

TRADITIONAL VALUE CHAIN MANAGEMENT OF NAGA KING CHILLI: FINDINGS FROM MON DISTRICT OF NAGALAND

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ABSTRACT

This study aimed to identify and map different value chains of Naga King chilli and examine the challenges faced by various stakeholders. Data were collected from 100 randomly selected respondents, including 50 farmers, 20 intermediaries, and 30 consumers. The key players identified in the value chain were Naga King chilli growers (predominantly small-scale farmers), wholesalers (local and distant), retailers/vendors (local and distant), and consumers. The study identified four major marketing channels: Channel I (Naga King chilli producer-consumer), Channel II (Naga King chilli producer-local wholesaler-local retailer-consumer), Channel III (Naga King chilli producer – distant wholesaler – distant retailer- distant consumer), and Channel IV (Naga King chilli producer-local wholesaler-distant wholesaler-distant retailer-distant consumer). Major challenges faced by the value chain players included wide price fluctuations, supply shortages, handling and storage issues, and the perishable nature of chilli. The findings suggest promoting contract arrangements between farmers and buyers to ensure a steady supply of products. Initiatives such as post-harvest handling training for tribal farmers, proper storage facilities, and the formation of cooperatives or farmer producer organizations (FPOs/FPCs, training through KVKs, NGOs, state departments etc.) could help small-scale producers receive better prices.

Keywords: Marketing channel, Naga King chilli, Nagaland, Traditional practices, Value chain players

Nagaland, a far northeastern state of the India, is predominantly agrarian, with 90 per cent of its population dependent on agriculture. The state boasts high potential for horticultural crops, with 25,000 and 26,300 hectares of land under fruits and vegetable cultivation, respectively yielding a total production of 25,600 to 32,000 tonnes (KVK, 2017). Naga King chilli (*Capsicum chinense* Sacq), known by various names like 'Raja Merja' or 'Raja Mircha' at the local level, is one of the traditional food items cultivated by the Naga community in the state. It is also known by other names like *Bhut jolokia* in Assam and *U-morok* or *Go-morok* in Manipur. Naga King chilli is believed to have originated from the northeastern part of India and is mainly grown in the districts of Kohima, Mon, and Peren in Nagaland, and Tamenglong, Ukhrul, and Churachandpur districts in Manipur. The northeast region of India is recognized as a hotspot for chilli diversity (Meetei *et al.*, 2016). Naga King chilli is renowned worldwide for its distinct taste, aroma, and pungency, and has been recognized as one of the world's hottest chillies based on Scoville Heat Units (Anonymous, 2021). It also possesses medicinal properties, serving as a pain reliever for toothaches and muscle pain, exhibiting anti-inflammatory, anti-cancer, and anti-diabetic properties, as well as being used

for weight reduction, gastrointestinal abnormalities, asthma management, and bacterial infection control. The Nagaland government has obtained patent rights for Naga King chilli and secured Geographical Indication status from the Government of India under the Registration and Protection Act of 1999 (Statistical Handbook of Nagaland, 2017). During the 2015-16 period, Nagaland produced 7,739 metric tonnes of Naga King chilli across 1,385 hectares, with a productivity of 5,587 kg per hectare (Economic Survey of Nagaland, 2016).

In recent years, the Indian agricultural system has undergone rapid changes, particularly following the economic reforms of the 1990s. One of the most notable trends in the Indian market is the emergence of integrated agriculture, accompanied by the development of food supply and value chains (Kumar, 2016). Value chains play a crucial role in strategic planning for many businesses today (WBCSD, 2011). The terms "value chain" and "supply chain" are often used interchangeably (Westlake, 2005). Agriculture value chains, as described by Dunn (2014), encompass processing, packaging, storage, transportation, and distribution, forming vertical links or networks connecting various independent commercial entities. A value chain encompasses the entire lifecycle of a product or process, including material sourcing, production,

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consumption, and disposal/recycling processes.

The production of Naga King chilli in Nagaland remains traditional, with the crop cultivated organically. According to Konyak *et al.* (2022), growers in Nagaland engage in organic cultivation, and chain players profit significantly from Naga King chillies compared to other varieties. Trade exchanges of Naga King chilli are prevalent within the states of Northeast India, especially between Assam and Nagaland due to differences in cultivation and harvesting periods between the hills and plains. Many stakeholders from Nagaland are involved in these exchanges, earning their livelihood through the trade of various agricultural commodities between states. However, post-harvest operations and marketing are still conducted traditionally without an organized value chain.

Mapping out a value chain can provide a comprehensive visualization of all processes and their impact on both the company and its customers (WBCSD, 2011). In Nagaland, the cultivation of King chilli occurs throughout the year. Between 2010 and 2017, the cultivation area increased from 350 hectares to 1050 hectares, with production rising from 1470 MT to 3420 MT (Malakar *et al.*, 2019). Jamir and Jha (2020) found a positive and significant correlation between farmers' attitudes and income from growing King chillies with entrepreneurial behavior. These chillies are highly sought after in both domestic and foreign markets for their intense pungency and aroma (Malakar *et al.*, 2019).

India possesses the potential for market-based economic development through the establishment of national and regional value chains for agricultural products. To facilitate the sale of dried Naga King chilli outside the state, the State Department of Agriculture has established marketing relationships with entities such as the Indian Tobacco Company (ITC), Spices Board of India, and the International Competence Centre for Organic Agriculture (ICCOA) in Bangalore (Sharma, 2016). The first shipment of fresh King chilli for export was organized by APEDA and the Nagaland State Agricultural Marketing Board (Anonymous, 2021).

However, despite the advancements in agricultural growth, the establishment of a value chain can contribute to reducing rural poverty, stimulating growth in other sectors, and addressing key socio-economic issues affecting farmers and stakeholders within the chain. No previous studies have focused on the value chain management of Naga King chilli in the study area. Therefore, it is imperative to identify the traditional value chain players of Naga King chilli in the state, along with their roles and responsibilities. The specific objectives of this study include the identification and mapping of different value chains of Naga King chilli and examining

the challenges faced by value chain players.

MATERIALS AND METHODS

Data sources

The study utilized both primary and secondary data sources. For primary data collection, the Mon district of Nagaland was chosen, specifically the Tizit block, within which two villages, namely Nokyan and Loakho, were selected. A random sampling technique was employed to select Naga King chilli growers and other respondents. The total sample size comprised 100 individuals, including 50 Naga King chilli growers, 20 intermediaries (comprising 5 local wholesalers, 5 distant wholesalers, 5 local retailers, and 5 distant retailers), and 30 consumers of Naga King chilli. Data were collected regarding cultivation practices, marketing practices, and the involvement of market intermediaries, along with their profit margins, during the year 2020. The collected data were then analyzed using appropriate statistical tools such as averages, percentages, as well as simple tabular/graphical analyses.

Analytical procedure

Producer's Price

It is the net price received by the farmer at the time of the first sale which equals the wholesale price at the primary assembling center, minus the charges borne by the farmer in selling his produce (Harpreet and Amit, 2019).

$$\text{Producer's price (PF)} = \text{PA} - \text{CF}$$

where, PA = wholesale price in the primary assembling market,

CF = the marketing cost incurred by farmer

Marketing margin of a middleman

This is the difference between the total payments (cost + purchase price) and receipts (sale price) of the middleman (i^{th} agency). Three alternative measures can be used (Harpreet and Amit, 2019).

Absolute margin of i^{th} middleman (A_{mi}) = $PR_i - (P_{pi} + C_{mi})$

$$\text{Percentage margin of middleman (P}_{mi}\text{)} = \frac{P_{ri} - (P_{pi} + C_{mi})}{P_{ri}} \times 100$$

where,

P_{ri} = Total value of receipts per unit of produce (sale price)

P_{pi} = Purchase value of goods per unit of produce (purchase price)

C_{mi} = Cost incurred in marketing per unit

The margin, thus calculated includes the profit of the middleman and the returns.

Garrett ranking method

This technique was used to evaluate the problems faced by the respondents. The orders of merit given by the respondents were converted into rank by using the following formula (Henry and Woodworth, 1969):

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

where, R_{ij} = Rank given for the i^{th} variable by j^{th} respondents

N_j = Number of variables ranked by j^{th} respondents

RESULTS AND DISCUSSION

Identification and mapping of different value chain players of Naga King chilli

The detailed identification and mapping of different sub-value chains for various Naga King chilli products in the study area are presented in Fig. 1. The value chain actors identified include farmers, local wholesalers and retailers, distant wholesalers and retailers, as well as consumers. Additionally, other actors in the value chain, such as input suppliers, transporters, and retailers, were also identified (Gautam *et al.*, 2021).

A study on value chain analysis of chillies in South Tamil Nadu revealed the existence of contract arrangements for cultivating chillies in that region, with various actors involved in the chain, including input suppliers (such as manufacturers, wholesalers, and

retailers), farmers, village traders, commission agents, wholesalers, and retailers (Divya, 2014).

In the study villages of Nokyan and Loakho, the period of cultivation and production of Naga King chilli is similar, as both are situated in a hilly area of the Tizit block, and both villages practice the same planting season, namely the *kharif* season. Fig. 2 provides a detailed flow of the production schedule of Naga King chilli in the study region.

Value chain activities

Seed production and distribution

The Naga King chilli growers in the study areas save seeds from mature and healthy Naga King chilli plants from the previous season, rather than purchasing seeds from the market or companies (Fig. 3). This practice of using their own seed materials is also observed among chilli growers in Myanmar (ILO, 2016).

After smoking and sun-drying, the mature seeds are stored by farmers in small polythene packets, traditional bamboo pots, bottle gourd containers, etc. These packets are hung from the ceiling to prevent damage and stored locally on the farm for the next season. In the study area, growers typically utilize traditional varieties of chillies, which complete their growth cycle within a single rainy season (Fig. 4A).

Nursery bed preparation

The nursery beds are prepared in a small plot of land near the farm or in the kitchen garden near the farmer's house. Cow dung or ash from burned remains of shrubs or plant branches is added to enrich the soil.

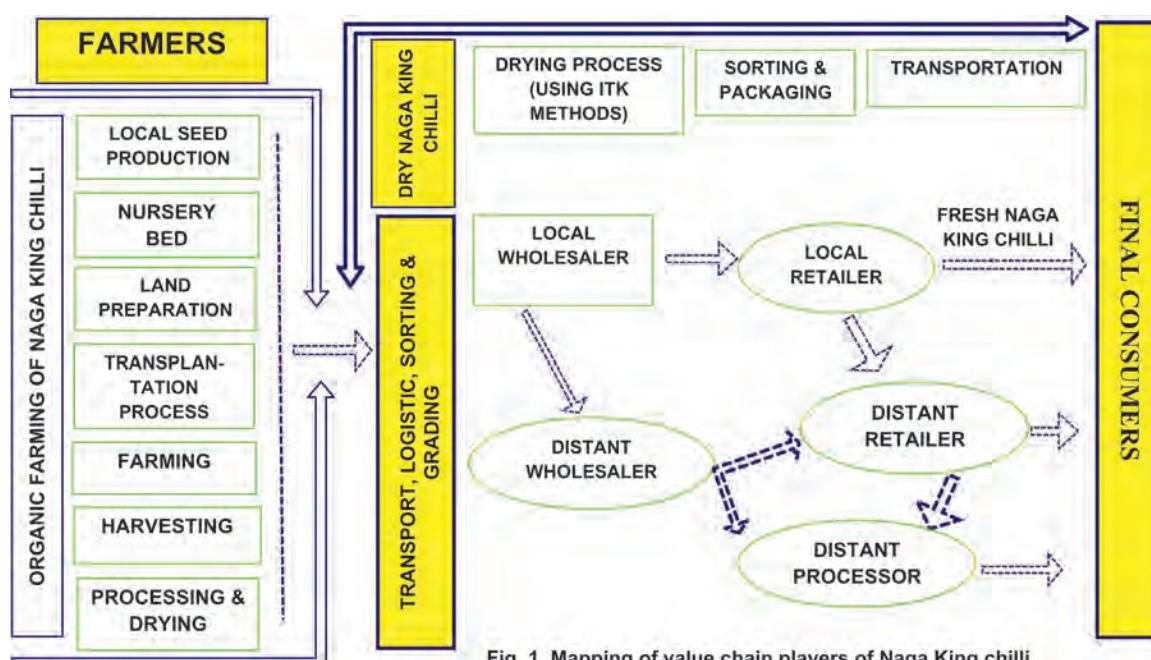


Fig. 1. Mapping of value chain players of Naga King chilli
Source: Authors identification during field survey

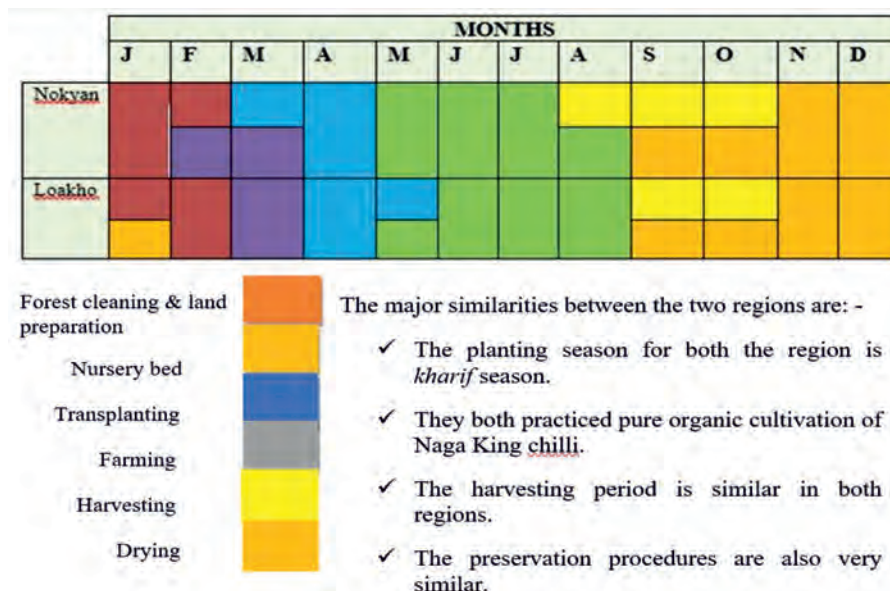


Fig. 2. Production schedule of Naga King chilli in Loakho and Nokyan of Mon district

Seeds are sown at the beginning of the dry season, typically between February and March, and are irrigated if there is no rainfall during that period.

Sometimes, the nursery beds are bordered with a bamboo fence to protect the crops from animals and village hens. However, these beds remain open and

are not covered with mulch or netting, leaving them unprotected from insects or heavy rains (Fig. 4B).

Forest cleaning and land preparation

State farming primarily involves *jhum* cultivation, also known as slash-and-burn cultivation. This process



Fig. 3A



Fig. 3B



Fig. 3C



Fig. 3D



Fig. 3E

Fig. 3. Different value chain activities

Note: Fig. 3A - Samplings of Naga King chillies; Fig. 3B - Nursery bed of Naga King chillies; Fig. 3C - Field preparation; Fig. 3D - Matured chilli plants before harvesting; Fig. 3E - Cultivation of Naga King chillies

begins with the selection of unused land, typically forest land, which has been left untouched for 3-4 years. Clearing of the forest using hand tools such as Naga Dao and spades takes place from January to mid-February.

The chosen location, often with a cluster of bamboo, is slashed, dried, and burned, requiring skilled or semi-skilled laborers to complete the task within the expected timeframe. After burning, the soil is manually tilted and ploughed. In the study area, growers do not use any additional FYM and rely solely on the remains of slash-and-burn bamboo for soil enrichment (Fig. 4C).

Transplanting process

Transplanting typically occurs approximately 30-45 days after sowing, usually between the months of March to April, and sometimes extending into May. Baby plants are carefully collected from the nursery bed, and their roots are kept moist in a shaded area the day before transplanting.

The transplanting process is carried out manually and typically completed within 1-2 days. It is usually timed to coincide with the onset of the rainy season, especially when rain is expected within 24 hours of planting (Fig. 4D).

Farming

The farming period in the study area spans from March to May. The majority of farmers in the study area adhere to traditional organic Naga King chilli cultivation practices, refraining from the use of fertilizers and irrigation facilities (Fig. 4E).

Harvesting

Harvesting typically commences from August to September and may extend to October. Yields vary among farmers, influenced by the location of their fields. Villagers believe that selecting land with bamboo results in higher production and yield, with less susceptibility to diseases.



Fig. 4A



Fig. 4B



Fig. 4C



Fig. 4D



Fig. 4E



Fig. 4F



Fig. 4G



Fig. 4H



Fig. 4I



Fig. 4J



Fig. 4K



Fig. 4L

Fig. 4. Different activities carried out for Naga King chillies

Note: Fig. 4A, B, C- Sampling of Naga King chilli stored in container from previous season; Fig. 4D- Nursery bed; Fig. 4E, F- Forest cleaning & land preparation; Fig. 4G, H- Harvesting fresh chillies; Fig. 4I, J- Logistics & transportation; Fig. 4K- Interaction with stakeholders; Fig. 4L- Dry Naga King chillies

Harvesting is usually done manually, with family laborers engaging in hand-picking. Each season sees at least 14 harvests. Following harvesting, Naga King chillies are distributed through various value chains and sub-chains, either as farm-fresh or dried chillies.

Drying

Drying is primarily done at the farmer's level, although it may also occur at the retailers' or consumers' level. Home processing is common in the study area, typically undertaken by farmers.

To dry matured Naga King chillies, farmers place them in a bamboo mate or 'Dola,' a local term meaning sieve, which is then positioned on the floor. The chillies are sun-dried or smoked above the fireplace and subsequently stored in bamboo pots or baskets above the kitchen fire area or on the ceiling, out of reach from animals, humans, and insects. Farmers meticulously separate rotten or damaged chillies from the good ones. Additional activities related to Naga King chillies are illustrated in Fig. 4 E-L.

Loading and logistics

The dried chillies are typically sold in transparent polythene packets or packed in bamboo baskets for sale in the nearest market. Fresh chillies, on the other hand, are packed in polythene sacks, loaded onto mini trucks, and transported to the nearest market. The transportation vehicle is usually privately owned, and payment is made on the spot after loading.

Transportation from farmers to intermediaries

The fresh Naga King chillies are transported to the Tizit market, where both local and distant wholesalers operate. Transportation is typically arranged by the farmers themselves to reach the local market. In cases where very small chili growers, unable to access transportation, such as those going to the Longding market in Arunachal Pradesh, they resort to traveling on foot, whether during peak or ending seasons.

At the market, farmers sell their chillies directly to local wholesalers or distant wholesalers. Local wholesalers then distribute the chillies to local retailers or other distant wholesalers, who in turn sell them to distant retailers and ultimately to consumers.

Quality grading of Naga King chilli

During the survey, it was observed that only 38 per cent of the respondents at the farmer's level regularly performed grading. Farmers mentioned that they did not find it necessary to grade, as they typically sell harvested Naga King chillies to the next channel actor while still fresh and easily preservable. They only separate over-ripened or spoiled chillies.

The majority (60%) of local and distant wholesalers

stated that they did not engage in grading due to dealing with large quantities. Additionally, they needed to sell the chillies to other value chain actors within the same or next day to maintain freshness and quality.

However, local retailers (60%) and distant retailers (60%) reported purchasing graded chillies, as these chillies often lost quality and freshness through various channels. Therefore, they checked specific quality characteristics such as size, color, moisture content, and freshness before making purchases.

Materials used for packing

The choice of packaging material is crucial in enhancing shelf life and protecting the crop from external factors. The majority (80%) of farmers utilized sacks and nets, while 20% opted for bamboo baskets and wooden crates.

In the study area, it was observed that most wholesalers (100% of local wholesalers and 80% of distant wholesalers) preferred sacks and nets for packaging. Conversely, retailers (60% each of distant and local retailers) tended to utilize more plastic film and plastic bags.

Marketing channels and border trading with neighboring states

In the study area, four traditional major marketing channels were observed for the marketing of Naga King chilli (Table 1). Previous studies on value chain analysis of selected crops in the Northeastern states identified two channels in the study area: Farmers-Aggregators-Wholesaler-Retailer-consumer (Local markets) and Farmers-Trader/contractor-wholesaler (in Kolkata, Delhi, Mumbai, etc.) (Small Farmers Agri-business Consortium, 2012). Our findings are consistent with results reported by Kedrishi *et al.* (2023) and Reddy *et al.* (2019).

Table 1. Different marketing channels of Naga King chilli

Particulars	Marketing channels
Channel I	Naga King chilli producer – Direct consumer
Channel II	Naga King chilli producer – Local wholesaler – Local retailer – Consumer
Channel III	Naga King chilli producer – Distant wholesaler – Distant retailer- Distant consumer
Channel IV	Naga King chilli producer – Local wholesaler – Distant wholesaler – Distant retailer -Distant consumer

Source: Authors findings based on field survey

Marketing costs incurred by the stakeholders from value chain of Naga King chilli

Table 2 presents the distribution of costs among material costs, transportation costs, and all other

Table 2. Marketing cost* incurred by the stakeholders from Naga King chilli

Particulars	Wholesaler		Retailer	
	Local	Distant	Local	Distant
Transportation & loadings	2,200 (11.18)	796 (5.06)	1,368 (11.18)	3,700 (13.58)
Gunny bag/pack	450 (2.29)	204 (3.30)	340 (2.94)	410 (1.50)
Personal expenses	2,140 (10.87)	952 (6.05)	1,620 (14.00)	1,248 (4.58)
Storage expenses	1,160 (5.87)	240 (1.52)	3,120 (26.97)	1,440 (5.29)
Expenses from loss of chilli in the market	11,750 (59.69)	12,932 (82.14)	3,800 (32.85)	19,390 (71.19)
Miscellaneous (tax include)	1984 (10.08)	620 (3.94)	1,320 (11.41)	1,048 (3.85)
Total	19,684 (100)	15,744 (100)	11,568 (100)	27,236 (100)
Percentage distribution of the cost of all the stakeholders	26.52	21.21	15.58	36.70

Source: Authors calculations

Note: Figures in parentheses represent the percentage relative to the column total

*Cost is in Rs. per quantity procured per year

associated costs incurred by stakeholders involved in the marketing and value addition of Naga King chilli. In the study area, the most significant expenses were observed among distant retailers, totaling Rs. 27,236, followed by local wholesalers and distant wholesalers with Rs. 19,684 and Rs. 15,744, respectively. Conversely, local retailers incurred the least expenses, amounting to Rs. 11,568. Distant retailers accounted for the highest percentage distribution of costs among all stakeholders in the study area.

Table 3 illustrates the total expenses for all resources incurred by local wholesalers, distant wholesalers, local retailers, and distant retailers, amounting to Rs. 6, Rs. 5, Rs. 25, and Rs. 25, respectively. Additionally, the purchasing costs for these stakeholders were Rs. 250, Rs. 261, Rs. 257, and Rs. 277, respectively. The total returns from all sources of Naga King chilli marketing for local wholesalers, distant wholesalers,

local retailers, and distant retailers were Rs. 270, Rs. 293, Rs. 294, and Rs. 426, respectively. Consequently, the net income (profit) annually for local wholesalers, distant wholesalers, local retailers, and distant retailers amounted to Rs. 14, Rs. 26, Rs. 12, and Rs. 124, respectively, in the study area. The findings of Konyak *et al.* (2022) indicate that Naga King chilli production is profitable in Nagaland, with a satisfactory return over cost.

Consumer satisfaction with the quality of purchased Naga King Chilli

In the study area, the majority (33.33%) of consumers reported consuming excellent quality Naga King chilli products, followed by 30% who indicated outstanding quality. Conversely, the smallest proportion of consumers (13.33%) perceived the chilli quality as average (Table 4). These findings indicate overall

Table 3. Distribution of income across different value chain players

Particulars	Gross returns (in Rs./kg)			Total expenses (in Rs.)	Net income (in Rs.)
	Total returns	Purchasing cost	Total amount (after deducting the purchased amount with sales)		
Local wholesaler	270	250	20	6.21	13.79
Distant wholesaler	293	261	32	5.64	26.36
Local retailer	294	257	37	25.30	11.70
Distant retailer	426	277	149	25.01	123.99

Source: Authors calculations

satisfaction among the majority of consumers regarding the quality of locally farmed king chillies.

Table 4. Satisfaction level on quality of the Naga King chilli purchased by the consumers

Particulars	Consumer respondents	Percentage
Outstanding	9	30.00
Excellent	10	33.33
Good	7	23.33
Average	4	13.33
Total	30	100.00

Source: Authors calculations

Factors influencing consumers' decision to purchase Naga King chilli

Table 5 illustrates that quality ranked first (65.5%) among factors influencing the purchasing behavior of Naga King chilli consumers. Regarding quality, consumers prioritize characteristics such as color and freshness. Taste ranked second (61%), with respondents favoring the flavor of Naga King chilli over other varieties available in the study area. Additionally, factors such as previous experience (ranked 3rd), health considerations (ranked 4th), and market availability (ranked 5th) were also significant determinants of purchasing behavior.

Table 5. Factors influencing consumers' decision to purchase Naga King chilli

Particulars	Percentage	Rank
Quality	65.5	I
Taste	61.0	II
Earlier use	45.3	III
Health reason	38.1	IV
Availability	36.5	V

Source: Authors calculations

Challenges encountered in Naga King chilli production by farmers

Pest and insect attacks emerged as the primary challenge (1st rank) faced by farmers in Naga King chilli production. Dessie *et al.* (2017) highlighted similar findings in their study on the value chain analysis of Red Pepper in South Ethiopia, where pests and diseases adversely affected marketable supply.

The lack of knowledge about modern techniques for disease and pest management (2nd rank) was identified as the second most significant issue. Farmers often lack awareness about different diseases and pests, as well as modern management techniques such as trapping, vacuuming, and the use of bio-control agents (such as bio-insecticides and bio-pesticides), or even synthetic pesticides. Instead, they primarily rely on Indigenous

Technical Knowledge (ITK) for pest and disease control. Furthermore, farmers expressed a strong interest in receiving information about government incentives, horticultural practices, weather conditions, crop diseases, profitable markets, and cold storage facilities (Somashekhar *et al.*, 2016).

The lack of assistance and support from government agencies, NGOs, extension agents, and private organizations (3rd rank) was another major concern. Farmers lamented the absence of visits from extension agents, state departments, or NGOs to provide knowledge on agricultural practices, pest management, post-harvest processing, and input provision. Consequently, farmers often cultivate small plots of land, resulting in reduced production levels on many occasions (Table 6).

Issues encountered by the value chain players

Table 7 outlines various challenges encountered by farmers in Naga King chilli production. Notably, local and distant wholesalers identified wide price fluctuations as the primary concern, while local retailers highlighted the lack of storage facilities. In contrast, distant retailers cited the perishable nature of Naga King chilli as their main challenge.

Farmers' poor understanding of price volatility has been noted (Prabhavathi and Kishore, 2013), leading to instances where they sell chillies at lower prices to mitigate market risks. Additionally, the perishable nature of the product poses transportation challenges (Small Farmers Agri-business Consortium, 2012). Consumers expressed dissatisfaction with the lack of processed Naga King chilli products, indicating a gap in value-added offerings. This constraint is echoed in value chain management (Sharangi and Acharya, 2007).

The present study was undertaken to examine the various value chains associated with Naga King chillies, recognizing their significance to the Nagaland state. The research delved into the diverse activities within the value chain, encompassing seed production to processing and drying. Additionally, it assessed the marketing costs incurred by stakeholders in the study area and identified factors influencing consumers' purchase decisions and satisfaction with the product's quality.

Key marketing channels utilized by respondents were identified, alongside major challenges faced by farmers and other value chain players. The study revealed significant demand for King chilli in both domestic and global markets, highlighting the need for enhanced farmer training facilitated by NGOs, state government agencies, and KVKs.

Furthermore, the study proposed that contractual agreements between growers and buyers could

Table 6. Problems faced in Naga King chilli production by farmers

Sr. No.	Particulars	Garrett value	
		Mean score	Rank
1	Pest and insect attack	74.48	I
2	Lack of knowledge about modern techniques for disease and pest management	69.88	II
3	Lack of assistance and support from Government agency/NGOs/ Extension agents/ Private organizations in Naga King chilli production	66.14	III
4	Non-availability of pest resistance and high yield variety of Naga King chilli	55.52	IV
5	Loss of crop in the field	52.4	V
6	Non-availability of processing industries	38.1	VI
7	Extreme rainfall	37.76	VII
8	Non-availability of credit facilities for crop production	28.74	VIII

Source: Authors calculations

Table 7. Problems faced by the value chain players of Naga King chilli

S. No.	Types of problem	Rank				
		Local wholesaler	Distant wholesaler	Local retailer	Distant retailer	Consumer
1	Wide fluctuations in price	I (69.0)	I (71.4)	III (52.0)	II (59.8)	III (42.1)
2	Lack of storage facilities	II (67.2)	III (63.4)	I (64.0)	V (30.6)	-
3	Perishable nature of chilli	III (63.4)	IV (48.6)	II (62.0)	I (66.0)	II (42.9)
4	High transportation cost	IV (50.0)	VI (36.4)	-	-	-
5	Irregular supply of Naga King chilli	V (42.6)	II (64.8)	-	-	-
6	Non-availability of credit facilities	VI (28.8)	-	-	IV (37.8)	-
7	High labor charges/availability	VII (28.0)	VII (26.2)	-	-	-
8	Handling risk	-	V (38.2)	-	-	-
9	Unable to access the demand	-	-	IV (36.2)	-	-
10	Supply shortage	-	-	-	III (54.8)	I (57.7)
11	Non-availability of support facilities from government or NGO's.			V (34.8)		
12	Lack of processed product of Naga King chilli					I (57.7)

Source: Authors calculations. Note: Figures in parentheses denote the percentage of respondents who ranked the specific issue

strengthen market connections and increase market awareness, leading to improved market information flow, price stability, consistent supply, and enhanced product quality.

Conflict of Interest

The authors declare that there is no conflict of interest.

Authors' contribution

Conceptualization of research work and designing of experiments (TK, ND); Execution of field/ lab experiments and data collection (TK, ND); Analysis of data and interpretation (TK, SHM, ND); Preparation of manuscript (SHM, ND)

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