similar to herbs like milk thistle and artichoke, turmeric contains compounds that might offer liver-protective benefits. Some studies suggest it could help reduce inflammation and support healthy bile flow, potentially aiding in managing conditions like hepatitis and promoting overall liver function.
- **Cancer:** While turmeric has a long history of traditional use, scientific research is only beginning to catch up. Exciting studies suggest turmeric may play a role in hindering the growth of some cancers, particularly skin cancer. There's even potential for topical applications on pre-cancerous lesions. However, it's important to be realistic. Turmeric is not a cure for cancer. These initial findings are promising, but more research is needed to confirm its effectiveness and determine how it might best complement conventional cancer treatments. Always consult a healthcare professional before using turmeric for any medical condition, especially alongside existing treatments.
- **Atherosclerosis:** One potential benefit lies in its ability to lower LDL, the "bad" cholesterol. Since oxidized LDL contributes to plaque buildup in arteries, hindering this oxidation process could be a valuable weapon. Secondly, turmeric might help prevent blood clots by inhibiting platelet clumping on injured blood vessel walls. These clumps can lead to blockages and potentially contribute to heart attacks or strokes. However, it's crucial to remember that turmeric is not a replacement for conventional heart disease treatments. While these initial findings are exciting, more research is needed to solidify its effectiveness and determine how

it might best complement existing therapies. Always consult a healthcare professional before using turmeric for any medical condition, especially alongside current medications.

- **Osteoarthritis:** Turmeric's anti-inflammatory properties might offer relief for osteoarthritis sufferers. Studies suggest it could help manage pain and disability associated with this condition. This is because turmeric may help reduce inflammation in the joints, a key contributor to osteoarthritis symptoms.
- **Bacterial Infection/ Wounds:** Turmeric's potential antibacterial properties might be helpful in preventing infections in wounds, aiding the healing process.
- **Other Health Disorders:** Turmeric's anti-inflammatory properties extend beyond joints. Research suggests it might help with conditions affecting mucous membranes, which line the throat, lungs, stomach, and intestines. This could potentially benefit people suffering from issues like colitis, Crohn's disease, diarrhea, or even post-infectious gut issues. Furthermore, its anti-inflammatory effects might offer relief from the itching and inflammation associated with hemorrhoids and anal fissures. Some studies even explore turmeric's role in skin conditions like eczema, psoriasis, and acne, possibly due to its potential detoxifying effects. However, it's important to note that more research is needed to confirm these benefits for all these conditions.

### 1.2.2 B. Food Use

Turmeric is widely cultivated for its rhizomes which are used as a bright yellow-orange culinary spice. turmeric shines as a natural food colouring. This vibrant yellow-orange spice, often dubbed "poor man's saffron" for its affordability, owes its colour to curcumin, the main pigment. Food manufacturers widely utilize curcumin to add colour to various products. It's a popular choice for dairy products like flavoured milk drinks, yogurt, and desserts, where it imparts lemon or banana hues. In other applications like sausages, pickles, sauces, and savoury mixes, turmeric is used at higher concentrations to leverage its original purpose as a spice, adding both colour and flavour. From breakfast cereals to bakery goods and even ice cream, turmeric's versatility as a natural colouring agent is undeniable.

### 1.2.3 C. Cosmetic Use

Turmeric's history in cosmetics stretches back centuries, particularly in Eastern cultures. In some regions, like India, turmeric holds a special place, deeply ingrained in traditions and viewed as a valuable beauty aid. While scientific studies exploring its properties began in the late 1970s, focusing

on its anti-inflammatory effects, turmeric's cosmetic applications have gained global recognition in recent years.

- **Skin care and colouring:** Turmeric's journey extends beyond the kitchen spice rack. For centuries, particularly in Eastern cultures, it's been a popular ingredient in natural skincare routines. Research is catching up to tradition, exploring turmeric's potential benefits for various skin concerns. Some studies suggest it might help with dryness and even offer relief for conditions like eczema and acne due to its anti-inflammatory properties. The possibility of turmeric brightening skin has also sparked interest, although claims about hair growth reduction lack scientific support. The cosmetic industry embraces turmeric's potential, incorporating it into cleansers for a gentle, possibly brightening effect. It's important to remember that turmeric can stain skin, so consulting a dermatologist before topical use is crucial. While research is promising, more is needed to solidify its effectiveness for specific conditions. Always consult a healthcare professional before using turmeric for any skin issue, especially if you have existing conditions or use topical medications.
- **Hair care:** Beyond its culinary and medicinal uses, turmeric has a surprising presence in the world of haircare. Natural extracts, like those potentially found in turmeric, are used in various hair products: for dandruff defence, some plant extracts offer a natural approach to scalp health. Turmeric itself contributes to the world of natural hair colour, with curcumin, its vibrant pigment, offering a range of yellow to deep orange tones. However, it's important to remember that research on the effectiveness of plant extracts, like turmeric, specifically for hair growth stimulation is still in its early stages. Always consult a healthcare professional before using any product on your scalp, especially if you have existing hair or scalp conditions.
- **Skin disease:** While turmeric has a long history of traditional use, it's important to approach information about its effectiveness for serious illnesses with caution. Traditionally, turmeric has been used for leprosy and chickenpox, often applied topically as a juice, paste, or powder. However, it's crucial to understand that there's no scientific evidence to support its effectiveness in treating these conditions. Leprosy and chickenpox require proper medical diagnosis and treatment. Always consult a healthcare professional for any serious medical concern.

### **1.3 OBJECTIVES OF STUDY**

The following are the objectives of the study:

- To identify processes and complications faced by farmers in the supply chain of turmeric
- To identify processes and complications faced by village traders and wholesalers in the supply chain of turmeric

### **1.4 STATEMENT OF THE PROBLEM**

Turmeric is a spice used extensively by all classes of people in India and is one of India's most ancient and traditional export commodities. The world production of turmeric stands at around 11 lakh tones in which India hold a share of approximately 75-80%. Also, India consumes around 85% of its own production. And the share of India in the national production of turmeric is pity high. And in India, the 4th largest producer of turmeric is Tamil Nadu. In Tamil Nadu, the highest-producing district is Erode. But the farmers and village trader/wholesaler of turmeric are facing too many dilemmas.

#### **1.4.1 Challenges of farmer:**

- **Price Fluctuations:** Turmeric prices can fluctuate wildly depending on factors like harvest yield, international demand, and speculation by traders. This makes it difficult for farmers to plan their income and secure stable livelihoods.
- **Lack of Bargaining Power:** Small and marginal farmers often lack bargaining power with middlemen and processors. They may be forced to accept low prices for their produce due to limited access to markets and information asymmetry.
- **High Transportation Costs:** Transportation costs can be a significant burden for farmers, especially those located far away from processing centres or markets. This reduces their profit margins and makes them vulnerable to price variations.
- **Post-Harvest Losses:** Due to inadequate storage facilities and lack of proper drying techniques, a significant portion of turmeric can be lost after harvest. This not only reduces farmers' income but also leads to wastage.

- **Limited Access to Information:** Farmers often lack access to real-time market information, such as prevailing prices and potential buyers. This makes them reliant on middlemen who may not provide accurate information.

#### **1.4.2 Challenges of Village Trader & Wholesaler:**

- **Unreliable Supply:** Farmers' dependence on weather conditions can lead to unpredictable yields and unreliable supply, making it difficult for wholesalers to fulfil contracts or maintain consistent inventory.
- **Poor Quality Control:** Inconsistent drying and storage practices by farmers can lead to variations in turmeric quality, causing problems for wholesalers who need to meet specific quality standards for their buyers.
- **High Transaction Costs:** Dealing with numerous small farmers can incur high transaction costs for wholesalers due to the need for more frequent collections and negotiations.
- **Price Fluctuations:** Just like farmers, wholesalers are also affected by price fluctuations. Sudden price drops can lead to losses if they have a large inventory.
- **Competition:** Wholesalers face competition from other traders and may struggle to secure good quality produce at competitive prices, especially during peak seasons.

### **1.5 SCOPE OF STUDY**

The turmeric supply chain connects farmers who cultivate the golden spice to consumers worldwide. But this journey isn't always smooth. To improve the lives of those involved, researchers can delve into the processes and challenges faced by both farmers and wholesalers/village traders.

For farmers, optimizing production and post-harvest practices is key. Researchers can analyse factors influencing yield and quality, like crop selection and pest control. Additionally, studying proper drying, storage, and handling techniques can minimize post-harvest losses, a significant financial burden for farmers. Furthermore, exploring alternative marketing channels like cooperatives or online platforms, and value-added options like processing turmeric powder, can empower farmers and increase their income.

Wholesalers/village traders face their own set of challenges. Optimizing sourcing strategies and supply chain efficiency can be achieved through studying logistics, storage, and transportation networks.

Additionally, research can identify risk management strategies to mitigate price fluctuations. Finally, exploring improved grading systems and utilizing technology for better communication and market access can create a more transparent and streamlined turmeric supply.

## **1.6 METHODOLOGY OF THE STUDY**

A research project's methodology is its action plan, outlining in great detail how data are gathered, examined, and presented in order to provide knowledge that is meaningful.

A study on the Supply Chain of Turmeric in Kodumudi block, Erode district, India, between February and April 2024. A purposive sample of 30 farmers, 5 village traders, and 5 wholesalers were selected for the study. Data collection included a structured survey administered to these stakeholders, along with secondary data gathered from relevant articles and websites. The collected data was then analysed using both descriptive statistics (**Percentage analysis**), (**Rank order analysis**) and inferential statistics (**ANOVA**) to identify patterns and relationships between the variables.

## **1.7 LIMITATION OF THE STUDY**

Due to time constraints and resource limitations, this study relied on a survey of participants within the Erode district, potentially introducing bias and limiting the generalizability of the findings to a wider population

**CHAPTER 2**  
**LITERATURE REVIEW**

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 LITERATURE REVIEW**

##### **1. Sujatha (2006), Export Competitiveness of Spices in India**

This analysis draws inspiration from Sujatha's 2006 thesis titled "Export Competitiveness of Spices in India." The original work examined the export performance of major Indian spices across pre-WTO and post-WTO periods, analysing growth trends, trade direction, market integration, export competitiveness, and constraints faced by exporters. This current analysis builds upon that foundation to investigate the impact of WTO membership on the Indian spice export sector.

##### **2. Fafchamps et al. (2007), Quality Control and the Marketing of Non-Staple Crops in India**

Fafchamps et al. (2007) address the functionality of non-staple crop markets in India and propose improvements for the existing agricultural marketing system in their paper titled "Quality Control and the Marketing of Non-Staple Crops in India." Their research employs a multifaceted survey approach, gathering data from various stakeholders across the supply chain.

##### **3. Madan (2008), Changing Scenario of Turmeric Production and Marketing**

Madan (2008) investigates the evolving landscape of turmeric production and marketing in India over the past two decades. The study focuses on potential changes under the WTO regime's free trade and spice trade regulations. The analysis employs time series data on production, export, and prices, utilizing seasonal, trend, and Fourier analysis techniques. To account for inflation, a revised series of the turmeric commodity wholesale price index with a base year of 1993-94 is used to determine the real value of marketed turmeric.

The study reveals a significant increase in turmeric productivity, rising from 2.1 t/ha in 1980-81 to 3.63 t/ha in 2002-03. Interestingly, the analysis of time series data indicates that the coefficient of variation for farm prices is higher than that of production, suggesting greater fluctuations in price compared to production variations.

#### **4. Murukananthi et al. (2008), A Study on the Direction of Trade in the Indian Turmeric Exports: Markov Chain Approach**

Murukananthi et al. (2008) focus on the export direction of Indian turmeric in their study titled "A Study on the Direction of Trade in the Indian Turmeric Exports: Markov Chain Approach." While acknowledging India's dominant position in turmeric exports, they recognize the fluctuations in export quantity and value over time. To maintain India's leadership amidst rising domestic demand and competition, the researchers analyze the export performance of turmeric. Their analysis employs growth rates, instability index, and Markov chain analysis, utilizing data on export quantity and value from 1996 to 2006.

#### **5. Roy and Hore (2009), Bio-organic Inputs for Organic Turmeric Production**

Roy and Hore (2009) investigated suitable bio-organic inputs for cultivating organic turmeric as an intercrop in arecanut plantations. Their research focused on identifying organic alternatives that could enhance growth and yield compared to conventional inorganic methods. The study found that plants grown using bio-organic inputs exhibited superior performance in most growth and yield parameters. This suggests that bio-organic inputs can be a viable and effective approach for organic turmeric production.

#### **6. Ganesh Prasad et al. (2010), Economics of Production and Marketing Channels Used by Turmeric Growers in Chamarajanagar District of Karnataka**

Ganesh Prasad et al. (2010) delves into the economic aspects of turmeric production and the marketing channels employed by turmeric growers in Chamarajanagar district, Karnataka. Their study utilizes a pre-tested interview schedule to gather data from 120 turmeric growers.

A key finding is that the majority of respondents marketed their produce in the regulated market located at Erode, Tamil Nadu. Additionally, the study highlights price fluctuation as a significant marketing constraint, with approximately 63% of turmeric growers identifying it as a major concern. This research provides valuable insights into the economic realities and marketing challenges faced by turmeric growers in this specific region.

## **7. Timsina et al. (2010), Value Chain Analysis of Turmeric (*Curcuma longa*) in Eastern Nepal**

Timsina et al. (2010) investigated the turmeric value chain in eastern Nepal's Sunsari district, a major producer. Their study, conducted in December 2010, employed a mixed sampling method, interviewing 40 randomly selected farmers and 25 purposively chosen traders, wholesalers, and retailers from Sunsari and Biratnagar. A key finding was the significant share (over 38%) of labor costs in production due to the crop's labour-intensive nature. Furthermore, the research identified a lack of formal institutions promoting turmeric, leading farmers to rely on traditional, likely local, seed varieties. This analysis sheds light on the structure and challenges within Nepal's eastern turmeric value chain, highlighting areas for improvement like labor efficiency or introducing better varieties and cultivation practices through institutional support.

## **8. Chatterjee et al. (2012), Spices Scenario in the North Eastern States of India with Special Reference to Production and Marketing**

Recognizing India's status as the "Spice Bowl of the World," Chatterjee et al. (2012) investigated the potential and challenges of spice production and marketing in the North Eastern states. This region boasts diverse topography, climate, and altitude, offering ideal conditions for a variety of spice crops. However, the study finds that many growers struggle to sell their produce at a fair price during peak season. To address this and enhance competitiveness, Chatterjee et al. (2012) proposes public-private partnerships to ensure wider access to crucial production technologies. Additionally, they emphasize the need for improved infrastructure networks and focused research to unlock the region's potential for high-quality spice production. Finally, the study suggests forming farmer organizations and cooperatives at local and regional levels to strengthen the marketing capabilities of the North Eastern states, solidifying their role in India's spice sector.

## **9. Veerakumaran (2012), Mapping the Value Chain of Paddy: A Case Study of Paddico Ltd**

In a 2012 article titled "Mapping the Value Chain of Paddy: A Case Study of Palakkad District Procurement, Processing and Marketing Co-operative Society Limited (Paddico Ltd)," Veerakumaran examines the flow of paddy from farmers to consumers in India's Palakkad district. The study focuses on Paddico Ltd, a cooperative society that plays a key role in both procurement and processing of paddy through its modern rice mill. Inputs for cultivation likely come from Primary Agricultural Credit

Cooperatives. Paddico Ltd then markets the processed rice through two channels: the Kerala State Civil Supplies Corporation and their own retail outlets. This dual approach suggests Paddico Ltd aims for wider market reach while potentially maintaining some control over pricing, ultimately aiming to benefit both farmers and consumers.

### **10. Kiruthika (2013), Economics of Production of Turmeric in India: A Case Study of Erode District of Tamil Nadu**

Kiruthika (2013) examined the economics of turmeric production in India, focusing on Erode district, a major producer in Tamil Nadu. India's position as a leading global producer contrast with its low export volume, raising questions about export efficiency. The study identified economic importance for both the national and farm economies. Interestingly, Kiruthika's research suggests that larger farms achieved higher net returns per hectare, indicating potential benefits of economies of scale or access to better resources. However, the study acknowledges challenges faced by farmers in both production and marketing aspects of turmeric cultivation.

### **11. Prabhavathi et al. (2013), Analysis of Supply Chain of Spices in India: A Case Study of Red Chillies**

Prabhavathi et al. (2013) investigated the spice supply chain in India through the lens of red chillies. Their study identified two distinct channels, with supply chain II emerging as more efficient. This efficiency translates to a greater value delivered to consumers at a lower marketing cost for producers. However, the study highlights challenges for farmers regardless of the chosen channel. These include delayed payments, unfair pricing mechanisms, excessive commissions collected by intermediaries, and limited access to loans for their produce. These findings suggest a need to address these issues to create a more streamlined and equitable spice supply chain in India.

### **12. Shincy and Karthika (2013), Value Chain Analysis of Pepper in Trikkur Panchayat**

Shincy and Karthika (2013) investigated the pepper value chain in Trikkur Panchayat, India. Their study aimed to achieve two key goals: first, to map out the various components and stakeholders involved in bringing pepper from farms to consumers. Second, they sought to analyze how the financial benefits generated at each stage of the pepper value chain are distributed among the different participants. To achieve these objectives, the researchers used a combination of data collected directly

from stakeholders (primary data) and existing information on the subject (secondary data). This combined approach offers a comprehensive look at the structure of the pepper value chain in Trikkur Panchayat, revealing the roles played by various stakeholders and how profits are distributed at each level.

**CHAPTER 3**  
**PRODUCTION AND SUPPLY CHAIN PROCESS**

## **CHAPTER 3**

### **PRODUCTION AND SUPPLY CHAIN PROCESS**

This chapter is about turmeric production and supply chain process. The chapter briefly explains about total production in India, global supply chain scenario, and procurement of raw material, processing, packing.

#### **3.1 PRODUCTION SCENARIO**

##### **3.1.1 GLOBAL SCENARIO**

On the world stage, turmeric reigns supreme in Asia. India, the undisputed champion, cultivates a staggering 80% of the globe's turmeric, making it the leading producer, consumer, and exporter. Other Asian countries like China, Myanmar, and Bangladesh also contribute to the global supply. This golden spice isn't just an Asian phenomenon though. Turmeric cultivation extends beyond the continent, finding a home in Africa, with Nigeria being a notable producer. The Caribbean and Latin America see turmeric growth as well, with countries like Jamaica, Haiti, and Brazil participating in the global production scene.

The global demand for turmeric is on a golden run, projected to reach billions by 2029. This surge is fuelled by its dual appeal: as a flavourful food additive and a potential health booster. Its perceived anti-inflammatory and antioxidant properties are capturing increasing attention, particularly in North America. This trend, coupled with growing consumer interest in natural ingredients, is propelling the global turmeric market forward. As research continues to explore the potential benefits of turmeric and innovative products hit the shelves, the future of this vibrant spice looks as bright as its colour.

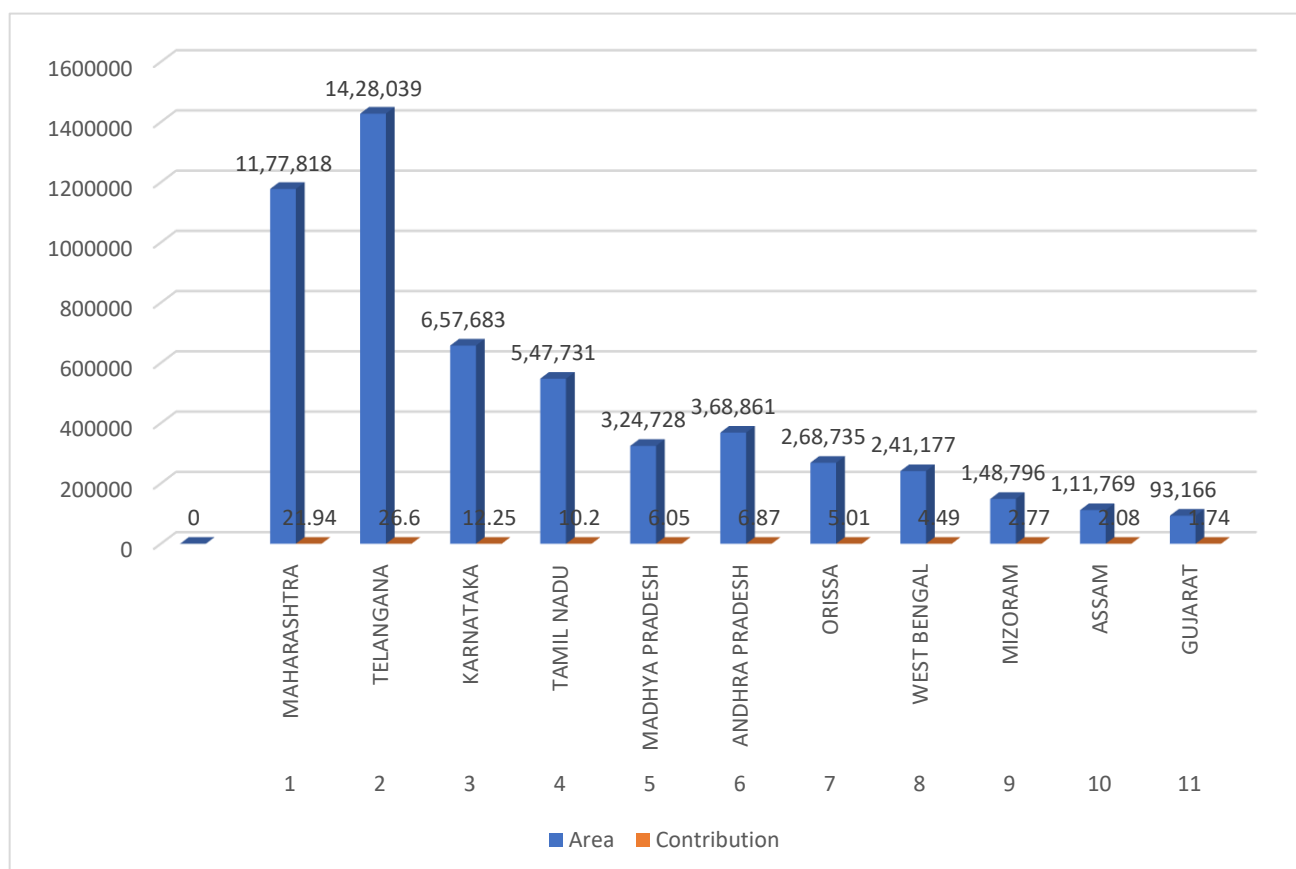
### 3.1.2 INDIAN SCENARIO

Table: 3.1 INDIAN PRODUCTION OF TURMERIC (2018-2023)

S.NO	State	Production (Production in Tons)	Contribution
1	MAHARASHTRA	11,77,818	21.94
2	TELANGANA	14,28,039	26.6
3	KARNATAKA	6,57,683	12.25
4	TAMIL NADU	5,47,731	10.2
5	MADHYA PRADESH	3,24,728	6.05
6	ANDHRA PRADESH	3,68,861	6.87
7	ORISSA	2,68,735	5.01
8	WEST BENGAL	2,41,177	4.49
9	MIZORAM	1,48,796	2.77
10	ASSAM	1,11,769	2.08
11	GUJARAT	93,166	1.74
	<b>TOTAL</b>	<b>53,68,503</b>	

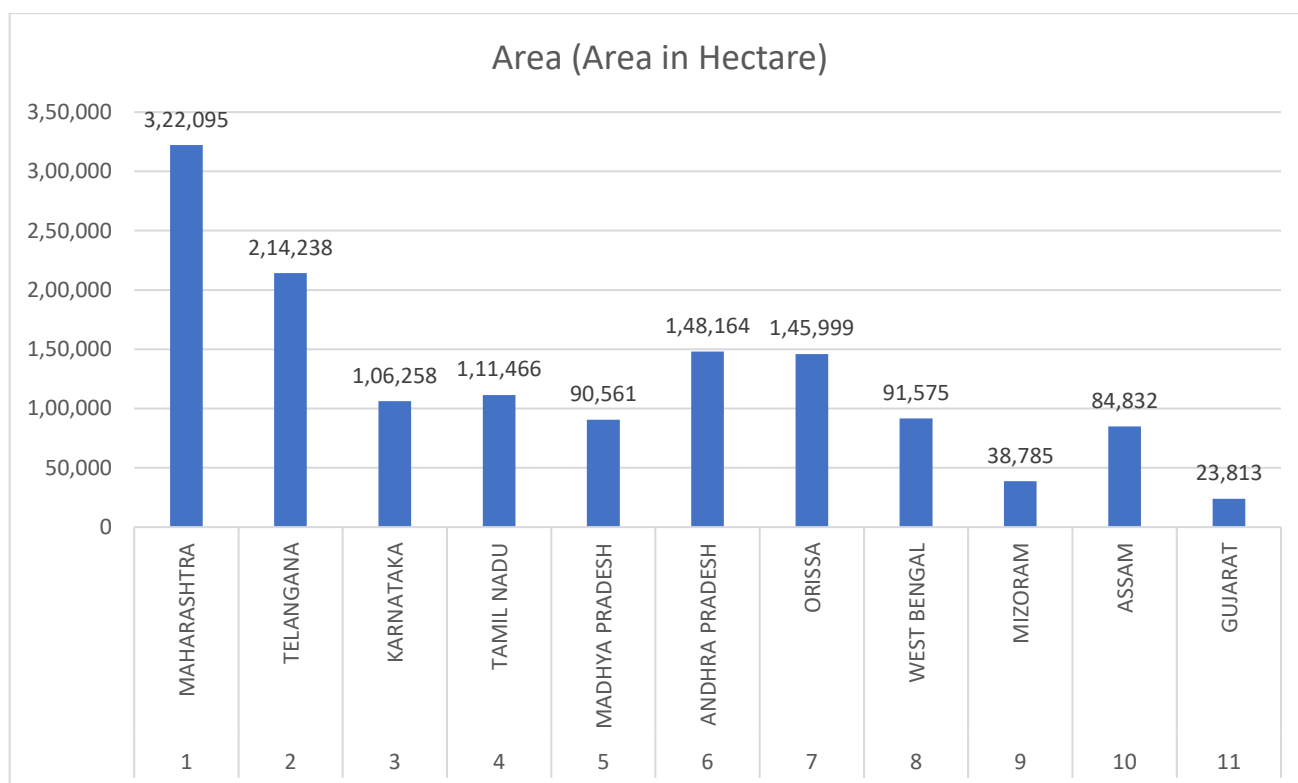
Source: www.indianspices.com

Figure: 3.1 Indian Production of Turmeric (2018-2023)



Source: www.indianspices.com

**FIGURE: 3.2 INDIAN'S TURMERIC AREA (2018-2023)**



Source: [www.indianspices.com](http://www.indianspices.com)

### 3.1.3 PRODUCTION OF TAMIL NADU

Tamil Nadu stands tall as a key contributor to India's position as the global leader in turmeric production. This southern Indian state is estimated to cultivate around 17% of the country's total turmeric, making it a significant player on the national stage. Several districts within Tamil Nadu have carved a niche for themselves in turmeric farming. Erode, Coimbatore, Salem, and Dharmapuri are particularly well-known for their fertile lands that nurture high-quality turmeric.

These regions benefit from well-developed irrigation systems, crucial for sustaining turmeric growth. The crop thrives in red soil, black soil, and alluvial soil, all of which are found abundantly in these districts. Farmers typically cultivate turmeric between June and March, taking advantage of the warmer months. While data for the current year isn't readily available yet, acreage under turmeric cultivation in Tamil Nadu saw a healthy increase last year. Reports indicate a rise from 24,166 hectares in the previous year to 24,746 hectares, reflecting a growth of about 15%. This increase can likely be attributed to favourable weather conditions, with good and timely rainfall supporting farmers' decisions

to expand their turmeric fields. Given this expansion and assuming normal growing conditions, production range is 136370 metric tonnes for Tamil Nadu in the past year.

## **3.2 HARVESTING AND PROCESSING**

### **3.2.1 Kerala's Golden Harvest**

Kerala, a state renowned for its lush greenery and vibrant culture, also boasts a thriving turmeric industry. Here, turmeric is cultivated on raised beds, creating a unique landscape dotted with golden bounty. The harvest window typically falls between January and March, after the crop has matured for 7-9 months. Visible signs of maturity include dry leaves turning light brown or yellowish, indicating the ideal time to reap the rewards.

### **3.2.2 Harvesting Techniques: Manual or Modern**

Kerala's turmeric farmers employ two primary harvesting methods. The traditional approach involves manual labor. The land is first ploughed, followed by the careful lifting of turmeric clumps using a spade. Finally, the turmeric rhizomes, the underground stems that hold the valuable curcumin, are meticulously handpicked. For larger operations, a more modern approach utilizes tractors equipped with specialized turmeric harvesters. These machines efficiently extract the turmeric clumps from the raised beds, but regardless of the method, the harvested rhizomes require further manual processing.

### **3.2.3 The Final Touches**

Once harvested, the turmeric rhizomes undergo a final cleaning process. Farmers meticulously remove any adhering dirt or debris to ensure a high-quality product. These cleaned rhizomes are then prepared for the next stage, whether it's curing for later consumption or immediate processing into turmeric powder, a vibrant spice enjoyed worldwide for its flavor and potential health benefits.

## **3.3 CROP CALENDAR**

The journey of Indian turmeric, from field to market, follows a distinct seasonal rhythm. Planting kicks off in June, with farmers opting for either raised beds or ridges to cultivate the crop. This sets the stage for a harvest window that typically starts in late January and stretches through March. By March, the vibrant golden tubers begin to enter the market, with peak arrivals occurring between March and April.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Turmeric												

Harvesting period	
Sowing period	
Peak arrivals	

**Table: 3.2 Crop Calendar**

**Source: primary data**

### **3.4 GLOBAL SCENARIO: SUPPLY CHAIN OF AGRO BASED PRODUCT**

The world's food system faces a delicate challenge: keeping pace with surging demand. Globalization and population growth are driving a steady increase in the need for diverse, high-quality food products. Efficient agro-food supply chains are crucial to meet this demand, but navigating this complex landscape is no easy feat. Unpredictable weather patterns disrupt harvests, while the inherent perishability of many agricultural products presents logistical challenges. A complex web of regulations – encompassing food safety, environmental protection, and international trade – adds another layer of difficulty. Further complicating matters are evolving consumer preferences for a wider variety of food options.

This confluence of factors threatens to disrupt the delicate balance between supply and demand, raising concerns about future food security. Developed countries may need to significantly increase their agricultural production and improve supply chain efficiency to meet the anticipated 70% rise in global food demand by 2050.

The concept of supply chain management is a recent, but crucial, innovation in the agro-food industry. Rapid industrialization of agriculture, the concentration of food distribution, and the rise of information and logistics technologies are just some of the factors driving this shift. Concerns about food safety, evolving consumer demands, and the emergence of powerful new players like supermarkets and multinational corporations have all contributed to the need for a more holistic approach to the agro-food sector. Standardization and quality management systems are key components of ensuring food

safety, while sophisticated logistics operations are essential for managing the flow of goods efficiently within modern agro-food supply chains.

### **3.4.1 The Role of Developed Nations**

Developed countries, with their advanced agricultural infrastructure and technological prowess, have a significant role to play in strengthening the global food supply chain. They can contribute by increasing their own agricultural production, implementing best practices, and sharing knowledge and resources with developing nations. Investing in research and development of drought-resistant crops and climate-smart agricultural techniques will be crucial for building long-term resilience.

### **3.4.2 Building a Sustainable Future**

Ultimately, ensuring a secure and sustainable food supply for all requires a global shift towards a more holistic approach. This means fostering collaboration between governments, businesses, and consumers to promote responsible production practices, reduce waste throughout the supply chain, and minimize the environmental footprint of the agro-food sector. By embracing innovation, fostering international cooperation, and prioritizing sustainability, we can create a more resilient food system that can nourish a growing global population for generations to come.

## **3.5 SUPPLY CHAIN PROCESS OF TURMERIC**

### **3.5.1 FARMERS TO VILLAGE TRADER**

Step 1: HARVESTING-As per the crop calendar harvesting takes place in the month January to April.

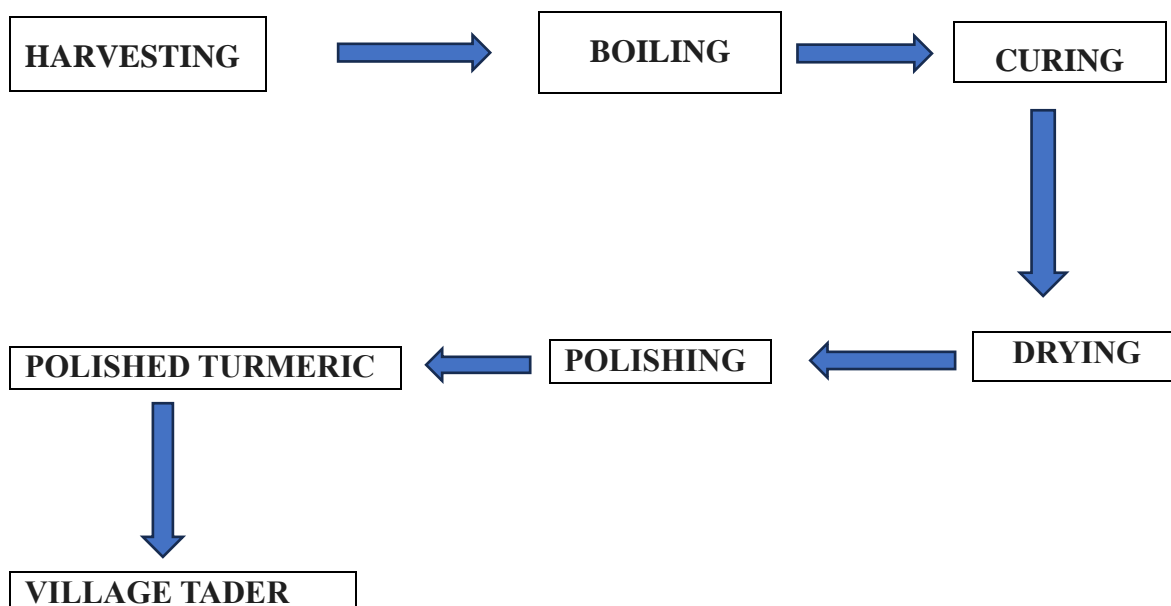
Step2: BOILING/COOKING- After harvesting turmeric the next process is to cook the turmeric. Cooking process takes about 40 to 45 minutes.

Step3: CURING-next process curing. The cooked turmeric has to be cured by spreading in dry land. It has periodically turnaround turmeric for better results.

Step4: DRYING-after curing it takes to drying process. Drying take hardly up to 20-30days if the temperature is high.

Step5: POLISHING-after the turmeric is dried it has to be polished. Polishing takes 30 - 60 minutes until yellow colour comes it has to be polished. After polishing turmeric is packed in a sack. Then it is stacked in Godown after the farmer sell their finger/bulb turmeric in the local market. Traders from various region quote the tender and who is quoting high price they buy turmeric from the farmers through turmeric committee.

**FIGURE: 3.3 THE SUPPLY CHAIN PROCESS OF TURMERIC FROM FAMER TO VILLAGE TRADER**



As the above is supply chain process of the farmers. It's from harvesting to sell in the local market. Next is to from point of village trader how they purchase the finger turmeric and steps involved in processing of turmeric.

### **3.5.2 VILLAGE TRADER TO WHOLESALER**

Step1: PURCHASING OF TURMERIC-The village trader buy the polished turmeric from the farmer at quoted price.

Step2: DESTONER-Next process is to filter stones and very tiny turmeric. The destoner is the machine that removes stones which is present in the turmeric.

Step3: MANUAL CLEANING- After destoner removes the stones. Then manual cleaning and screening process is done by the exporter.

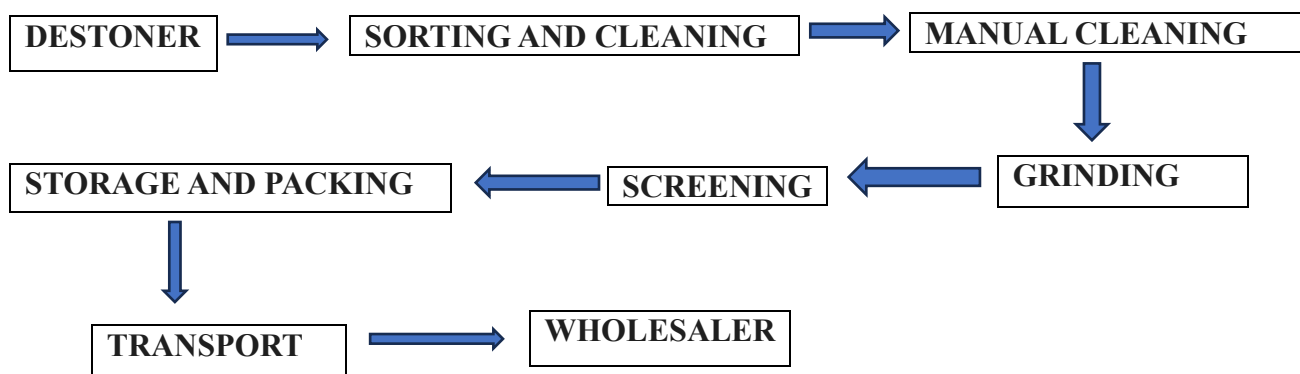
Step 4: SORTING-After manual cleaning sorting has to be done.in sorting process the machine categorizes according to their sizes various from small-big. After sorting finger turmeric are packed in sack according to importers specification whether it is packed in 25kgsor 50kgs.

Step5: GRINDING-After sorting the turmeric grinding process is to be done.

Step6: SCREENING-Screening is the process of separating the powder according to their grinding standards.

Step7: STORING AND PACKING-After screening the turmeric powder has to be more in the storage hover. Packing is based on the requirements of the wholesaler it is packed in 1kg, 2kgs, or kgs.

**FIGURE: 3.4 SUPPLY CHAIN PROCESS OF TURMERIC FROM VILLAGE TRADER TO WHOLESALER**



As the above is supply chain process of the village traders. It's from purchasing of turmeric to sell to the wholesaler. Next is to from point of wholesaler how they purchase the finger turmeric and steps involved in processing of turmeric.

# **CHAPTER 4**

## **ANALYSIS**

## CHAPTER 4

### ANALYSIS

#### 4.1 INTRODUCTION

Supply chain analysis of turmeric in Kodumudi Block, Erode district. It explores the various participants, their functions, and their roles within the system. The study relied on primary data collected through structured interviews with 30 farmers, 5 village traders and 5 wholesalers in Kodumudi Block. The findings of this research are presented and analysed in this chapter.

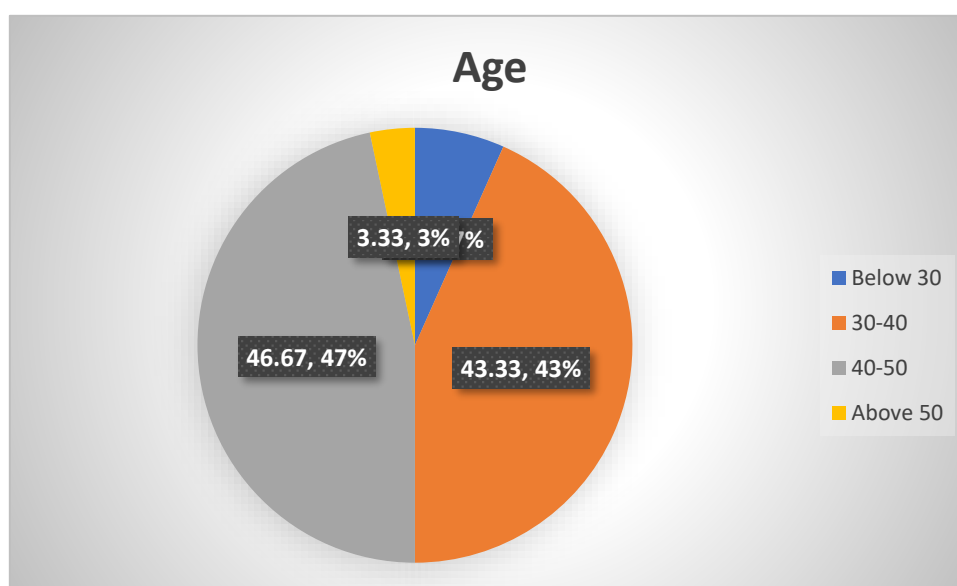
#### 4.2 PRODUCER FARMER

The study selected a total of 30 farmers for participation. 15 farmers were chosen from vadakkupudupalayam panchayath and periyasemmandapalayam panchayath.

##### 4.2.1 Socio-economic profile

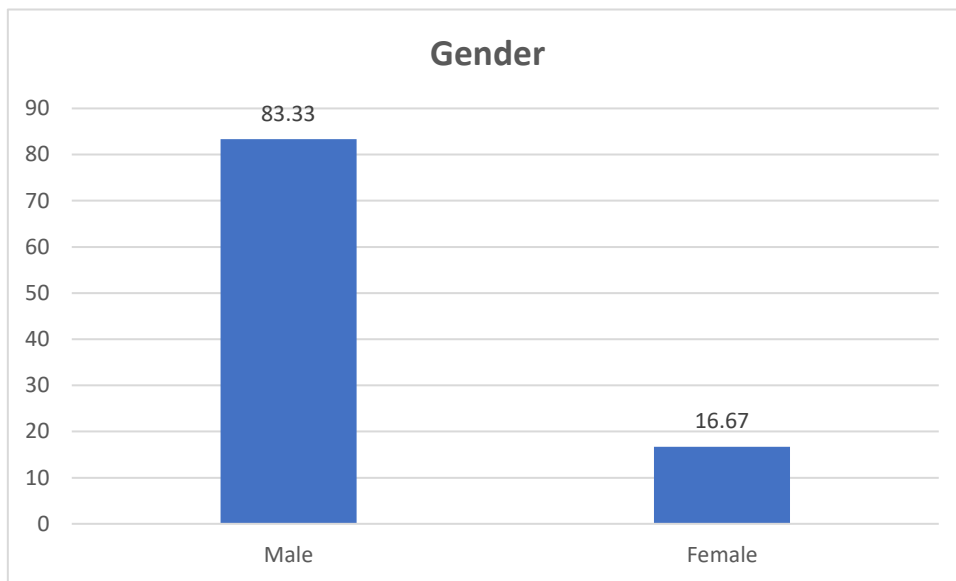
To gain insight into the farmers' backgrounds, the study examined their demographic characteristics. This included factors like age, gender, primary occupation, educational attainment, yearly income, and the amount of land they owned. By analysing these aspects, researchers aimed to understand the farmers' standard of living and potential influences on their farming practices.

**Figure: 4.1 Farmer's age**



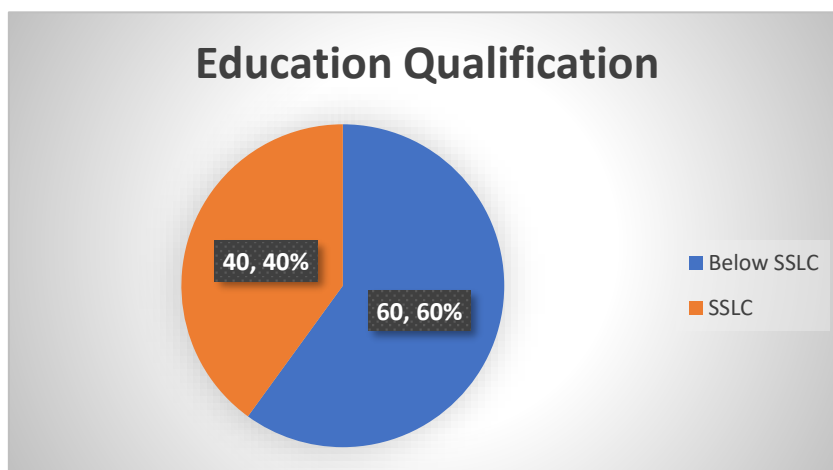
**Source: primary data**

**Figure: 4.2 Gender**



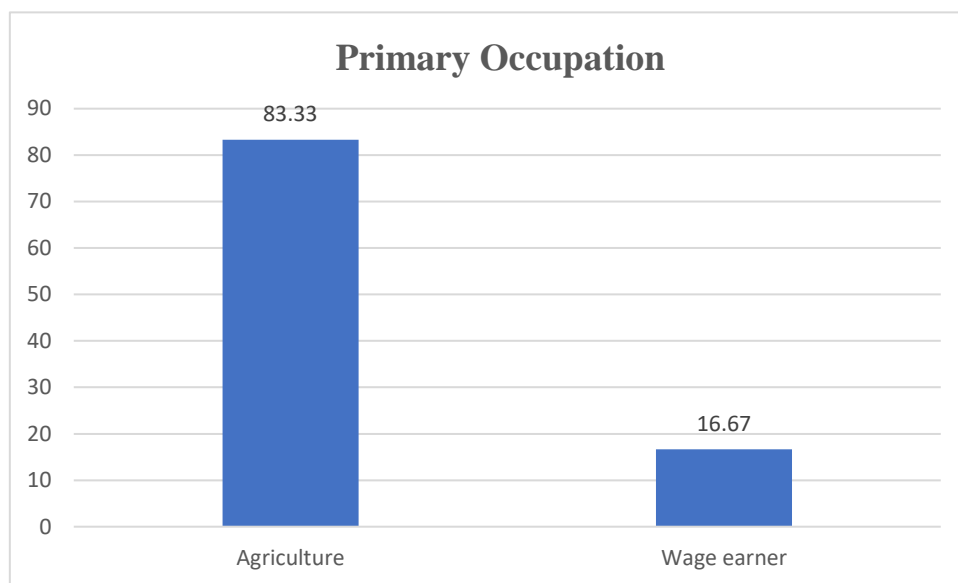
**Source: primary data**

**Figure: 4.3 Education Qualification**



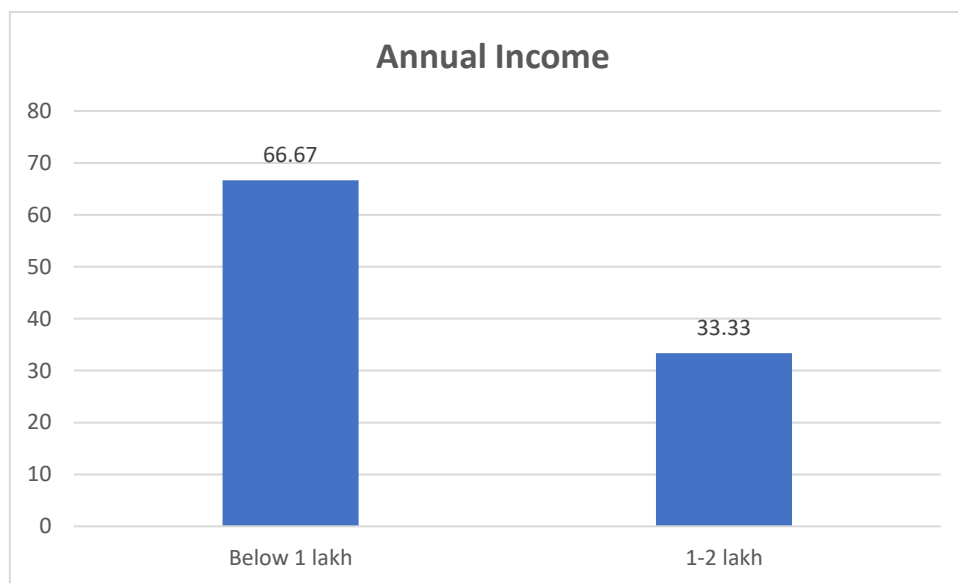
**Source: primary data**

**Figure: 4.4 Primary Occupation**



**Source: primary data**

**Figure: 4.5 Annual Income**



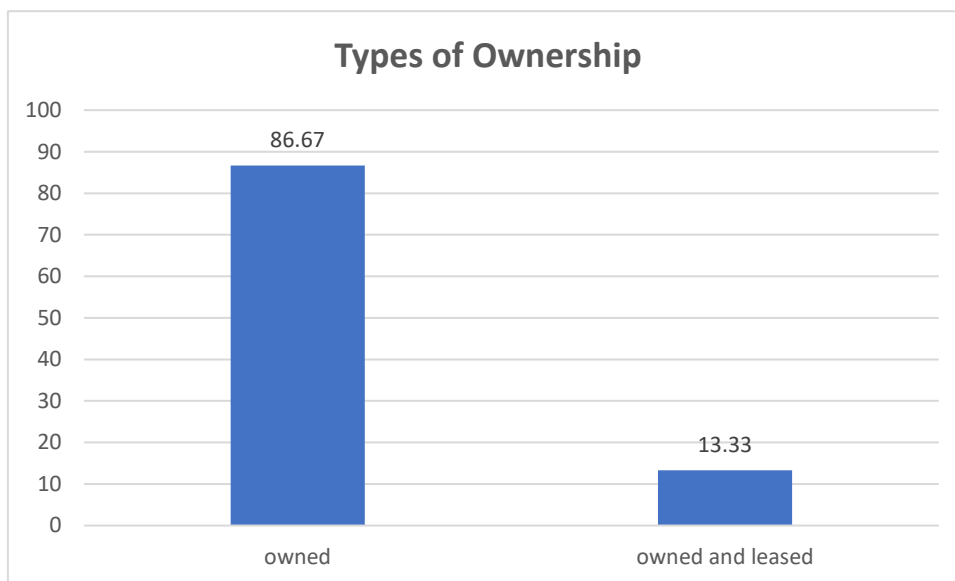
**Source: primary data**

Based on data in Figure 4.1-4.5, the majority of farmers (47%) belong to the 40-50 age group. Men dominate the agricultural workforce, accounting for 83% of respondents, while women comprise the remaining 17%. This highlights a gender gap in agricultural operations. In terms of education, 40% of the farmers have not completed secondary school (SSLC). Notably, 83% of the respondents rely on agriculture for their livelihood. Income levels reveal that 67% of the farmers earn less than one lakh annually, and 33% fall within the 1-2 lakh income bracket.

### 4.2.2 Land holdings pattern

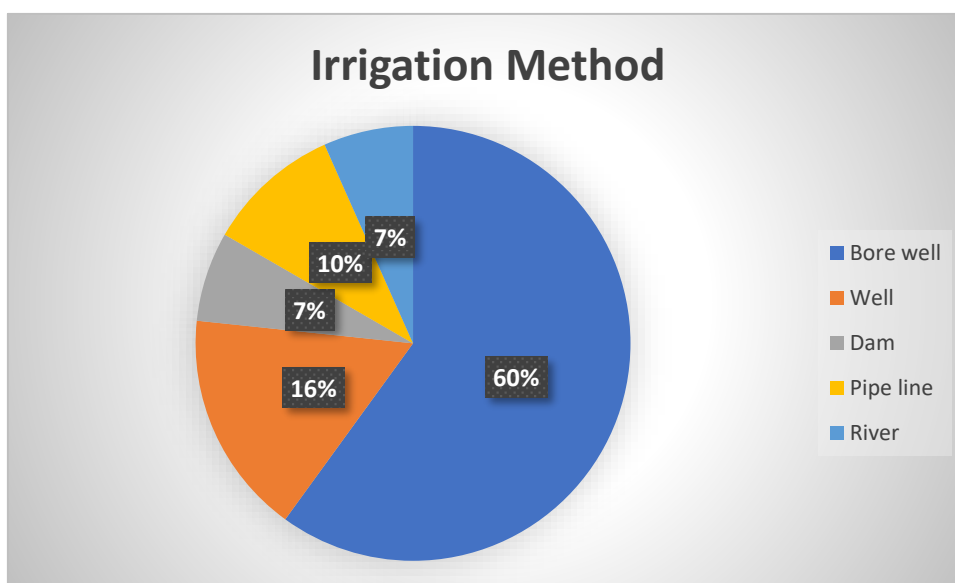
Land plays a crucial role in agricultural activities. The following table provides details on the types of land holdings, irrigation methods employed, and cultivation practices followed by turmeric farmers in Kodumudi Block. This information offers valuable insights into the land management and farming techniques prevalent in the region.

**Figure: 4.6 Types of Ownership**



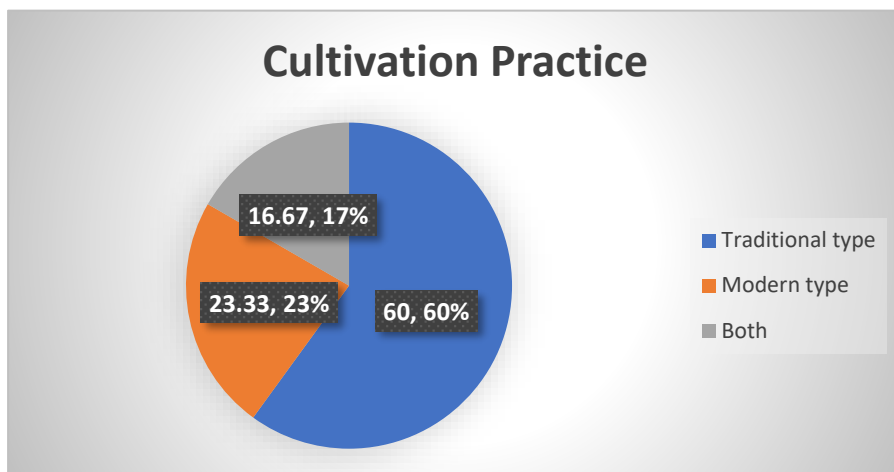
Source: primary data

**Figure: 4.7 Irrigation method**



Source: primary data

**Figure: 4.8 Cultivation Practice**



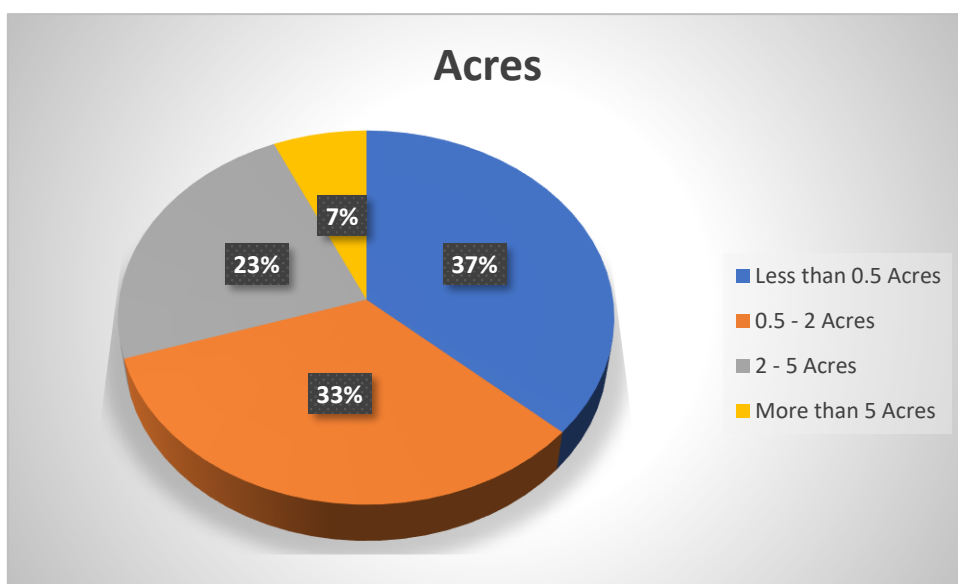
**Source: primary data**

An analysis of land holdings in Figure 4.6-4.8 reveals that most farmers (87%) own their land, while the remaining 13% cultivate leased land in addition to their own. In terms of irrigation, borewells are the primary source of water for 60% of the farmers. In terms of cultivation practice, most of farmers following Traditional cultivation of 60%.

#### 4.2.3 Inputs for cultivation of turmeric

The study area's farmers utilize turmeric rhizomes, the underground root-like stems, for planting. Notably, they cultivate local varieties and haven't adopted any specific preferred variety.

**Figure: 4.9 Acres**



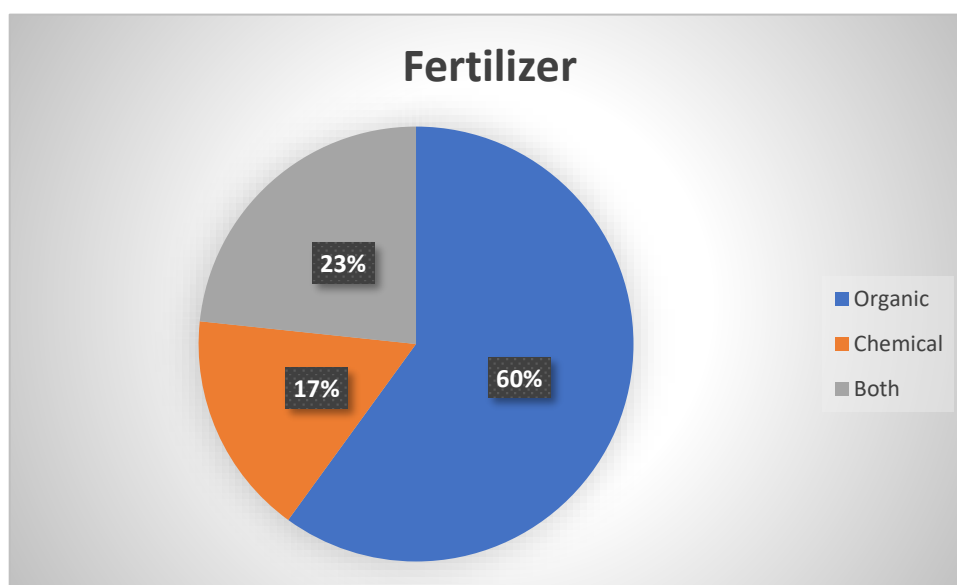
**Source: primary data**

The pie chart reveals land holdings. Most land falls between 2 and 5 acres (37%) with a significant portion exceeding 5 acres (33%). Smaller holdings (.5-2 acres and under .5 acres) make up 30% combined.

#### 4.2.4 Details regarding use of fertilizer

There are no particular fertilisers needed for the production of turmeric. All it requires is organic fertilisers, such as compost and animal dung. There are no significant insect or disease issues with the crop. Fertiliser usage is displayed in the table below. Information on applying pesticides and fertilisers is shown in Figure 4.10.

**Figure: 4.10 Use of fertilizers**



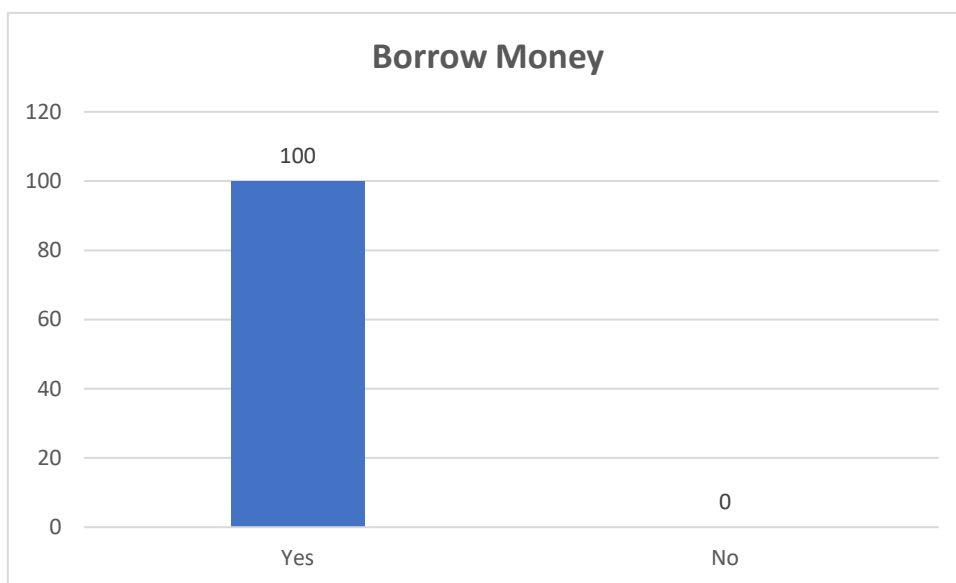
**Source: primary data**

The information on the use of fertilisers is shown in Figure 4.10. The 60% farmer was only producing the organic fertiliser.

#### 4.2.5 Borrowings by farmers

Bank are the institution mainly providing financial assistance to farmers. The farmer's loan information is displayed in the Figure below.

**Figure: 4.11 Borrowings by Farmer**



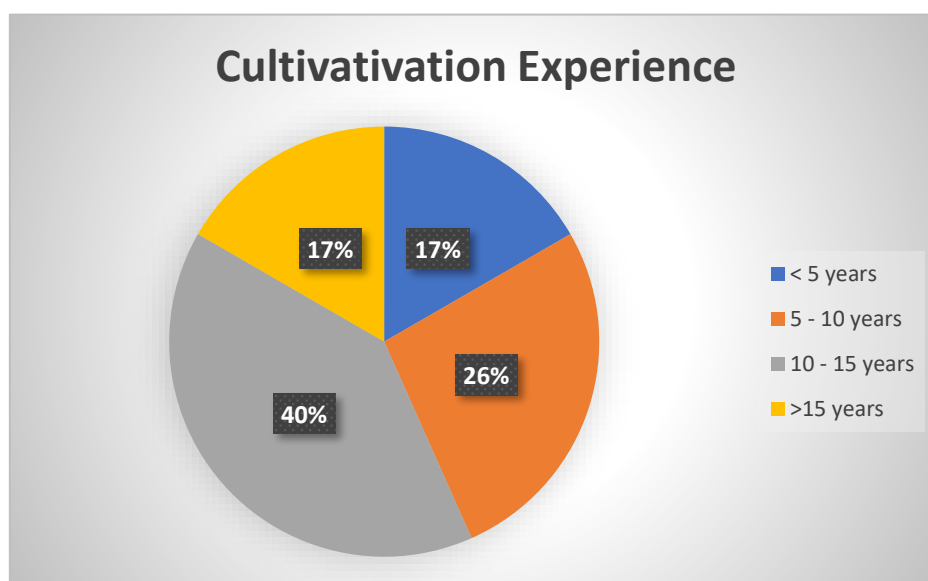
**Source: primary data**

Figure 4.11 presents the information pertaining to borrowing. In 30 farmers, all of them had borrowed money from co-operative bank and few of them money lenders. But none of them borrowed from commercial bank

#### **4.2.6 Details regarding experience of farmers**

The table below shows the period the farmers were engaged in cultivation.

**Figure: 4.12 Experience of farmers**



**Source: primary data**

According to the data, 26 percent of farmers had been growing turmeric for less than ten years, 40 percent had been doing so for ten to fifteen years, and 17 percent had been doing so for less than five years. Merely 17% of farmers have more than 15 years of experience cultivating turmeric.

#### **4.2.7 Details about harvesting of turmeric**

Turmeric grows about eight to nine months. The major harvest season lasts from the end of January until the beginning of March. When turmeric leaves start to dry out and turn yellow, they are picked.

**Table: 4.1 Details about harvesting of turmeric**

Harvesting techniques used	No. of respondents	Percentage
Manual	30	100
Total	30	100

**Source: primary data**

From the survey, it was discovered that farmers primarily employ manual harvesting techniques.

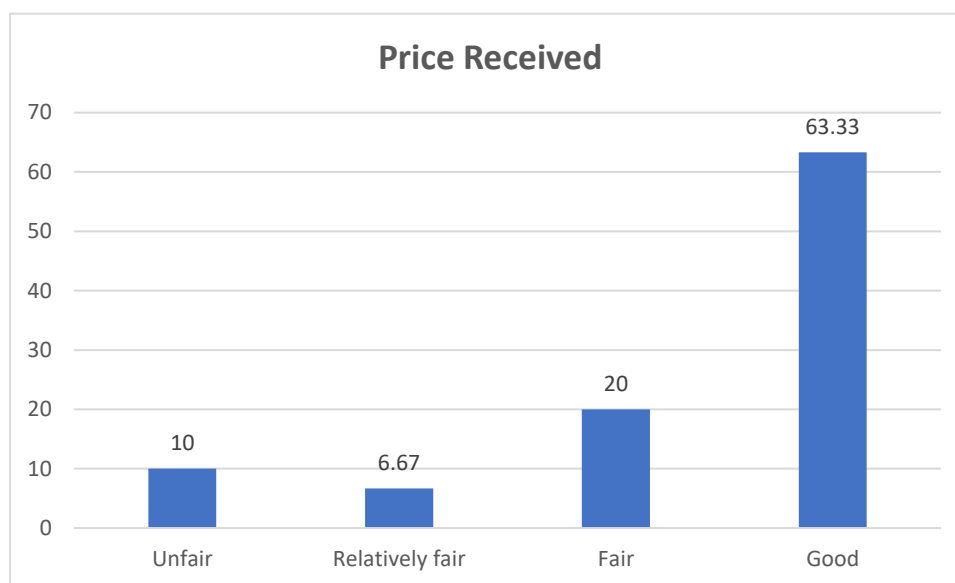
#### **4.2.8 Details regarding post harvesting**

Farmers are focusing on drying turmeric after harvesting. Farmers are selling dried turmeric to the village traders. There are no farmers selling turmeric to consumers, shops, or processors directly. The only task at the farmer level is drying turmeric. At this point, no additional value is being added.

#### **4.2.9 Marketing of turmeric**

Produce demand, pricing, and the availability of post-harvest infrastructure all play a role in how much is sold. Farmers will go ahead and sell their goods right away if there is a market for it and they are receiving a fair price; otherwise, they will have to wait for the market to improve. But this is not a common occurrence. The size of the farmer's holdings and financial situation also affect things. A survey regarding the amount that village traders charged farmers was also conducted, and the results are shown in Figure 4.13.

**Figure: 4.13 Opinion of farmer about price received**



**Source: primary data**

It is evident from the above table that most farmers thought the amount they were paid by middlemen for turmeric was fair.

#### 4.2.10 Problems faced by farmers

From farm to market, challenges abound. Production obstacles like variable yields, unpredictable pest and disease outbreaks, and difficulty finding quality inputs can significantly impact harvests. Furthermore, a lack of available labour makes cultivation even more difficult. The economic landscape presents its own set of hurdles. Fluctuations in market price and high labour costs can squeeze profits, while poor marketing infrastructure limits farmers' ability to get a fair return on their investment.

**Table: 4.2 Details regarding constraints**

Constraints	Total score	Index	Rank
<b>Production Constraints:</b>			
Non availability of labour	157	87	1
Variability in production	145	81	2
Pest and disease attack	61	34	4
Lack of plant protection measures	45	25	6
Weather problems	90	50	3
Non availability of input	60	33	5
<b>Economic Constraints:</b>			

<b>Price fluctuation of produce</b>	<b>150</b>	<b>83</b>	<b>1</b>
<b>High cost of inputs</b>	<b>65</b>	<b>36</b>	<b>5</b>
<b>High labour charges</b>	<b>127</b>	<b>71</b>	<b>3</b>
<b>Inadequate marketing facilities</b>	<b>125</b>	<b>69</b>	<b>4</b>
<b>Inadequate credit facilities</b>	<b>50</b>	<b>28</b>	<b>6</b>
<b>High transportation cost</b>	<b>133</b>	<b>74</b>	<b>2</b>

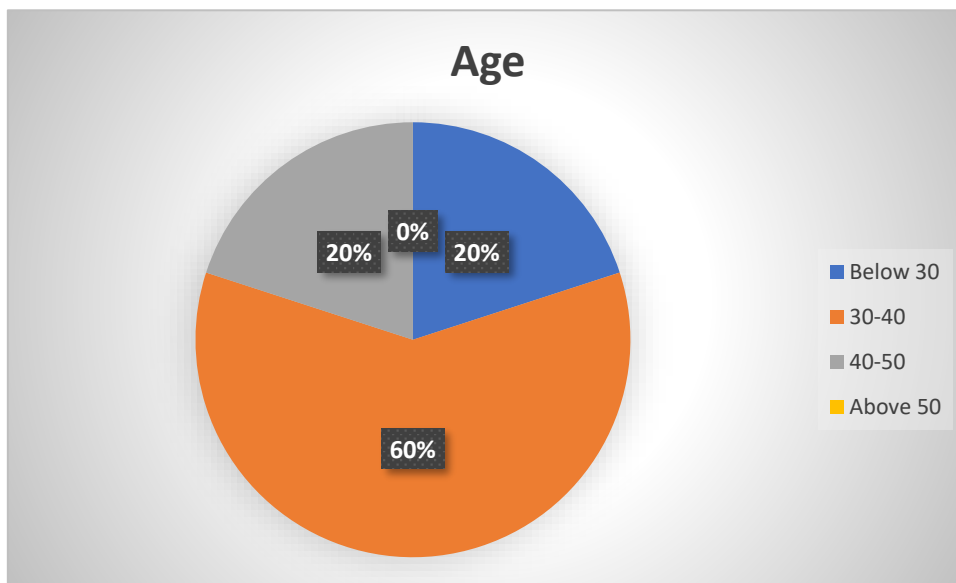
**Source: primary data**

Table: 4.2 shown, Turmeric farmers face a complex web of challenges throughout the production and marketing process. According to the data, labor shortages pose the greatest hurdle, followed by unpredictable yields and volatile market prices. Weather fluctuations and pest/disease outbreaks also threaten crops. Obtaining high-quality inputs and implementing proper plant protection measures can be difficult. Economically, farmers grapple with fluctuating prices, high transportation costs, and rising labor expenses. Limited access to credit and inadequate marketing infrastructure further restricts their ability to earn a fair return. In summary, labor scarcity, yield variability, price of farmers

### **4.3 VILLAGE TRADER**

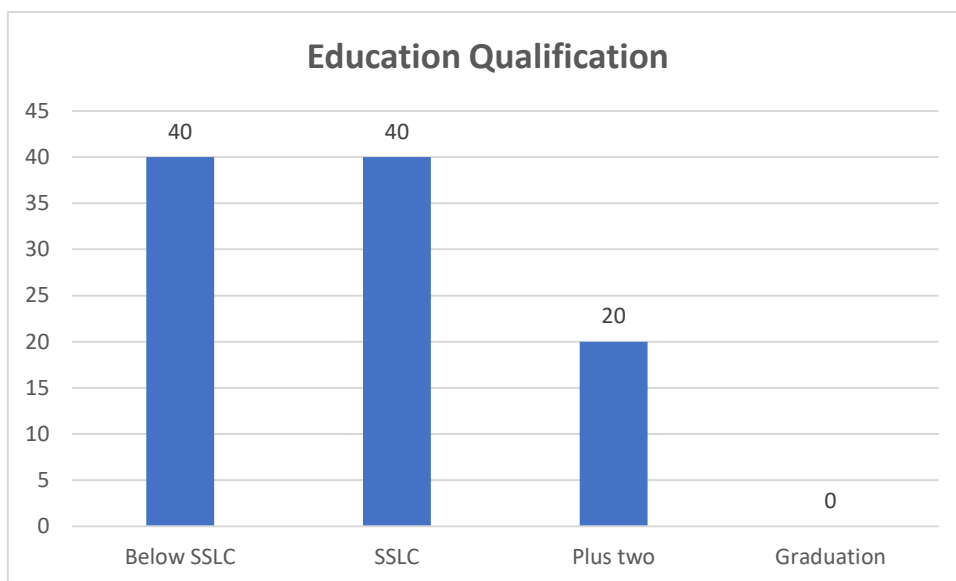
Village traders are those who purchase turmeric from the farmers' producers and resell it to distributors. Five village traders were chosen at random to be surveyed and examined. The analysis of the socio-economic qualities of the village traders in Kodumudi block is based on factors including age, education, yearly income, and trading experience.

**Figure: 4.14 Village trader's Age**



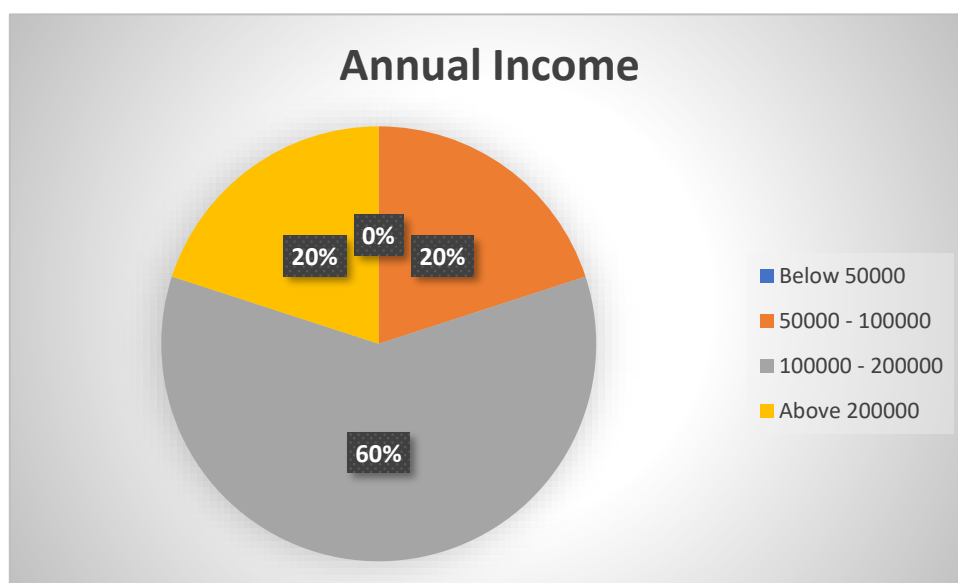
**Source: primary data**

**Figure: 4.15 Education Qualification**



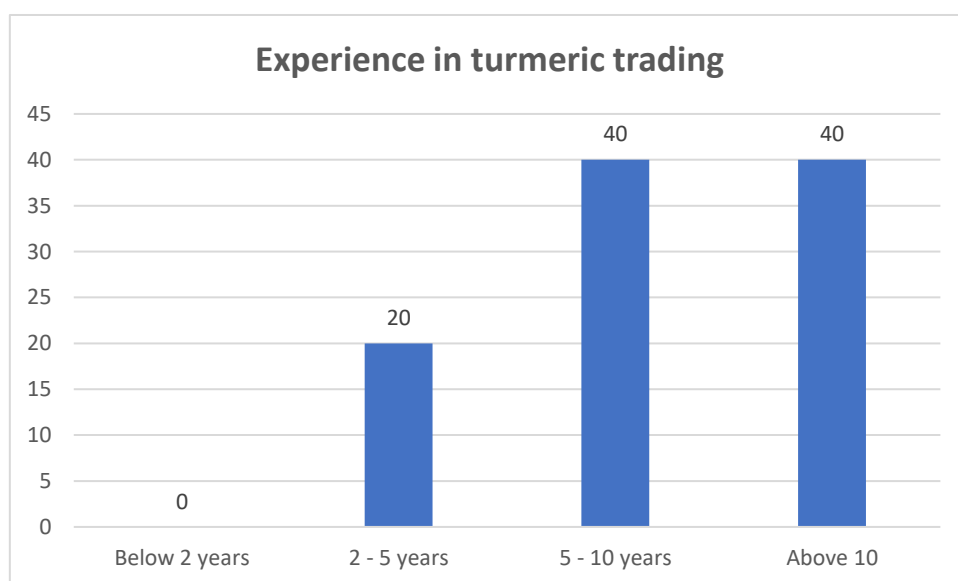
**Source: primary data**

**Figure: 4.16 Annual Income**



**Source: primary data**

**Figure: 4.17 Experience in turmeric trading**



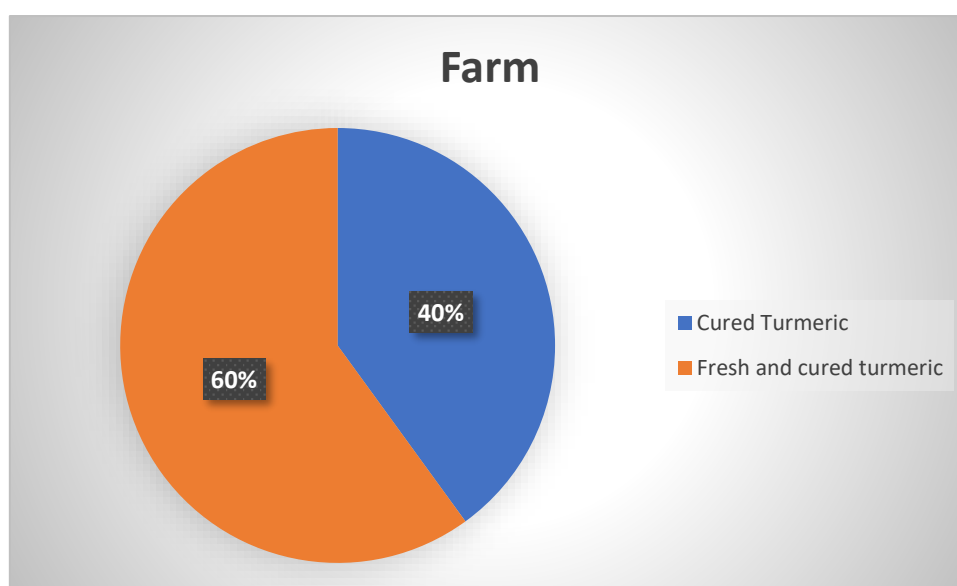
**Source: primary data**

Figure 4.14-4.17 analysis of village traders reveals interesting trends. The majority, 60%, fall within the 30–40-year age bracket, with a smaller group (20%) between 40 and 50. Notably, there's an absence of older (over 70) traders. In terms of education, 40% of village traders possess a Secondary School Leaving Certificate (SSLC). Interestingly, 60% traders reported an annual income between 1 and 2 lakh rupees. Experience levels vary, with 20% having 2-5 years under their belt, followed by 40% with 5-10 years. The remaining 40% boast over 10 years of experience in village trade.

### 4.3.1 Procurement of turmeric

Five village traders were chosen from two panchayats: Periyasemmandapalayam and Vadakkupudupalayam. Two of these traders acquire their turmeric from Periyasemmandapalayam, while the remaining Three hail from Vadakkupudupalayam. Notably, farmers deliver their produce directly to the village traders, who all conduct on-the-spot transactions with them.

**Figure: 4.18 Farm of turmeric traded by village traders**



**Source: primary data**

Figure 4.18 indicates that a majority (60%) of traders deal in both fresh and cured turmeric, while the remaining 40% focus solely on cured turmeric. Interestingly, those purchasing fresh turmeric procure it at ₹141 per kilogram. In addition to turmeric, these traders diversify their offerings by selling other spices like nutmeg, areca nut, and pepper. It's worth noting that traders who buy fresh turmeric cure it before selling it.

### 4.3.2 Marketing of turmeric

The village traders surveyed unanimously sell their turmeric to wholesalers within the Erode district. Interestingly, they rely on newspaper prices to determine their own selling price. Transportation primarily involves hiring vehicles, as none of the traders possess storage facilities. Price fluctuation remains a significant challenge for these traders. Currently, they lack any support from the government's Spices Board. Despite these hurdles, all traders maintain positive relationships with both farmers and wholesalers within the turmeric supply chain.

**Table 4.3 Problems faced by village traders**

<b>Constraints</b>	<b>Total score</b>	<b>Index</b>	<b>Rank</b>
Low profit	<b>13</b>	<b>52</b>	<b>3</b>
Price fluctuation	<b>25</b>	<b>100</b>	<b>1</b>
Inadequate supply	<b>12</b>	<b>48</b>	<b>4</b>
Lack of storage facility	<b>18</b>	<b>72</b>	<b>2</b>
Unavailability of labour	<b>6</b>	<b>24</b>	<b>5</b>

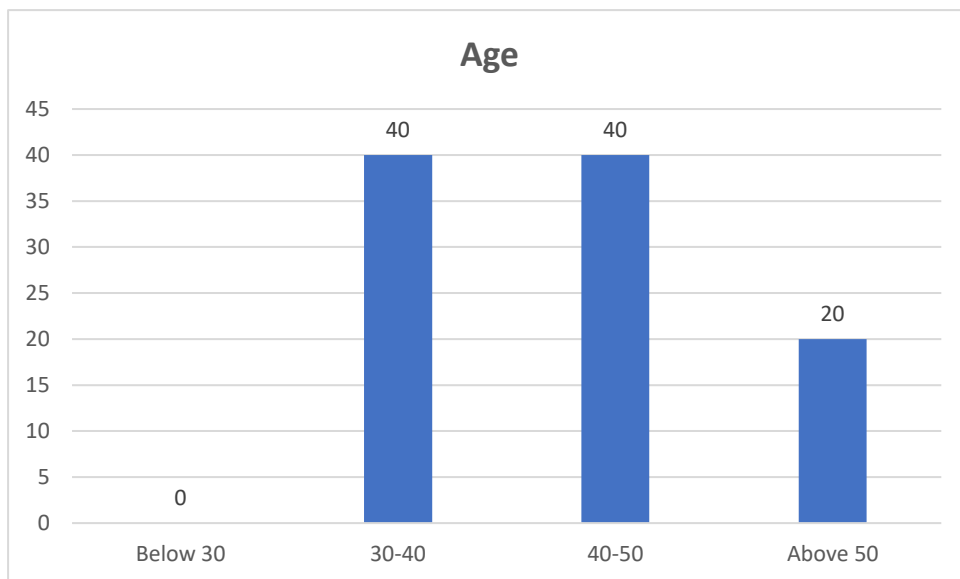
**Source: primary data**

An analysis of village trader data (Table 4.3) reveals that price fluctuations and the lack of storage facilities pose the most significant challenges. Other concerns, ranked as moderate problems, include securing sufficient profit margins and dealing with an inadequate supply of turmeric. Fortunately, labour availability appears to be less concerning for these traders.

#### **4.4 WHOLESALERS**

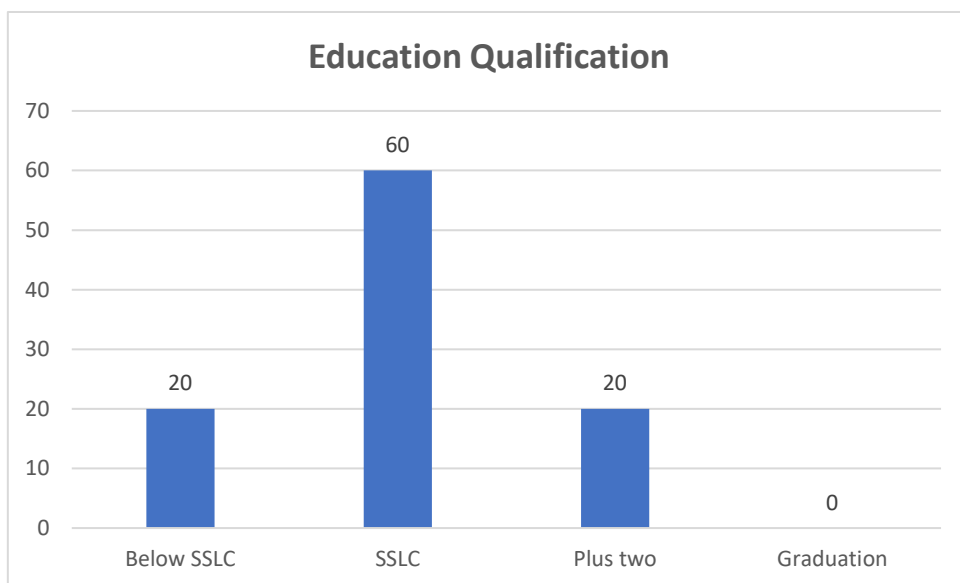
The study aimed to understand the role of wholesalers in the turmeric distribution network, even though none were identified within the immediate study area. Wholesalers typically acquire turmeric from both village traders and farmers within a district, then redistribute it through various channels. Their role can improve the efficiency of turmeric distribution by fostering competition among buyers. Ideally, wholesalers also contribute to market stability for local produce, encouraging increased production and overall productivity. To address the lack of local wholesalers, the study focused on three wholesalers from Erode town, near the municipal bus stand. The socio-economic characteristics of these respondents and their various activities are explored in the following sections.

**Figure: 4.19 Wholesaler's Age**



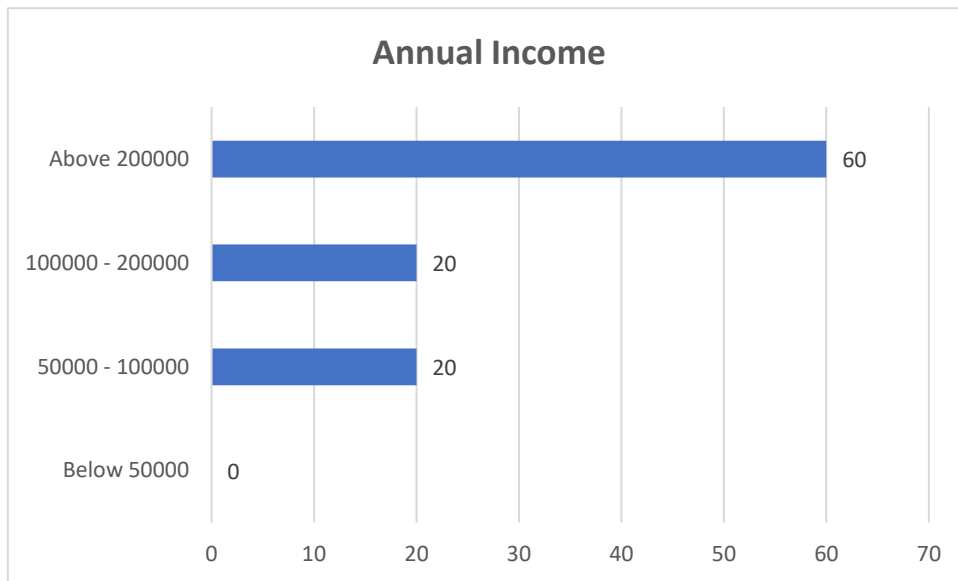
**Source: primary data**

**Figure: 4.20 Education Qualification**



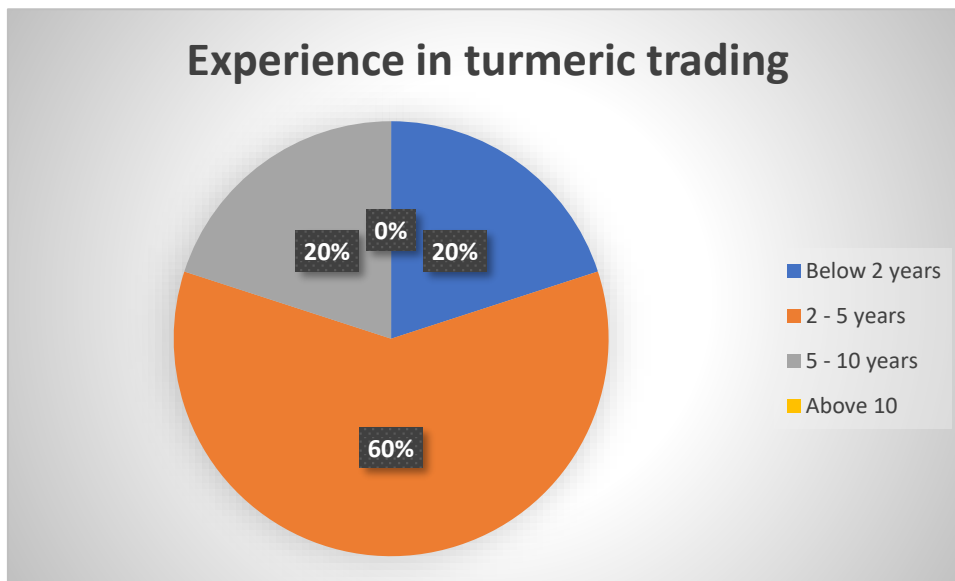
**Source: primary data**

**Figure: 4.21 Annual Income**



**Source: primary data**

**Figure: 4.22 Experience in turmeric trading**



**Source: primary data**

An examination of wholesaler data (Figure 4.19–4.22) reveals a trend towards experience. The majority (80%) fall within the 30–50-year age bracket, with the remaining 20% above 50. Notably, there's a lack of representation from younger generations (under 30) in this sector. All wholesalers reported literacy, with 60% holding a Secondary School Leaving Certificate (SSLC) and 20% having completed higher secondary education (plus two). Financially, all reported annual incomes exceeding ₹2 lakh. Interestingly, all shops boast extensive experience, having been operational for 2-5 years.

#### 4.4.1 Procurement of turmeric

Erode district wholesalers acquire turmeric from a variety of sources, including both farmers and village traders across the district. Notably, producers bring their turmeric directly to the wholesalers, where all transactions are settled on the spot. These wholesalers diversify their offerings beyond cured turmeric, also trading in other spices like pepper, chilies, tamarind, nutmeg, cashew, and areca nut.

#### 4.4.2 Marketing of turmeric

Wholesalers play a crucial role in connecting Erode turmeric with export agencies. These agencies then distribute the turmeric to North Indian states, ultimately reaching retailers or processing units. Interestingly, wholesalers determine their pricing based on a combination of newspaper and online sources. While all possess storage facilities with an average capacity of 200 sacks of cured turmeric, the high demand often leads to immediate sales, minimizing storage needs. Despite this brisk trade, wholesalers sometimes face challenges due to fluctuating market prices and occasional supply shortages. Notably, they lack any support from the government or Spices Board. Nevertheless, all wholesalers maintain positive relationships with farmers and village traders throughout the turmeric supply chain, expressing overall satisfaction with the turmeric trade.

**Table 4.4 Problems faced by wholesaler**

<b>Constraints</b>	<b>Total score</b>	<b>Index</b>	<b>Rank</b>
Price fluctuation	<b>12</b>	<b>100</b>	<b>1</b>
Inadequate supply	<b>6</b>	<b>50</b>	<b>3</b>
Export agencies take away a large part of profit	<b>8</b>	<b>67</b>	<b>2</b>
Unavailability of labour	<b>4</b>	<b>33</b>	<b>4</b>

**Source: primary data**

An analysis of wholesaler data (Table 4.4) reveals that price fluctuations pose the most significant challenge for these businesses. Additionally, wholesalers expressed concern about the large share of profits captured by export agencies. While an inadequate supply of turmeric can be problematic at times, it's considered a less pressing issue compared to price volatility and profit margins. Labor availability appears to be a minimal concern for wholesalers.

## **4.5 Analysis of Variance (ANOVA)**

ANOVA, or Analysis of Variance, is a statistical technique used to assess differences between groups. It compares the variation within groups, how spread out the data is in each, to the variation between groups, how separate the groups themselves are. This comparison helps determine if there's a statistically significant difference in the means of the groups. Before running ANOVA, researchers establish two key hypotheses: the null hypothesis ( $H_0$ ) stating there's no difference in means between groups, and the alternative hypothesis ( $H_2$ ) stating there is at least one group with a different mean. A small p-value from the analysis suggests we should reject the null hypothesis and conclude the groups likely have different average values.

### **4.5.1 ONE -WAY ANOVA**

**Table 4.5: Age**

SL.NO	Farmer	Village Trader	Wholesaler
1	29	28	33
2	29	35	34
3	33	36	40
4	40	38	40
5	51	43	52

**Source: primary data**

**Figure: 4.23 Age Analysis (ANOVA)**

Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Farmer	5	182	36.4	86.8
Village Trader	5	180	36	29.5
Wholesaler	5	199	39.8	57.2

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	43.6	2	21.8	0.376945	0.693795	3.885294
Within Groups	694	12	57.83333			
Total	737.6	14				

Source: primary data

**ANOVA Interpretation for Table-4.5: Age of Farmers, Village Traders, and Wholesalers**

This ANOVA analysis examines the age differences between three groups: farmers, village traders, and wholesalers. Here's a breakdown of the key findings:

- **Sample Sizes:** There are 5 individuals in each group (Farmer, Village Trader, Wholesaler).
- **Mean Age:** The average age across all groups is 36.7 years old (not shown in the table but can be calculated from Sum / Total Count).
- **Variation within Groups:** There's a significant variation in age within each group, with a variance ranging from 29.5 to 86.8 years.
- **Variation between Groups:** The variation between the group means (43.6) is relatively small compared to the variation within groups (694).
- **Hypothesis Testing:** The F-statistic (0.3769) and p-value (0.6938) are not statistically significant. This means **we fail to reject the null hypothesis (H<sub>0</sub>)** which states there's no difference in average age between the groups.

**Table 4.6: Experience**

SL.NO	Farmer	Village Trader	Wholesaler
1	7	4	1
2	9	9	4
3	12	9	4
4	14	10	5
5	20	11	7

**Source: primary data**

**Figure: 4.24 Experience Analysis (ANOVA)**

Anova: Single Factor

**SUMMARY**

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Farmer's Cultivation	5	62	12.4	25.3
Village Trader	5	43	8.6	7.3
Wholesaler	5	21	4.2	4.7

**ANOVA**

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	168.4	2	84.2	6.772118	0.010748	3.885294
Within Groups	149.2	12	12.43333			
Total	317.6	14				

**Source: primary data**

**ANOVA Interpretation for Table 4.6 Experience**

This ANOVA analysis examines the experience between three groups: farmers, village traders, and wholesalers. Here's a breakdown of the key findings:

- **Sample Sizes:** There are 5 individuals in each group (Farmer, Village Trader, Wholesaler).
- **Average Cultivation Experience:** The average experience across all groups is 12.4 years.
- **Variation within Groups:** There's a moderate variation in cultivation experience within each group, with a variance ranging from 4.7 to 25.3 years.

- **Variation between Groups:** The variation between the group means (168.4) is statistically significant compared to the variation within groups (149.2) based on the F-statistic (6.77) and p-value (0.01).
- **Hypothesis Testing:** The p-value (0.01) is statistically significant at the 0.05 alpha level. This means **we reject the null hypothesis ( $H_0$ )** which states there's no difference in average cultivation experience between the groups. We can conclude that there's a statistically significant difference between the groups' experience.

**CHAPTER 5**

**SUMMARY OF FINDINGS, SUGGESTIONS AND  
CONCLUSION**

## CHAPTER 5

### SUMMARY OF FINDINGS, SUGGESTIONS AND CONCLUSIONS

#### 5.1 SUMMARY

This chapter summarizes the key findings and conclusions from a study titled "A study on the supply chain of turmeric." The research aimed to objectively analyse the challenges faced by farmers, village traders, and wholesalers within the turmeric supply chain. To achieve this objective, a survey was conducted among 30 farmers, 5 village traders, and 5 wholesalers. Farmers were specifically chosen from the panchayats of Vadakkupudupalayam and Periyasemmandapalayam, known for their high concentration of turmeric cultivation. The list of participating farmers was obtained from the respective Kodumudi (administrative body) of these panchayats. The following sections will present the major findings, conclusions, and recommendations derived from the study.

#### 5.2 FINDINGS

- India is the world leader in turmeric production, consuming and exporting most of the global supply.
- Other producers include China, Myanmar, Bangladesh, Nigeria, Jamaica, Haiti, and Brazil.
- Growing demand for turmeric is driven by its use as a flavouring and potential health booster.
- Tamil Nadu is a major producer of turmeric in India, contributing around 17% of the country's total.
- Erode, Coimbatore, Salem, and Dharmapuri are known for their fertile lands suitable for turmeric cultivation.
- Favourable weather conditions and increased acreage have led to a rise in turmeric production in Tamil Nadu.
- Kerala is another major producer with a unique practice of cultivating turmeric on raised beds.
- Harvesting typically occurs between January and March after 7-9 months of growth.
- Manual or modern harvesting techniques are used, followed by cleaning and curing the turmeric rhizomes.
- Planting takes place in June on raised beds or ridges.
- Harvesting occurs from late January to March.
- Peak arrivals in the market happen between March and April.

- Unpredictable weather patterns, perishable nature of products, and complex regulations disrupt the global food supply chain.
- Developed countries need to increase production and improve efficiency to meet rising food demands.
- Innovation, collaboration, and focus on sustainability are crucial for a resilient food system.
- After harvesting, turmeric undergoes boiling, curing, drying, polishing, and packing.
- Farmers sell polished turmeric to village traders at the local market.
- Village traders purchase polished turmeric from farmers.
- Destoning, manual cleaning, sorting, grinding, screening, storing, and packing are done at this stage.
- Turmeric is then sold to wholesalers.
- Most farmers in the study belonged to the 40-50 age group and were men.
- A significant portion had not completed secondary school and relied on agriculture for their livelihood.
- Most farmers owned their land, with borewells as the primary water source.
- Traditional cultivation practices and local turmeric varieties were prevalent.
- Organic fertilizers were the primary input, and no significant pest or disease issues were reported.
- Cooperative banks were the main source of financial assistance for farmers.
- Most farmers had experience between 5-15 years, and manual harvesting techniques were used.
- Farmers focused on drying turmeric and sold it directly to village traders.
- Farmers sold their produce based on market demand, price, and their financial situation.
- Most farmers believed they received a fair price from village traders.
- Common challenges faced by farmers included production variability, weather issues, labor shortage, price fluctuations, and inadequate marketing facilities.
- Most village traders were aged 30-40 and had a Secondary School Leaving Certificate.
- Their annual income ranged from ₹1-2 lakh.
- Experience levels varied, with some having over 10 years in the trade.
- Traders procured turmeric directly from farmers, with most dealing in both fresh and cured turmeric.
- They sold their turmeric to wholesalers within the district and relied on newspaper prices to determine their selling price.
- Lack of storage facilities and price fluctuations were the biggest challenges for village traders.

- Wholesalers were experienced, mostly in the 30-50 age bracket, and all were literate.
- They sourced turmeric from both farmers and village traders within the district.
- Wholesalers offered a variety of spices beyond turmeric.
- They connected Erode turmeric with export agencies, ultimately reaching retailers or processing units.
- Wholesalers determined their pricing based on online and newspaper sources.
- Storage facilities were available, but high demand often led to immediate sales.
- Price fluctuations, competition from export agencies, and occasional supply shortages were challenges faced by wholesalers.
- Wholesalers maintained positive relationships with farmers and village traders throughout the turmeric supply chain.

### 5.3 SUGGESTION

- **Global Turmeric Production:** India reigns supreme, cultivating 80% of the world's turmeric. Other Asian and African countries contribute as well. Global demand is projected to reach billions by 2029 due to its use as a flavouring and potential health booster.
- **Indian Turmeric Production:** Tamil Nadu stands out as a key contributor, cultivating around 17% of India's turmeric. Erode, Coimbatore, Salem, and Dharmapuri are known for their fertile lands and well-developed irrigation systems. Acreage under cultivation has seen a healthy increase in recent years.
- **Crop Calendar:** Planting kicks off in June, with harvesting from late January to March, and peak arrivals hitting the market between March and April.
- **The Turmeric Supply Chain:** Farmers harvest, boil, cure, dry, and polish the turmeric before selling it to village traders.
- **Village Traders to Wholesalers:** Traders purchase polished turmeric, remove stones and tiny pieces, sort it by size, grind it (if needed), and store or pack it for wholesalers.
- **Wholesalers:** They acquire turmeric from various sources, including village traders and farmers. They connect Erode turmeric with export agencies, who distribute it further. Wholesalers face challenges like price fluctuations and limited control over profits captured by export agencies.
- **Government:** The government should encourage organic farming to reduce the cost of cultivation. It seeks to avoid the use of chemical nutrients and pesticides. To reduce the worries of turmeric farmers, the government has to ensure a minimum support price for their harvest.

The government should ensure that high value like turmeric crop is insured. In case of any natural calamities happen, it should benefit the farmers

## **5.4 CONCLUSION**

In conclusion, A study on the supply chain of turmeric in the Kodumudi Block turmeric supply chain, reliant on the collaboration between farmers, village traders, and wholesalers, faces challenges like seed access, labour costs, and unpredictable weather. These hurdles restrict farm output and income. However, the exciting prospect lies in value-added products like processed turmeric powder, health supplements, and spice blends. Investing in processing facilities and promoting these products can create a more robust and profitable ecosystem for everyone involved. This will empower farmers with better yields and incomes, while village traders and wholesalers can benefit from increased product diversification and market reach. Overall, a focus on value addition strengthens Kodumudi Block's position in the turmeric industry.

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# QUESTIONNAIRE

# QUESTIONNAIRE

## A STUDY ON THE SUPPLY CHAIN OF TURMERIC

### INTERVIEW SCHEDULE FOR SURVEY OF FARMER

1. Name of the Respondent:
2. Gender
  - Male
  - Female
3. How old are you?
  - Below 35 years
  - Between 35-45 years
  - Between 45-55 years
  - Above 55 years
4. What is your highest level of education completed?
  - Illiterate
  - Below SSLC
  - SSLC
  - Pre-degree
  - Graduation
5. What is your primary occupation?
  - Agriculture
  - Government employee
  - Business
  - Wage earner
  - Private Job
  - Others
6. What is your annual income?
  - Below 1 lakh
  - Between 1-2 lakh
  - Between 3-5 lakh
  - Above 5 lakhs

7. What type of land holding do you have?
  - Owned
  - Lease
  - Both
8. What type of irrigation method do you adopt?
  - Well
  - Bore well
  - Dam
  - Pipe line
  - River
9. What type of cultivation practice do you prefer?
  - Traditional type
  - Modern type
  - Both
10. What is the total area of land currently under turmeric cultivation in your holding?
  - Less than 0.5 Acres
  - 0.5 – 2 Acres
  - 2-5 Acres
  - More than 5 Acres
11. Do you use fertilizers for cultivation?
  - Yes
  - No
12. If yes, what type of fertilizers are you using?
  - Organic Fertilizers
  - Chemical Fertilizers
  - Both
13. Do you borrow money for carrying cultivation practices?
  - Yes
  - No
14. If yes, sources of it
  - Co-operative banks
  - Local moneylenders
  - Commercial bank
  - Others

15. How many years of experience do you have in this field?

- Below 5 years
- 5 – 10 years
- 10 – 15 years
- Above 15 years

16. To whom you directly sell turmeric?

- Consumers
- Village traders
- Wholesaler
- Retailer
- Processors
- Others

17. Rate the following Production & Economic constraints on a scale of 1 (very high risk), 2 (high risk), 3 (moderate risk), 4 (somewhat risk), 5 (low risk) and 6 (very low risk)

Constraints	Rank
Production Constraints:	
Non availability of labour	
Variability in production	
Pest and disease attack	
Lack of plant protection measures	
Weather problems	
Non availability of input	
Economic Constraints:	
Price fluctuation of produce	
High cost of inputs	
High labour charges	
Inadequate marketing facilities	
Inadequate credit facilities	
High transportation cost	

## VILLAGE TRADER & WHOLESALER

1. Name of the Respondent:
2. Gender
  - Male
  - Female
3. How old are you?
  - Below 30 years
  - Between 30-40 years
  - Between 40-50 years
  - Above 50 years
4. What is your highest level of education completed?
  - Below SSLC
  - SSLC
  - Pre-degree
  - Graduation
5. What is your annual income?
  - Below 50000
  - Between 50000 - 100000
  - Between 100000 - 200000
  - Above 200000
6. How many years of experience do you have as a village trader/wholesaler?
  - Below 2 years
  - 2 – 5 years
  - 5 – 10 years
  - Above 10 years
7. From where you procured the turmeric?
  - Farmers
  - Another village trader
  - Retailer
  - Others
8. Where did you sell the procured product?
  - Wholesaler
  - Retailer

- Processing unit
- Consumers
- Others

9. Rate the following village trader constraints on a scale of 1 (very high risk), 2 (high risk), 3 (moderate risk), 4 (low risk) and 5 (very low risk)

Constraints	Rank
Low profit	
Price fluctuation	
Inadequate supply	
Lack of storage facility	
Unavailability of labour	

10. Rate the following village trader constraints on a scale of 1 (very high risk), 2 (high risk), 3 (moderate risk) and 4 (low risk)

Constraints	Rank
Price fluctuation	
Inadequate supply	
Export agencies take away a large part of profit	
Unavailability of labour	