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Identifying, Mapping, and Analyzing Stakeholders of Tomato Value Chain

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The research aims to optimize the efficiency of tomato value chain by mapping and analyzing various stakeholders. The study was taken as a part of the Research work of MBA (Agribusiness) carried out at Madanapalli taluka of Chittoor district in Andhra Pradesh. The complete research design work is based on primary and secondary data collected through a structured questionnaire and from the Madanapalli Agriculture Produce Marketing Committee, annual reports of the National Horticultural Board, and articles from the World Processing Tomato Council. A multistage sampling technique was used for selection and Descriptive statistics, value chain analysis was carried out to

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identify the key activities within the industry. A value chain map illustrates the journey of tomatoes from production to the consumer, highlighting the various stages and processors involved along the way. The connections are displayed in a vertical manner from the left to the right side. At the top, the main functions of the chain are listed. These functions encompass input supply, production, trading, marketing/processing, and consumption. The vertical progression from the left to the right side illustrates the individuals engaged in performing the various functions. Displayed on the left side, the enablers help and support the actors in performing their roles. These enablers primarily include formal and informal institutions, as well as private organizations. The study concludes that lack of access to credit, Huge loss of raw produce in a glut situation, Inadequate infrastructure, seasonal fluctuations in business, and intense competition within a limited timeframe pose significant challenges in the tomato value chain. The lack of incentives for quality differentiation further exacerbates these issues. The chain's lack of transparency allows middlemen to wield control, leaving farmers with little ability to market their produce effectively.

Keywords: Value chain; constraints; middlemen; stakeholders; mapping.

1. INTRODUCTION

India has achieved self-sufficiency and significant stability in food production, leading to a growing need to ensure the health security of the population by providing nutrition through a well-balanced diet. Vegetables play a crucial role in a balanced diet. India stands as the world's second-largest producer of vegetables, following closely behind China [1,2]. Despite this, the per capita consumption of vegetables remains relatively low [3-5]. In the efforts to combat malnutrition in India, there are ongoing initiatives to enhance the carbohydrate content in cereals. Vegetables can serve as an effective supplement to achieve this goal. Due to the short duration of most vegetable crops, they can be grown successively on the same plot, allowing for year-round employment of family labor for vegetable growers. According to universal dietary standards, the daily minimum requirement of vegetables is 284 grams per person, accounting for approximately 20 percent of an adult's daily food intake in India [6]. his requirement is higher for individuals following a vegetarian diet. Tomatoes are among the most popular vegetables in tropical and subtropical regions, cultivated worldwide. China, India, and the United States collectively contribute to about 70 percent of global tomato production [7]. India ranks second both in tomato cultivation area and production [8]. Tomatoes are considered essential commodities in the Indian market, with various products such as ketchup, juice, puree, paste, sauce, and pickles readily available [9]. These products are commonly used in households, hotels, restaurants, and institutions. Recent advancements in tomato processing industries and the rise of organized food retail stores have helped in balancing the supply and demand for tomatoes in urban areas, thereby safeguarding the interests of farmers during times of overproduction. As a result, a study has been initiated to map and analyze the different stakeholders involved in the tomato value chain.

The notion of the value chain, commonly known as value chain analysis, was first introduced in the field of business management by Michael Porter in his seminal 1985 book, 'Competitive Advantage: Creating and Sustaining Superior Performance'. The process of enhancing the value of a product as it progresses through a series of activities is commonly referred to as Porter's value chain [10].

2. METHODOLOGY

In order to achieve the research goals, it is crucial to have a robust research methodology along with suitable analytical tools to derive significant conclusions from the study and to generalize the findings. The present study was confined to Madanapalli taluka of Chittoor district and it was carried out during the year 2019 as a part of masters research. Chittor is the largest tomato-growing district of Andhra Pradesh and Madanapalli is the largest tomato market in Asia [11]. Hence, Madanapalli of Chittor district was selected for study. The tomatoes from here are supplied to most of the southern states and some of the northern states of India [12].

A multistage sampling technique was used for the sample selection. In the first stage, Madanapalli Mandal was selected purposively as it is one of the largest tomato markets in Andhra Pradesh. In the second stage, five villages were selected and in the third stage, 5 per cent of farmers from each village were selected, depending upon the availability input suppliers,

nursery growers, traders, retailers, and other persons who were involved in the tomato value chain were selected randomly. Thus, the overall sample size reached 187, with data gathered from both primary and secondary sources.

The primary data was obtained from the farmers, commission agents, nursery growers, input suppliers, traders, wholesalers, retailers, and processors with the help of well-prepared questionnaires for evaluating the objectives of the study. Secondary data was obtained from government reports and online sources. Information was gathered from the Madanapalli Agriculture Produce Marketing Committee, annual reports of the National Horticultural Board, and articles of the World Processing Tomato Council.

2.1 Method of Data Analysis

Qualitative techniques such as descriptive statistics and value chain analysis were used
Value Chain Analysis:

Value chain analysis proved to be a valuable tool in identifying the key activities within the organization or industry that make up the value chain [1]. The identification of stakeholders to be considered for the study was based on secondary data collected from various, Journals and published articles.

The implementation of the study involved several stages.

Stage 1- Identification and mapping of the commodity value chain

The focus was on identifying and mapping the value chain for tomatoes, from the producer to the consumer. This included the involvement of traders and commission agents. The mapping methodology used primary data, supplemented by field interviews with various enterprises in the value chain. The value chain map was presented in a conventional format, with the key stages of the value chain identified at the top and the associated players listed from left to right. The mapping process was conducted in two phases, starting with an initial basic map based on initial data collection, and then an adjusted map after additional interviews. and follow-on interviews.

Stage 2 - Analysis of key constraints

This included identifying the bottlenecks and constraints that hindered the achievement of competitive advantage. Secondary information was reviewed, and semi-structured interviews were conducted with players at each stage of the value chain. The input of stakeholders was also sought to identify the major constraints related to competitive advantage, commercialization, diversification, and increased value addition [13,6,14].

Stage 3 - Options for Improving Performance

Otions for improving performance were assessed. This stage involved a detailed analysis of the constraints identified in Stage 2. Based on this analysis, intervention strategies were developed to enhance the performance of the value chains. The criteria for exploring potential opportunities to strengthen the tomato value chain included awareness about the distribution channel, understanding the challenges faced by farmers in achieving competitive advantage, and the potential for commercialization, diversification, and increased value addition [13,6,14,1].

Table 1. Construction of a sample group of respondents for the purpose of value chain mapping

S. No.	Selected Respondents	Sampling Frame	Sample size
1	Farmers (5%) of sampling frame		
a.	Kothavaripalle	452	22
b.	Ankisettipalle	430	21
c.	Kotavaripalle	582	30
d.	Ctm Cross Road	84	5
e.	Ponnetipalem	443	22
2	Commission agents	-	10
3	Traders	-	15
4	Retailers	-	20
5	Processors	-	2
6	Buyers	-	20
7	Nursery growers	-	10
8	No. of input suppliers	-	10
Total			187

3. RESULTS AND DISCUSSION

The collected data were critically analyzed using qualitative techniques such as descriptive statistics and the observations are presented [1].

3.1 The Map of Value Chains

The value chain map illustrates the journey of tomatoes from production to consumption, showcasing various stages and processors. The connections are displayed vertically from left to right, with the top section outlining key functions of the chain. These functions encompass input supply, production, trading, marketing/ processing, and consumption. The vertical progression from left to right highlights the different actors responsible for executing these functions. Positioned on the left side, enablers assist and facilitate the actors in their roles, primarily consisting of formal and informal institutions, along with private entities [15].

In Figs. 1 and 2, it is evident that certain actors fulfill multiple functions, while others are limited to a single function. For instance, the local traders engage in both the collection of products from farmers and the distribution to wholesalers or processors [1].

3.1.1 Tomato value chain: Functions and actors

Public and Private Extension Services include Organizations like KVK and APMAS offer extension services to farmers.

Credit Institutions like Banks and APMAS provide credit and information on tomato production schemes.

Input Suppliers such as Seed, fertilizer, and plant protection companies, government distributors, small wholesalers, and small retail shops at the village level supply inputs to farmers.

Farmers engage in three types of production systems: subsistence production, small-scale commercial production, and large-scale commercial production. Subsistence production is primarily for household consumption and is produced in limited quantities. The produce from these farmers is usually not sold in the market or is sold in very small quantities, particularly in the local bazaar or market. On the other hand, small and large-scale commercial farmers sell most of their produce to market intermediaries. These farmers typically interact with traders and wholesalers through commission agents, who act as intermediaries in the value chain. Thanks to the availability of communication technology, farmers generally have some access to market information [16,17].

Commission Agents are licensed market functionaries in APMC, play a crucial role in the market. They act on behalf of farmers, selling their products to traders and making payments to the farmers. They receive a commission based on the transaction amount.

Traders directly participate in the buying and selling of tomatoes from various remote district towns or markets. They then sell these tomatoes to wholesalers, making a profit in the process. Often, these traders act as facilitators for large wholesalers or exporters.

Wholesalers handle a significant volume of products through traders. They invest substantial amounts of money in their business and often have an influence on market prices.

Processing Firms such as Galla Foods located in Puthalapalle village, specialize in producing raw sauce, puree, ketchup, and juices from tomatoes, mangoes, and grapes. With a tomato processing capacity of 200 metric tons per day, Galla Foods primarily sources its tomatoes from Madanapalli taluka due to abundant production. The processed products are then sold to secondary processors like Hindustan Unilever Pvt. Ltd., Indira Food Products, and others, before reaching retailers.

Retail Shops purchase fresh tomatoes from wholesalers and processed products from processors through their distributors. They sell these products directly to consumers.

3.2 Prospects for Enhancing the Tomato Value Chain

Value chain analysis involves the crucial task of identifying both constraints and opportunities. Through the utilization of structured interview guides, value chain participants were able to pinpoint the constraints and opportunities within the value chain. The initial interview guide employed in this process was specifically crafted to uncover the challenges and prospects encountered by the various players involved. Throughout the tomato value chain analysis, a diverse range of constraints were identified at various stages. Below, you will find a

comprehensive list of these constraints and opportunities categorized by the actors involved and rank was based on the count of respondents [1].

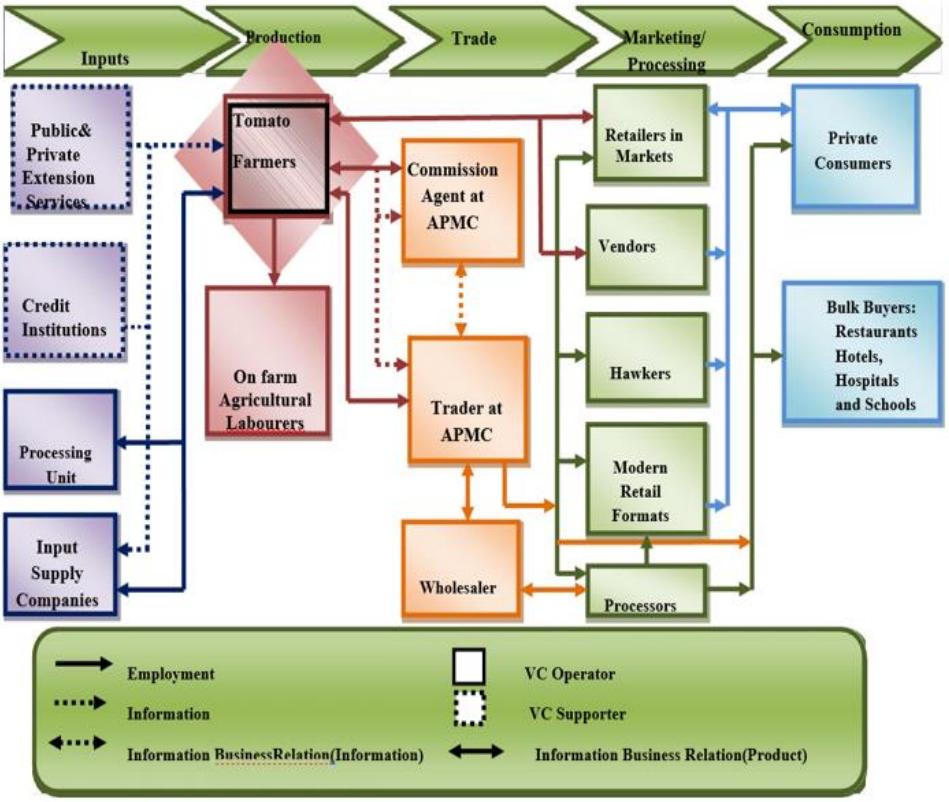

Fig. 1. Tomato value chain map

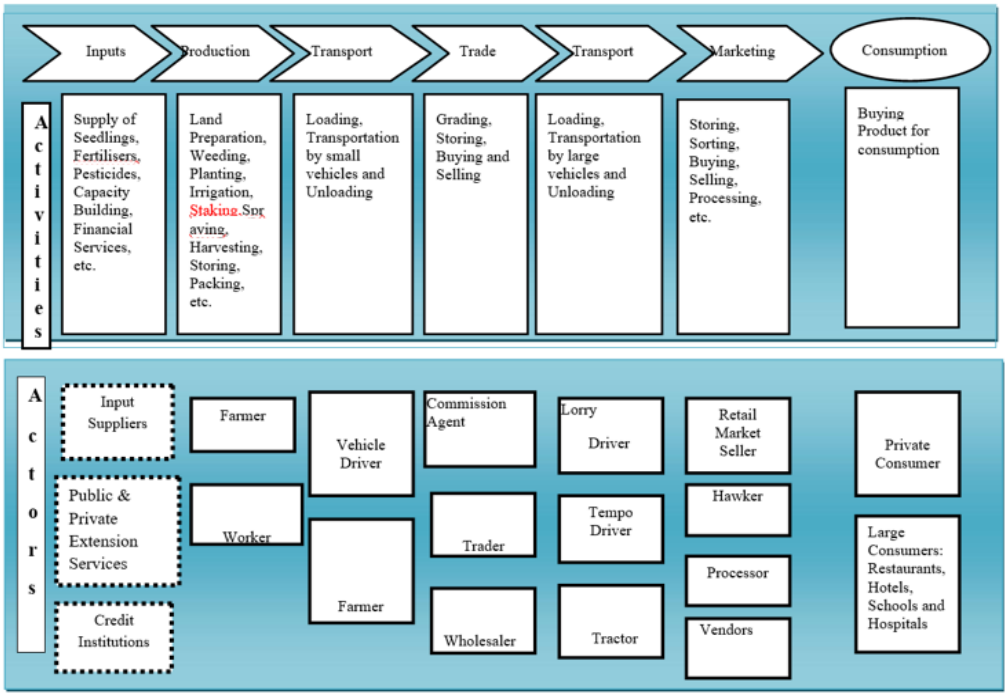

Fig. 2. Tomato value chain - actors and their activities

Table 2. Value chain analysis

Value Chain Actors	Rank
Input suppliers	
Constraints:	
Insufficient availability of credit.	1
Inadequate adoption of advanced agricultural methods and knowledge by farmers.	2
Ineffective communication between District extension officers and farmers, leading to a lack of technical and market information.	3
Farmers and extension workers lack the expertise to gather and utilize market information for improved production planning and marketing.	4
Opportunities:	
Growing demand for diverse varieties and superior quality seedlings.	1
Opportunities to establish connections with representatives from chemical companies (fertilizers, PPC) for technical support.	2
Potential for organizing promotional events to share knowledge and boost sales.	3
Scope for small entrepreneurs to venture into the inputs packaging industry.	4
Producers	
Constraints:	
Insufficient cold storage facilities.	1
Lack of irrigation facilities.	2
Farmers are unable to take full advantage of market fluctuations over time.	3
Inadequate credit facilities.	4
Significant losses of raw produce during surplus situations.	5
Unstable tomato prices.	6
Infrastructure limitations such as farm-to-market access roads, electricity, and storage.	7
Opportunities:	
High local and regional demand for tomatoes, a staple crop in India.	
Many farmers are willing to adopt new ideas and change their agronomic practices to increase productivity.	1
Enhancement of farmers' clubs to maximize benefits, such as coordinated input purchases and crop aggregation.	2
Availability of mobile telephone network in most areas, including rural regions, facilitating quick dissemination of market information.	3
Potential for the tomato processing industry, including products like ketchup, puree,	4
pickles, and sauce.	5
Commission Agents	
Constraints	
Insufficient space for proper infrastructure.	1
Irregular quality standards.	2
Limited business opportunities due to seasonal fluctuations and intense competition within a short timeframe.	3
Challenges posed by bureaucratic procedures, delayed payments, and corruption.	4
Opportunities	
Enhancing connections with a wide network of traders and producers.	1
Implementing standardized grades and criteria to improve overall efficiency.	2
Leveraging the potential of information technology across all levels of the supply chain to enhance productivity.	3
Traders	
Constraints	
Inadequate transportation and road infrastructure, including issues with capacity, availability of rented vehicles, and poor road conditions.	1
Seasonal nature of business leading to intense competition within a short timeframe.	2
Lack of effective communication, transparency, and trust between traders and producers.	3
Lack of transparency in the supply chain, with middlemen exerting control and farmers struggling to market their produce.	4
Opportunities	
Implementation of standardized grades and quality standards to enhance marketing effectiveness.	1
Ability to act as a source of market information for farmers.	
Potential to support farmers by providing inputs and credit for tomato production.	2
	3
Retailers	
Constraints	

Value Chain Actors	Rank
Restricted availability of funds for operations.	1
Absence of rewards for quality distinction.	2
Opportunities	
High demand for fresh and processed tomato goods.	1
Potential for exploring different marketing avenues for direct sourcing.	2

4. CONCLUSION

This paper not only identifies, and maps the various stakeholders involved in the value chain but also analyses the constraints and opportunities. The tomato value chain is affected by various challenges. Notable among those are lack of access to credit, infrastructure constraints, instability in tomato prices, inconsistent quality, the chain lacks transparency, with middlemen exerting dominance over it, thereby leaving farmers with limited control over marketing their produce. These challenges are affecting various stakeholders significantly. For farmers, the regular issue is low prices during glut periods. Tomato being a perishable commodity and due to lack of storage facilities, farmers are left with no other option other than selling their produce to traders at low prices. Madanapalli, having better agro-climatic conditions is suitable for tomato cultivation and because of its production there is a huge scope for tomato value addition

5. RECOMMENDATIONS

APMCs should take initiatives to maintain hygienic conditions and to provide better infrastructure facilities in the market area. One of the weak points in the value chain is tomato processing. There is a need for public-private partnerships to provide better income to farmers and also for companies to get the preferred assortment of tomatoes for processing. The stakeholders have expressed their desire for financial assistance to improve their business prospects. Therefore, it is imperative for both banks and the government to step up and offer the necessary financial support.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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