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Production and Marketing Constraints of Chia Cultivation: A Study in Mysuru and Chamarajanagara District of Karnataka

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Abstract

Chia (*Salvia hispanica* L.*)* is a nutrient-rich crop native to Mexico and Guatemala, valued for its high content of omega-3 and omega-6 fatty acids, protein, dietary fiber, vitamins and antioxidants. Historically used by the Aztecs and Mayans, chia is now cultivated globally for its health benefits and drought resilience. Introduced to India by CFTRI Mysore in 2015, chia has seen significant growth, particularly in Karnataka, where it is now a major crop. Mysuru and Chamarajanagar districts are key contributors, collectively accounting for half of Karnataka's chia cultivation. This study investigates the production and marketing constraints faced by chia farmers in these districts, focusing on socio-economic, production, marketing and technical challenges. Utilizing a multistage sampling technique, data were collected from 90 farmers through personal interviews and group discussions. Garrett's ranking technique was applied to analyze these constraints and prioritize them based on their impact. The results reveal that the most significant production constraints included lack of high-yielding varieties, inadequate post-harvest technology and inefficient threshing and storage methods. Marketing issues highlighted, high transportation costs, fragmented production, inadequate pricing support, Communication gaps with buyers and limited extension services. Recommendations included investing in research for high-yielding varieties, improving post-harvest technologies, enhancing market access and strengthening extension services. Additionally, promoting farmer cooperation and mechanization, along with better storage and transport infrastructure, are crucial steps for overcoming production and marketing challenges and fostering the growth of the chia industry in Karnataka.

Keywords : Chia, Garrett's ranking technique, Production, Marketing and Constraints

Chia (*Salvia hispanica* L.), a nutrient-dense crop originating from Mexico and Guatemala, is a member of the mint family Lamiaceae and has been a staple in human diets for approximately 5,500 years. (Armstrong, 2004). The Aztecs and Mayans historically used chia seeds in traditional medicine, culinary preparations and even for artistic purposes. (Armstrong, 2004). The name 'chia' comes from the Spanish word 'Chian,' meaning oily. This crop is renowned for its rich content of omega-3 and omega-6 fatty acids, high-quality protein, dietary fiber, vitamins, minerals and polyphenolic antioxidants, which contribute to its nutritional value and help protect the seeds from chemical and microbial degradation. Chia seeds are particularly notable for their omega-3 content, with 25-30 per cent extractable oil composed of 55 per cent omega-3, 18 per cent omega-6, 6 per cent omega-9 and 10 per cent saturated fat.

Domesticated about 4,500 years ago, chia was a key food and medicinal plant in Meso-america before

falling into relative obscurity. (Ayerza and Coates, 2011). Today, chia is cultivated in various countries, including Australia, Bolivia, Colombia and Mexico, with Mexico being the major producer. The crop is increasingly popular in Africa and Asia due to its nutritional advantages and drought resilience. In India, chia cultivation is expanding, especially in Uttar Pradesh, Rajasthan, Andhra Pradesh and Karnataka. (Anand *et al.,* 2024) With rising global health awareness, chia is recognized for its potential to combat malnutrition and promote well-being. Approved as a novel food by the European Union in 2009, chia is versatile and can be incorporated into a variety of foods or used as an egg substitute in baking, underscoring its role in enhancing dietary security. (Vuksan *et al.*, 2010).

This versatile crop was introduced to India in 2015 by the Central Food Technological Research Institute (CFTRI) Mysore, originating from Mexico and Guatemala, (Singh & Verma, 2022). In India, chia is cultivated in several states including Rajasthan, Gujarat, Tamil Nadu and Karnataka, with Karnataka emerging as the leading producer of chia seeds in the country (Singh & Verma, 2022). With in Karnataka, chia cultivation spans approximately 20,000 hectares (50,000 acres). The state boasts a production level exceeding 10,000 tonnes, with a productivity rate of 7 quintals per hectare (Anand *et al*., 2024). Among the key contributors to Karnataka's chia production are the districts of Mysuru and Chamarajanagar. These districts play a pivotal role in the industry, collectively accounting for 50 per cent **(~5-10 acres)** of the total chia seed cultivation area in the state. The benefit cost ratio of chia production is about 2.56. (AICRP, UAS, GKVK annual report, 2024)

Importance of Study

The study is crucial as it addresses the growing potential of chia seed cultivation in the study area as it is cost-effective, profitable, and sustainable. (AICRP, UAS, GKVK annual report, 2024). With the global chia seeds market expected to grow at a CAGR of 22.50 per cent and reach USD 4.9 billion by 2027, (Marketresearch.com) understanding the advantages of chia cultivation, including its high nutritional value, is essential. The study also aims to overcome existing challenges such as limited farmer awareness and inadequate marketing channels, which currently impede the growth of chia farming. By identifying these barriers and proposing solutions, the research will contribute to optimizing chia production, enhancing market access and supporting the overall development of the chia industry. The present study i carried out to analyse the production and marketing constrains faced by farmers in study area

Methodology

Study Area

This study utilized a multistage sampling technique to select farmers engaged in chia seed production during the Kharif season. It involved conducting personal interviews and group discussions with 90 respondents across three talukas: Kollegala in Chamarajanagar and Hunsur and HD Kote in Mysuru. The sample consisted of 90 farmers, with 30 of them being randomly selected from each district. (fig.1)

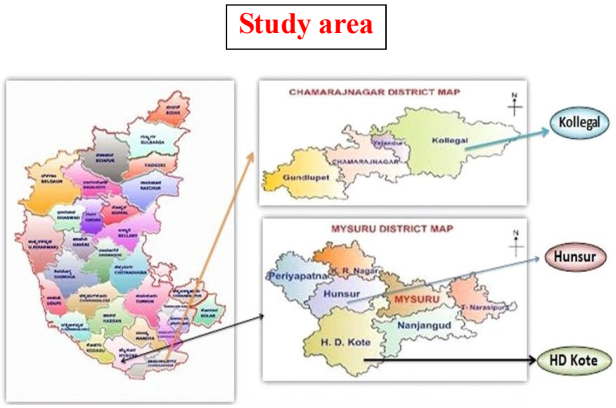

Fig. 1 : Map depicting the location of the study area

Primary Data

For evaluating the specific objectives of the study, the primary data was collected from selected farmers (90 farmer respondents) by personal interview method with the help of pre-tested and well-structured schedule. Primary data was collected from various aspects like socio-economic profile of farmer respondents socio-economic, production, personal-

social marketing, economical marketing, communicational marketing and physical-technical marketing constrains of chia from chia growers in study area.

Classification of Constraintsa

I. Production constraints

a) **Socio-economic constraints** (Awareness, Age, Cultural Practices, Landholding and Education etc.)

b) **Production constraints**

II. Marketing constraints

a) **Personal - social marketing constraints** (confidence to approach market, bargaining, poor networking etc.)

b) **Communicational marketing constraints** (communication between farmers and buyers, information about market price etc)

c) **Economical marketing constraints** (Cost incurred in transportation, Storage, Labour charge and Market price fluctuation etc)

d) **Physical-technical marketing constraints** (Inadequate Storage Facilities, Poor Transportation Infrastructure and Lack of Processing Units etc)

Sample Size Analytical Tool

To analyze the problems faced by farmers in production and marketing of chia, Garrett's ranking technique was used. Garrett's ranking technique was used to find out the most significant constraints which influence the respondents. According to this, respondents were asked to assign the rank for all the pre-listed, pre-tested constraint list separately for both production and marketing practices followed by them the ranking of all respondents were summarized into score value with the help of the following formula:

$$\text{Per cent position} = \frac{100(Rij-0.5)}{Nij}$$

Where R_{ij} = Rank given i^{th} item by j^{th} individual
N = Number of items ranked by j^{th} individual.

The per cent position of each rank was converted in to scores by referring to Garrett table. Then for each factor, the scores of individual respondents were summed up and divided by the total number of respondents for whom scores were gathered. The mean scores for all the factors were ranked following the decision criteria that higher the value, more important is the constraint. '(Garrett and Woodworth, 1969)'

Results and Discussion

Socio-Economic Characteristics of the Sample Respondents

The socio-economic characteristics of sample respondents are presented in Table 1. The majority of

Table 1

Socio-economic characteristics of sample farmers

Sl. No.	Particulars	Respondents (N=90)	Per cent
I.	**Age group (No.)**		
a.	Below 35 years	18	20.00
b.	35-50 years	48	53.33
c.	Above 50 years	24	26.67
	Average age (Years)	**41.94**	
II.	**Education level (No.)**		
a.	Primary	18	20.00
b.	High School	22	24.44
c.	College	30	33.33
d.	Degree	12	13.33
e.	Illiterate	8	8.88
III.	**Family size (No.)**		
a.	Small (<4)	8	8.89
b.	Medium (4-6)	66	73.33
c.	Large (>6)	16	17.78
	Average family size	**5.60**	
IV.	**Land holding (No.)**		
a.	Marginal farmers (< 1 ha)	9	10.00
b.	Small farmers (1 to 2 ha)	43	47.78
c.	Medium farmers (2 to 4 ha)	30	33.33
d.	Large farmers (>4 ha)	8	8.89
	Average land holding (ha)	**2.01**	

the farmers in the research area were in their middle age, between 35-50 years with 20 per cent respondents belongs to the age group of 18-35 years, 53.33 per cent were between the of 35 to 50 years of age and 26.67 per cent were above the age of 50. As a result, we concluded that farming in this area is largely undertaken by individuals with 35 to 50 age possibly a higher likelihood of stability in their farming practices. The average age of about 41.94 years aligns with this observation. The education level of the farmers is diverse, with a significant portion having completed collage (33.33 %), high school (24.44 %), primary (20.00 %), degree (13.33 %) and illiterate (8.88 %). A smaller group has attained a degree (13.33 %), while a minority (8 farmers) were illiterate. This range of education levels might influence the farmers to adopt new crop production by enabling informed decision-making and better resource management.

One of the key elements affecting farm size in the research area is the kind of family. It also has an impact on the farm's labour supply. The study revealed that 73.33 per cent families were medium sized and 8 per cent families were small size and 17.78 per cent were large size. In the study area, nearly half of the farmers are small landholders, representing 47.78 per cent of the sample. Medium-sized farms account for 33.33 per cent of the farmers. Marginal farmers, with less than 1 hectare of land, make up 10 per cent, while large landholders constitute 8.89 per cent. This indicates that small-scale farming is most common, with an average landholding size of 2.01 hectares. '(Lakshmi *et al.,* 2023)'

Socio-Economic Constraints Faced by Chia Farmers in Study Area

The socio-economic constraints faced by chia farmers in the study area are presented in Table 2, ranked by Garrett's scores. The most significant challenge was the inability to take risks, with a score of 68.58, indicating that many inability to explore new opportunities due to fear of failure or financial instability. Following this was the resistance to adopting new crops, scoring 62.25, which reflects reluctance to embrace unfamiliar ventures, for lack of enough surety of advantage by adopting a new venture. Small and fragmented landholdings was ranked third with a score of 57.98. Cultural incompatibility ranks fourth with a score of 50.65, suggesting that traditional beliefs may obstruct the adoption of modern techniques. A communication gap regarding chia cultivation information was ranked fifth with a score of 46.26. (Masood, 2015)

Table 2

Socio-economic constraints faced by Chia farmers in study area

Particulars	Garrett's score	Rank
Inability to take risk	68.58	I
Inability to accept new cop	62.25	II
Small and fragmented landholding	57.98	III
Cultural incompatibility	50.65	IV
Communication gap among farmer (information regarding chia cultivation)	46.26	V

Production Constraints faced by Chia Farmers in Study Area

The production constraints faced by chia farmers is outlined in Table 3. The most critical issue was the lack of High Yielding Varieties (HYVs) (Score: 82.58), limiting access to seeds that enhance productivity. Post-harvest technology (Score: 80.96)

Table 3

Production constraints faced by Chia farmers in study area

Particulars	Garrett's score	Rank
Lack of HYV'S varieties	82.58	I
Post-harvest technology	80.96	II
Threshing	79.34	III
Cleaning	77.72	IV
Storage problems	76.1	V
Weed problems	74.48	VI
Low price for chia	72.86	VII
Labour (lack of labour/skill labours)	71.24	VIII
lack of extension support	69.62	XI
lack of awareness about chia cultivation	68	X
Lack of credit facilities	66.38	1X

ranked second, reflecting difficulties in processing and preserving chia seeds, followed by threshing (due to small seed size and also lack of machinery) (Score: 79.34), where inefficient methods led to physical losses. Cleaning issues (Score: 77.72) and storage problems because this seed easily aboserve water if it get in contact with water *ie*., mucilage layer will formed (Score: 76.10) further affected quality and preservation. Weed infestation (Score: 74.48) and low market prices for chia (Score: 72.86) increased costs and reduced profitability. The lack of skilled labor (Score: 71.24) and extension support (Score: 69.62) hindered the adoption of efficient practices, while limited awareness of chia cultivation (Score: 68.00) and inadequate credit facilities (Score: 66.38) restricted farmers' ability to optimize their operations. These challenges highlight critical gaps in technology, knowledge dissemination, financial access and infrastructure, significantly affecting chia farming productivity and profitability. (Navdeep *et al*., 2016)

Personal-Social Marketing Constraints faced by Chia Farmers

The personal-social marketing constraints faced by chia farmers are outlined in Table 4. The first - most significant constraint was the lack of foresight and vision in marketing, with a score of 52.95. This indicated that farmers struggle with planning and strategizing for market opportunities. The second constraint was the lack of decision-making capability for selling, scoring 47.51, This reflects a lack of confidence or clarity in selling their produce. Lack of risk-bearing capacity was ranked third with a score of 42.07, reflecting farmers' reluctance to take financial risks in the market. The fourth constraint was the lack of cooperation among farmers, with a score of 36.63, highlighting challenges in collective marketing efforts and collaboration. (Kijsart and Soparth, 2017)

Table 4

Personal-Social marketing constraints faced by Chia farmers

Particulars	Garrett's score	Rank
Lack of foresight and vision of marketing	52.95	I
Lack of decision making capability of selling	47.51	II
Lack of risk bearing capacity	42.07	III
Lack of cooperation among farmers	36.63	IV

Economical Marketing Constraints faced by Chia Farmers

The economic marketing constraints faced by chia farmers outlines in Table 5. The most pressing issue was the high cost of transportation, with a score of 75.82. This was followed by high wage rate labor, which has a score of 70.68. Fragmented production ranks third with a score of 65.54, and the high cost of grading and packaging was fourth with a score of 60.40. Lack of reasonable support prices comes fifth with a score of 55.26, and price fluctuations rank sixth with a score of 50.12. The least critical constraint is delayed payment, with a score of 44.98. (Onyeneke, 2017)

Table 5

Economical marketing constraints faced by Chia farmers

Particulars	Garrett's score	Rank
High cost of transportation	75.82	I
High rate of labour charges	70.68	II
Fragmented production of chia	65.54	III
High cost of grading and packaging	60.4	IV
Lack of reasonable support price	55.26	V
Price fluctuation of chia	50.12	VI
Delayed payment of money from trader	44.98	VII

Communicational Marketing Constraints Faced by Chia Farmers

The communicational marketing constraints faced by chia farmers presented in Table 6. The foremost issue was inadequate contact with buyers and middlemen, with a score of 70.98. This was followed by inadequate guidance and cooperation from buyers and middlemen, scoring 65.48. Lack of information about marketing sources ranks third with score of 59.98,

Table 6

Communicational marketing constraints faced by Chia farmers

Particulars	Garrett's score	Rank
Inadequate contact with buyers/ middle-men	70.98	I
Inadequate guidance and co-operation from buyers/middle-men	65.48	II
Lack of information about sources of marketing	59.98	III
Poor marketing knowledge of extension workers	54.48	IV
Lack of reliable updated information on marketing	48.98	V

while poor marketing knowledge of extension workers was fourth with a score of 54.48. Lack of reliable updated information comes fifth with a score of 48.98. (Ouma and De, 2011)

Physical-Technical Marketing Constraints faced by Chia Farmers

The physical-technical marketing constraints faced by chia farmers, ranked by severity are outlined in Table 7. The most critical constraint was the lack of storage facilities, with a score of 80.62. This was followed by the unavailability of transport facilities, which has a score of 76.85. The distance to markets ranks third with a score of 73.08 and the absence of cooperative/APMC markets was fourth with a score of 69.31. Insufficient grading and packaging facilities come fifth with a score of 65.54 and a long chain of intermediaries ranks sixth with a score of 61.77. The lack of open auction systems was seventh with a score of 58.00 and the absence of processing units ranks eighth with a score of 54.23. The least critical issue was the lack of ancillary facilities, with a score of 50.46. (Kumar *et al.,* 2015)

Table 7

Physical-technical marketing constraints faced by Chia farmers

Particulars	Garrett's score	Rank
Lack of storage facilities	80.62	I
Un-availability of transport facilities	76.85	II
Market is away from village	73.08	III
Lack of co-operative/ APMC market	69.31	IV
Lack of grading and packaging facilities	65.54	V
Long chain of intermediaries	61.77	VI
Lack of open auction	58	VII
Un-availability of processing units	54.23	VIII
Lack of ancillary facilities	50.46	XI

The study highlights several constraints faced by chia farmers, including socio-economic challenges like risk aversion and resistance to new crops, fragmented landholdings, and cultural factors. Production issues involve a lack of High Yielding Varieties (HYVs), inadequate post-harvest technology and operational difficulties. Economically, high transportation and labor costs, along with fragmented production and pricing, are significant barriers. Communication issues, such as poor contact with buyers and insufficient guidance, hinder market access. Additionally, the absence of essential facilities like storage and transport impacts marketing efficiency. Addressing these constraints is essential for optimizing chia cultivation and market growth, necessitating targeted interventions to improve technology, infrastructure and awareness.

Policy Recommendations

To address the constraints faced by chia farmers, policy measures should focus on several key areas. Investing in post-harvest technology and storage, such as hermetic storage, cold chain systems and automated processing, reduces food loss and improves quality. These innovations ensure higher farmer incomes, better market access & enhanced food security. To alleviate economic pressures, reducing transportation costs and establishing reasonable support prices for chia seeds would benefit farmers. Developing cooperative markets and improving communication channels between farmers and buyers can facilitate better market access. Additionally, increasing training for farmers and providing financial support can help them adopt new practices and manage risks more effectively.

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