

EXPORT ORIENTED VALUE CHAIN STUDY

Chillies- Uttar Pradesh

Prepared by:
Alok Kumar Srivastava
Pratyush Ranjan Singh

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A. ABBREVIATIONS

AMD	Agricultural Market Development
APEDA	Agricultural and Processed Food Products Export Development Authority
APMC	Agriculture Produce Market Committee
C&F	Clearing and Forwarding
CHCs	Custom Hiring Centres
CSR	Corporate Social Responsibility
DA&FW	Department of Agriculture and Farmer welfare
FAO	Food and Agriculture Organization
FPC	Farmer Producer Company
FPO	Farmer Producer Organization
GAP	Good Agricultural Practices
Ha	Hectare
ICAR	Indian Council of Agricultural Research
IPNM	Integrated Pest and Nutrient Management
Kg	Kilogram
KVK	Krishi Vigyan Kendra
MT	Metric Tonne
NGO	Non-Government Organization
PoP	Package of Practices
Rs.	Rupees
Yr	Year
%	Percent
€	Euro

B. EXECUTIVE SUMMARY

India ‘Land of spices’ is the major producer and exporter of chillies. India is also one of the largest producer, consumer, and exporter of dry chillies in the world. Chilli is grown in almost all the states in India. Uttar Pradesh is one of the marked states for chilli production with a production of 11808 MT (2019-20) of Chilli in the state. The chillies produced in the state have a high potential of export, but lack of proper supply chain development have regulated the global market. To promote the export of chillies from Uttar Pradesh, the Indo-German Cooperation on Agricultural Market Development (AMD) project is envisioned to support sustained economic growth in the agricultural sector and improved livelihoods in rural regions of India.

The study on “Export Oriented Value Chain of chillies” deals with the assessment of existing value chain of chillies in Uttar Pradesh and recommends the development of sustainable export-oriented value chains for the chillies in the state. The study was conducted at Varanasi and Lucknow clusters where four FPC’s were shortlisted for the promotion of export of chilli from the state. Existing value chain studies revealed that most of the chillies are sold at domestic market where farmers share varies from 40% to 50% of consumer price in marketing of chillies. Various gaps like lack of farm management practices, technical knowledge about Integrated Pest and Nutrient Management (IPNM) and adoption of latest cropping techniques; poor postharvest management facility; lack of marketing strategy or market approach and lack of awareness among export compliances were observed during the study which imparts hindrance to the production of quality produce for export. There are opportunities for chilli growers in both domestic and export market, but to gain profit from market access, they need to substantially increase the quality of their produce. Various interventions are suggested to mitigate the gaps found during the study at production, post-harvest and packaging and market levels. These are:

Production	Identification and Promotion of chilli varieties suited to the destined market
	Training on the improved package of practices qualifying GAP certification
	Reduction in cost of production
	Much better pre-truck sorting and grading
	Training in appropriate harvest and post-harvest handling
	Exporters and buyers need to integrate themselves into production decisions
Postharvest and packaging	Development of infrastructure as a farm-gate collection centres and setting up a state-of-the-art pack houses for multi-products handling including chilli.
	Training of logistic service providers on appropriate packages for handling chilli during transportation.
	Developing a trained cadre at the local level having an understanding of export compliances and terminologies to help exporters and FPOs in managing logistics and the operation of exports.
Marketing support	Developing partnerships between different stakeholders at the domestic level for easing the business process.
	Facilitate market linkages by organising physical or virtual buyer-seller meets
	Develop a market profile with quantified demand for chillies of specific variety or with defined characteristics.
	Create a market facilitation cell for providing continuous support and resolving various day-to-day issues of exporters.

There is a need to improve the efficiency along with whole value chain and reduction in cost of doing business through investments in production, postharvest infrastructure, storage facilities and marketing support for promoting the export of chillies from the state.

1. INTRODUCTION

India has emerged as one of the leading producers of various agricultural products globally. This increase in production has created a marketable surplus and therefore, various Indian products need to explore global markets. However, access of Indian products in global markets has remained limited due to issues relating to competitiveness, quality, market access, and other factors (policies, phytosanitary restrictions, trade agreements, and non-tariff trade barriers) affecting exports. The supply chains of various agri-commodities have not evolved to meet the requirements of the global markets because of general inefficiencies that exist at different levels and negligence towards the understanding of the global market requirement.

The Indo-German Cooperation on Agricultural Market Development (AMD) project, therefore, is intended to support India's strategy in modernizing its agricultural markets leading to the sustainable economic growth of India's agricultural sector and improving livelihoods in the rural regions. To achieve its project activities, the project strategically endeavours promoting exchange of technical dialogues between the German and Indian stakeholders, imparting export-oriented trainings & capacity building measures, and strengthening sustainable and market-oriented value chains enabling ecosystem for Farmers Producer Organization's (FPOs). As part overarching project objectives, one of the key result areas of the project is to demonstrate with pilot activities how the integration of FPOs into sustainable and market-oriented value chains can work. During the project's inception phase (August 21 to April 22), under this result area, various analytical studies were undertaken by the project, both based on empirical evidence and providing strategic guidance. Specifically, the studies were commissioned to identify the export potential of 23 different Agri-commodities, under the frame of "One District One Product list" (listed in the project's pilot states as proposed by DA&FW¹) and assessed its export potential to the European Union markets. Secondly, State's agri-food profile assessment was carried out for Rajasthan, Odisha, and Uttar Pradesh to outline the broad contours of agri-food systems existing in the states. Furthermore, a diagnostic study was undertaken to identify the learning and challenges faced by the FPOs engaged in export-oriented activities. The findings of the different studies, later coupled with the state level consultations, the Project's Steering Committee agreed to strengthen the value chain of up to six most potential commodities in its pilot states and recommended to undertake three inclusive strategic pathways during its implementation phase (May 2022 onwards), namely-

1. Implementation of the export-oriented sustainable value chain for Mangoes and Green Chilies in Uttar Pradesh.
2. Piloting a model that would Institutionalize Agricultural Produce Marketing Committees (APMCs) as an export-oriented service provider; and
3. Supporting FPOs in development and implementation of viable export-oriented business plans in the three project pilot states.

¹ Project pilot states are Rajasthan, Uttar Pradesh, and Odisha states.

This particular study deals with the assessment of the existing value chain of Mangoes and Green Chilies in Uttar Pradesh state and recommends the development of sustainable export-oriented value chains for these two commodities. Scope of the study covers following aspects -

- Exploring commodity-wise value chain structures, activities, seasonality and the relationships among agents (Input suppliers, Government department & institutions, farmers, cold storage/warehouse, processors, commission agents, traders, wholesalers, exports, transports and logistic).
- Examining the infrastructure capacity and utilization capacities/efficiencies, testing and quality facilities, traceability, certification, packaging, labelling, logistics and transport systems.
- Examining the flow of commodities and their distribution patterns through different agents and through different channels.
- Understanding the value-added for different agents and analysing their costs, margins, profits, and losses.
- Identifying the bottlenecks, opportunities, and areas of potential improvement for export-oriented value chain development; and
- Proposing areas of interventions and strategic recommendations that strengthen and promote export-oriented value chains from pilot regions to the EU markets

The approach adopted to conduct this particular study has been discussed in the following chapter.

2. METHODOLOGY

For conducting the value chain study of mango, initially, intensive interactions were held with the ADT team to understand the overall objectives of the project. After rounds of discussion, the approach for the project was concluded, which included secondary research, a literature review and detail methodology for primary survey in the project area.

For the promotion of exports of Mango and Chilli, the project has targeted Lucknow and Varanshi clusters, and four farmers' producer companies (FPCs) have been shortlisted for this purpose. Therefore, for primary research, mango value chain stakeholders were selected from these clusters. Respondents for the primary survey included representatives of these FPCs, traders / aggregators and exporters already working in the project area.

For interactions, an interview guide was prepared in consultation with the ADT team and other consultants. These interview guides included roles and responsibilities of various value chain players, costs, margins and mark-ups at different levels, key challenges, and inefficiencies in the value chain.

Based on the analysis of secondary literature and information compiled from the field, the value chain analysis report has been prepared. The report has been divided into different chapters, such as a Review of Existing Value chain studies, Product profile, Value Chain analysis, and Proposed Interventions for Export.

3. REVIEW OF EXISTING VALUE CHAIN STUDIES

India is one of the major producers and exporters of chillies cultivated primarily by states such as Andhra Pradesh, Telangana, Karnataka, Madhya Pradesh, and Odisha. Value chain studies of chillies is extremely important to understand the price spread across the value chain and varied marketing channels of chillies. It is crucial to understand the different drivers involved in the value chain of chillies. Prominent drivers involved in the studies are farmers, traders/exporters, wholesalers, regulated market, commission agent, processors, and retailers. Few important value chain studies have been identified in the trade of chillies.

However, majority of value chain studies focus on production and marketing of red chillies. Only 10-15% of total production of chillies are sold as fresh green produce which limits the supply chain and the data and information available seems partial. According to various studies, Andhra Pradesh is the largest producer of red chillies which accounts for 26 % percent of area and 54 % percent of production in the country are from Guntur, Warangal, and Khammam in Andhra Pradesh. Sannam and Jwala variety of chillies have high demand for its competitive price, colour and pungency.

Important findings from some of these studies have been discussed here under –

A value chain study of red chillies in three major districts of Andhra Pradesh (Prabhavathi, Krishna Kishore, Dr. Seema) has given a reference that there are two important channels of marketing of this spice product existing in the state, which are as below -

- i) Channel-I: farmer – trader - wholesaler – retailer - consumer
- ii) Channel-II: farmer - processor – Retailer - Consumer

Channel I

In this supply chain the trader purchases the chillies through open auction at Regulated Markets, such as APMC in the administration of commission agent. The commission agent pays the farmer after due credit is received from the trader. In this period no interest rate is charged either to trader or commission agent which increases the opportunity cost of farmers. Without any further value addition, the raw chillies are sold through intermediary channels to other agents as per requirement.

The price spread in this supply chain is distributed as follows - farmer's share is approximately 49% while trader and wholesaler's share is 6% and Retailer's share is 13% and marketing costs incurred at all levels is equivalent to 26%.

Channel II

In this supply chain the processor [such as ITC etc.] purchases chillies directly from farmers in Regulated market through open auction method. The processor adds value to the raw chillies by processing it to different value-added products which is then packaged in variable quantities as per the market demand and distributed to retailers and supplied to customers.

The price spread in this supply chain is distributed as follows - Producer's share is 40%, while processor's share is 17%, Retailer's share is 20% and marketing costs incurred at all levels is equivalent to 23%.

A value chain study of chillies in Kurnool district of Andhra Pradesh (R Vyshnavi, Dr. A Rohini, Dr. N Deepa and Dr. R Vasanthi) has given a reference that there are five channels of marketing of chillies existing in the state, which are as below -

Channel I: Farmer-Commission Agent-Exporter-Consumer (Export Market).

Channel II: Farmer-Commission Agent-Wholesaler-Retailer-Consumer.

Channel III: Farmer-Commission Agent-Processor-Wholesaler-Retailer-Consumer.

Channel IV: Farmer-Commission Agent-Processor-Retailer-Consumer.

Channel V: Farmer-Procurement Agents of ITC-Processing.

According to author's primary research the following value chain study of **green chillies** is witnessed across rural areas -

Channel I: Farmers - village level aggregator - local mandi - small wholesalers - distant mandi - retailer

Channel II: Farmer - aggregator - large mandi - Commission Agent - wholesaler - distributor/retailer [This is visible in large areas]

Channel III: Farmer - FPO - exporter

Channel IV: Farmer - FPO - Local mandis

Summary of Value Chain Studies

As per the three different value chain studies, farmers share varies from 40% to 50% of consumer price in marketing of chillies. Most of the farmers involved in chilli cultivation are small and medium farmers. Different varieties of chillies are cultivated. Both the supply chain studies suggest that farmer's share of the market price is not adequate. Most of the valuation is lost while incurring marketing costs. This decreases the creditworthiness of farmers, and they are constantly under a loop of agricultural distress and are unable to acquire better inputs for next agricultural season.

For green chillies -

In India, different mandis in various districts across the nation showcase price variation when the green chillies arrive at mandis. For instance, modal arrival price of green chillies in Allahabad mandis is Rs 3600 per quintal while in Pune mandis the modal arrival price of green chillies Rs. 2500 per quintal. This showcases difference in price structuring and marketing channel components across different regions which also affects income of farmers simultaneously. This gap in information needs to be sorted out by policy interventions to create better opportunities for farmers.

At Production level:

Green chillies are susceptible to pathogenic variants and agrochemical residue which damages its nutrient content and colour. While disease attack is generated because of inappropriate pre-harvest methods, agrochemical residue is caused by poor farm management techniques. However, China's improved quality acts as a tough competitor to Indian chilli in the global scenario. Although various institutes have started their own testing services for exporters and entrepreneurs, they are not adequate as far as quality testing is concerned.

Studies suggest proper soil analysis and applying the right amount of fertilizers can reduce production costs. Moreover, digging a furrow which is approximately 6 inches high can reduce pest and disease problems and reduce the production cost. Chilli farmers require support for capacity building to understand the use of treated seeds, maintaining correct spacing and irrigating the crop at the recommended intervals.

At Marketing level:

Wastage of produce which is a result of improper handling of the harvest causes decrease in supply, along-with that high transportation costs, high commission charges, high loading and unloading charges all create disruption in the price spread which requires immediate attention. Post-Harvest management and marketing of the agricultural produce are the two components of the value chain where the farmers have to bear most of the costs. If such techniques can be improved, then it would positively impact the output growth as well as on the income of the farmers.

Export of Chillies

India is one of the largest exporters of Chillies. However, the overseas market seeks for reduction in agrochemical residues and pathogenic variants under sanitary and phyto-sanitary conditions. Therefore, quality assurance and maintenance of hygienic conditions in the entire value chain can ensure more export of this spice.

Comparison of Value Chain of Chillies in Bangladesh with regard to India.

According to studies, Chillies from Bangladesh are exported to around 30 overseas markets. The supply chain of chilli is hugely influenced by the chilli producer. The traders/exporters procure chilli from producers and carry those to the pack-house where the products are received and value-added activities such as, sorting/cleaning, grading, cooling, packing, transport to airport etc. are done (Chowdhury, Ahmed, Matin and Faruq). While in India the wholesalers and traders influence the price of the marketing channel.

Understanding the value chain of countries such as Bangladesh and Myanmar can help compare our policy programs and develop suitable policy interventions.

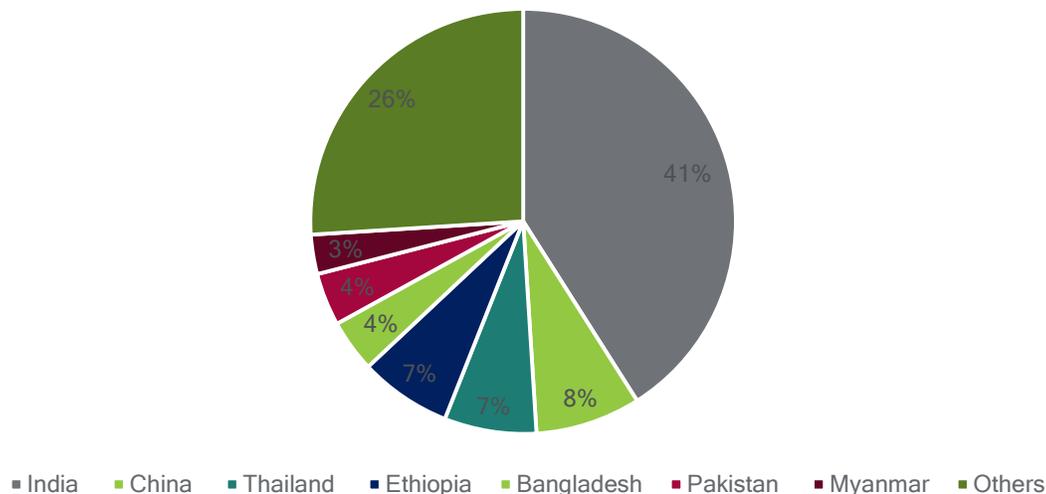
4. COMMODITY PROFILE – CHILLIES

4.1 Market Overview

4.1.1 Global Production of Chillies

India which is also known as the Land of spices as spices hold an important place in Indian diet. The spice production in India is characterized by producing 3.2 million tonnes of various spices in the world. That said, India is also one of the largest producer, consumer, and exporter of dry chillies in the world. The huge demand for Chillies is centuries old because of the many medicinal properties in them. They are useful in reducing the pain of arthritis, inflammation, burns, neuralgia, boosts the immune system and lowers cholesterol as well. Indian chillies have a dominant role to play in the international chilli market. India is not only the largest producer but also the largest consumer and exporter of chillies in the world. This spice alone contributes 42% of the total spice export quantity of the country and is ideally exported to countries like China, Vietnam, Thailand, Sri Lanka, Indonesia, and Malaysia. Indian chillies are unique because of their commercial qualities related to colour and strong aromatic taste. India is the largest producer of chillies with ~1.98 million tonnes production which is approximately 41% of the total chillies production across the globe, followed by China, Ethiopia, Thailand, Pakistan, and Bangladesh.

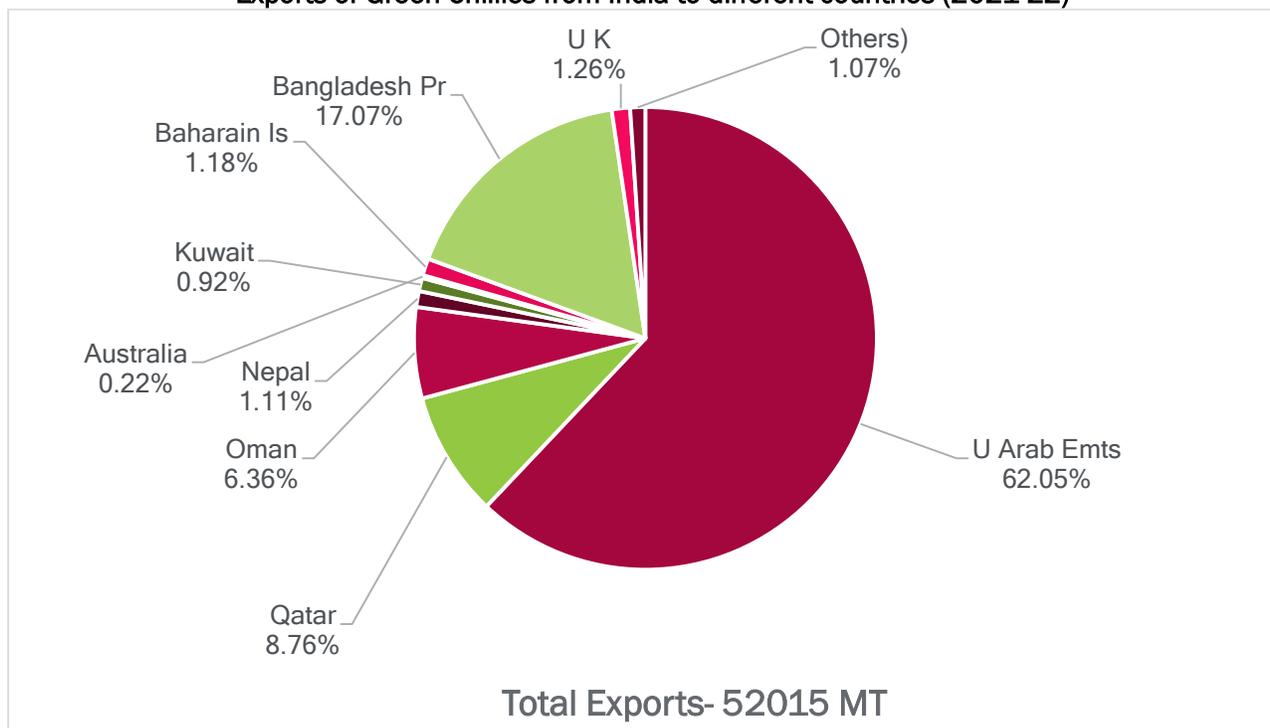
Country-wise share of Chillies Production in 2020-21



Source: fao.org/faostat/en/

Surprisingly, export of Indian red chillies has soared to a record as China's demand for such spices has skyrocketed up by huge quantities. For this reason, importers, traders and retailers have built huge stocks to prepare themselves for any disruption caused by the COVID-19 pandemic, as noted by traders and industry experts. In the recent years, Chinese subcontinent have taken a fancy to Indian chillies, because of which this single country itself accounts for nearly half of the export of this spice product.

Exports of Green Chillies from India to different countries (2021-22)



(Source: tradestat)

The production fluctuates widely between years in India and India annually exports approx. 45,000 - 50,000 tons of green chillies a year. The export of green chillies during 2021-22 has been an all-time high both in terms of volume and value and the export has been 52015 MT valued at Rs. 30732 lakhs in 2021-22. The major exported countries were UAE 62.05 per cent (32276 MT), Bangladesh 17.07 per cent (8879 MT), Qatar 8.76 per cent (4557 MT), Oman 6.33 per cent (3308 MT) and UK 1.26 per cent (656 MT)². The quantity and value wise exports of green chillies from India to different countries are provided in the below table³.

Country wise Export of Green Chillies from India (Quantity in tons and Value in lakhs)

S.N	Country	2017-18		2018-19		2019-20		2020-21		2021-22(EST.)	
		QTY (in MT)	VALUE (in Lakhs)								
1	U Arab Emts	24378	13017	23309	12111	28710	16405	31871	20191	32277	20945
2	Qatar	2731	1687	3523	2062	3749	2316	4508	3142	4557	3415
3	Oman	3524	2243	4545	2630	3276	2002	3224	2128	3309	2094
4	Nepal	509	104	768	74	2184	279	735	102	577	65
5	Kuwait	70	36	24	16	8	3	29	25	477	306
6	Australia	148	122	103	111	149	156	192	195	115	133
7	Baharain Is	1602	759	1414	774	1080	644	821	632	613	424
8	Bangladesh Pr	12756	2221	3334	622	842	186	49039	10918	8879	2124
9	U K	2412	2138	1958	2131	2647	2768	1092	1343	657	890
10	Others	811	614	1016	776	1768	1216	777	691	556	337
Total		48942	22940	39993	21309	44413	25976	92289	39366	52016	30732

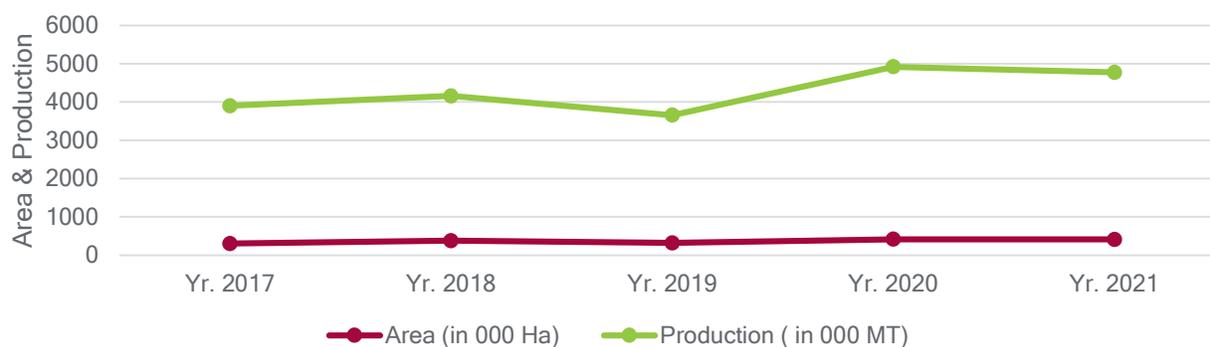
² http://www.indianspices.com/sites/default/files/Major_Item_Country_export_2021-22.pdf³ <https://tradestat.commerce.gov.in/eidb/ecomcnt.asp>

Another factor which caused the rise in exports was inability to process chillies in the country because of lockdowns and other COVID-19 restrictions which made it easier for countries like China, Thailand and Myanmar to put up factories for processing raw chillies from India.

4.2 Indian Production of Chillies

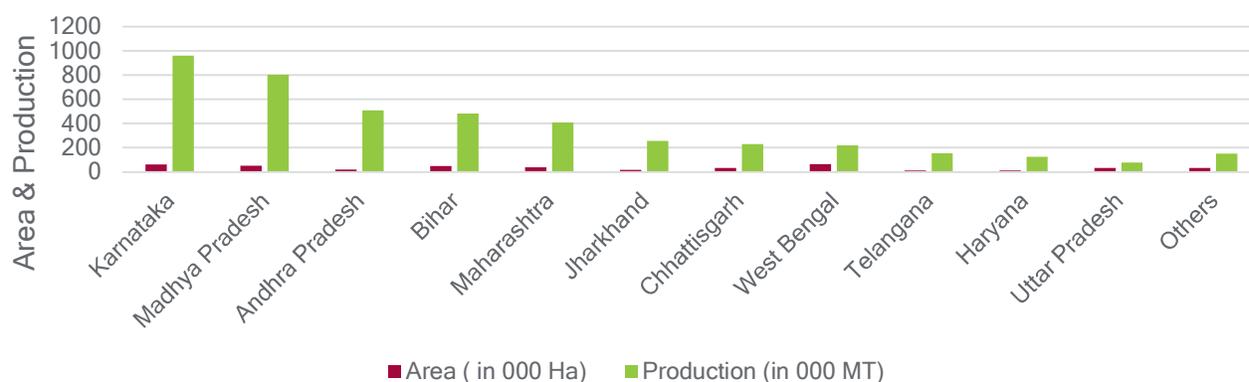
India is the largest producer and consumer of Green Chillies in the world. Green chillies production has increased significantly in the past decade. The rise in output was primarily on account of rise in yields. However, Green Chillies production has moderated in 2017-18 due to adverse weather conditions as shown in the graph below. Total production in India during 2021-2022 was estimated to be 4,363,170 MT from an area of 410,900 Ha with average productivity of 10.62 MT/ha according to the Department Of agriculture & Farmers Welfare. Numerous varieties of Chillis are grown in almost all states in India. Karnataka ranked highest in the list in green chilli production during 2021-22, with a share of 22 per cent (959,010 MT) followed by Madhya Pradesh at 18.39 per cent (801970 MT) and Andhra Pradesh placed the third position which contributes 11.62 percent (506870 MT) and Uttar Pradesh produced 151000 MT within the area of 30970 Ha and Bihar, Maharashtra, Jharkhand, West Bengal, Chhattisgarh, Telangana, are also among the major producers

Trends of area and production of Green Chillies in India



(Source: Department Of agriculture & Farmers Welfare)

State-wise Area and Production of Green Chillies in India (2021-22)



(Source: Department Of agriculture & Farmers Welfare)

Varieties

It is amusing to state that there are more than 400 different varieties of chillies found all over the world with few of the hottest chillies being grown in India. Spice Board of India identifies 18 varieties of chillies that are grown in different parts of the country. The following table encapsulates the varieties of chillies found across India.

S. N	State	Variety
SOUTH ZONE		
1.	Andhra Pradesh	Jwala, X-235, G-1, G-2, G-3, G-4, G-5, LCA-205, 206, 235, Karakulu, Sannalu, Dippayerupu, Punasa, Maduru, Pottibudaga, Hybrid, Bharat, Aparna, Pottikayalu, Cullakayalu, Barak, Mota, Chapta, Desi Sindu, Kiran, Chikkaballapur (Lavangi), Sapota.
2.	Karnataka	Jwala, Bayadgi, G-1, G-2, G-3, G-4, G-5, Pusa Jwala
3.	Kerala	Jwala, Sadabahar, Champa, CO-1, Nandan, K-1
4.	Pondicherry	K-1, K-2, CO-1, CO-2
5.	Tamil Nadu	K-1, K-2, CO-1, CO-2, CO-3, PMK-1, PMK-2, Borma Wonder, Sannam, Palam
II NORTH ZONE		
6.	Bihar	Rori, Moti Mirchi, Chittee
7.	Haryana	NP-46-A, Pusa Jwala, Pusa Summer
8.	Himachal Pradesh	Solan Yellow, Hot Portugal, Pachad Yellow, Sweet Banana, Hungarian Wax, Punjab Lal
9.	Jammu & Kashmir	NP-46-A, Ratna Red, California Wonder
10.	Punjab	CH-1, Sanauri
11.	Uttar Pradesh	NP-46, Jwala Pant C-1, Desh, Pahadi, Kalyanpur, Chaman and Chanchal.
III EAST ZONE		
12.	Assam	NP64-Am Pusa Jwala, Surya Mukhi, Krishna, Balijuri
13.	Tripura	Jwala, Suryamukhi, Krisha, Balijwai
14.	West Bengal	Siti and Suti, Akashi, Kajari, Bow, Dhani, Bullet, Dhala.
IV WESTERN ZONE		
15.	Goa	Cacana, harmal, Tanvati, Lavangi
16.	Gujarat	K-2, Pant C-1, Jawahar-218, NP-46-A, Jwala.
17.	Rajasthan	CH-1, NP-46-A, Jwala, Pant C-1, G-3, G-5
IV CENTRAL ZONE		
18.	Madhya Pradesh	Pusa Jwala, Sona-21, Jawahar, Sadabahar, Agni.
19.	Maharashtra	Pathori, Bugayati, Dhobri, Black seed, Chaski, Bhiwapuri
20.	Orissa	Jwala, Deshi, Sadabahar.

(Source: agmarknet.gov.in)

However, at commercial level, farmers use chilli varieties marketed by private sector seed companies. In market, there are dozens of private sector seed companies marketing 100s of different varieties.

Chillies arrive into markets in gunny bags carrying a weight of 30-40 kgs. Farmers dry the chillies and store them in gunny bags only. Generally, the produce is brought to markets in the peak season for sale. Arrival into the markets is largely influenced by prices. Wherever the information network

seems appropriate, farmers avail the information regarding prevailing prices in the market before disposing off the goods.

4.3 Production Chillies in Uttar Pradesh

4.3.1 Area and Production

Uttar Pradesh has huge potential in cultivation of green chillies as it one of the largest states in the country and has a large demand for chillies as compared to other states. Suitable agro climatic zones, fertile soil and adequate water availability makes it a perfect avenue for horticulture crops. According to the Department of Agriculture & Farmers Welfare, Uttar Pradesh also listed in the major producing state in the country as already discussed in the above section, it has 13547 Ha of area under production and is producing 11808 MT (2019-20) of Chilli in the state of Uttar Pradesh. The following table shows that district wise area and production of Chillies in Uttar Pradesh where Firozabad district is the leading producer of chillies in the state which contributes the production of 2021 MT followed by Kanpur Nagar (1308 MT) and Varanasi produced 393 MT and so on during FY 2019-20.

District wise area and production of Chillies in Uttar Pradesh							
S. N	District	2017-18		2018-19		2019-20	
		Area (Ha)	Production (Tonnes)	Area (Ha)	Production (Tonnes)	Area (Ha)	Production (Tonnes)
1	Agra	391	361	330	305	353	308
2	Allahabad	122	113	123	113	123	107
3	Bahraich	163	150	158	146	137	119
4	Barabanki	300	277	298	275	109	95
5	Bareilly	157	145	148	136	291	254
6	Budaun	164	151	158	146	167	146
7	Bulandshahr	352	324	353	184	140	122
8	Etah	133	123	198	183	365	318
9	Etawah	111	102	101	93	156	136
10	Farrukhabad	156	144	171	158	131	114
11	Fatehpur	2438	2249	2445	2259	197	172
12	Firozabad	1498	1382	1520	1404	2319	2021
13	Ghazipur	312	288	308	678	1475	1286
14	Hamirpur	277	256	83	77	316	276
15	Hardoi	244	225	392	362	260	227
16	Hathras	169	156	246	227	251	219
17	Kanpur Dehat	143	132	151	140	162	141
18	Kanpur Nagar	1462	1348	1494	1380	1501	1308
19	Kaushambi	327	301	303	280	313	273
20	Kheri	200	184	179	165	156	136
21	Mainpuri	140	129	151	140	160	140
22	Mirzapur	699	645	625	577	753	656
23	Moradabad	289	267	317	293	256	223
24	Muzaffarnagar	483	446	117	108	133	116
25	Rae Bareli	528	487	442	158	474	413
26	Sambhal	101	93	496	458	568	495
27	Unnao	400	369	540	499	414	361
28	Varanasi	445	410	435	402	451	393
30	Others	1436	1323	1481.00	1370	1416	1233
Total		13640	12580	13763	12716	13547	11808

Source: Department of Agriculture & Farmers Welfare

4.3.2 Chilli Crop Seasonality

Climatic conditions and global demand-supply are the major variables that is reflected on chillies strong pungency and price. Since India is the largest producer and consumer of chillies, any decline in output would have an immediate impact on prices. The crop is available throughout the year in majority of India. The major harvest season is between December-March with supply reaching peak levels in February-April. Planting is held mainly during August-October.

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

Sowing	
Harvesting	

5. VALUE CHAIN ANALYSIS

5.1 Major Actors in Value Chain

In Uttar Pradesh, green chillies play a vital role in the diet of the population. Although its demand has changed gradually over time the supply chain actors have more or less remained the same. The land size has reduced due to family bifurcations over time. In Uttar Pradesh, green chili is mostly cultivated on smallholder and Marginal farms. It has been observed during field visits farmers have found it hard to access the latest farming inputs and technologies. This has resulted in small harvests, low-quality chili crops, and, consequently, a low income for farmers and their families. Green chilli directly sells in the market as a fresh variety. Additionally, farmers as faced challenges at the marketing level due to an unorganized chillies market. According to the chilli value chain in India, the following actors play important roles –

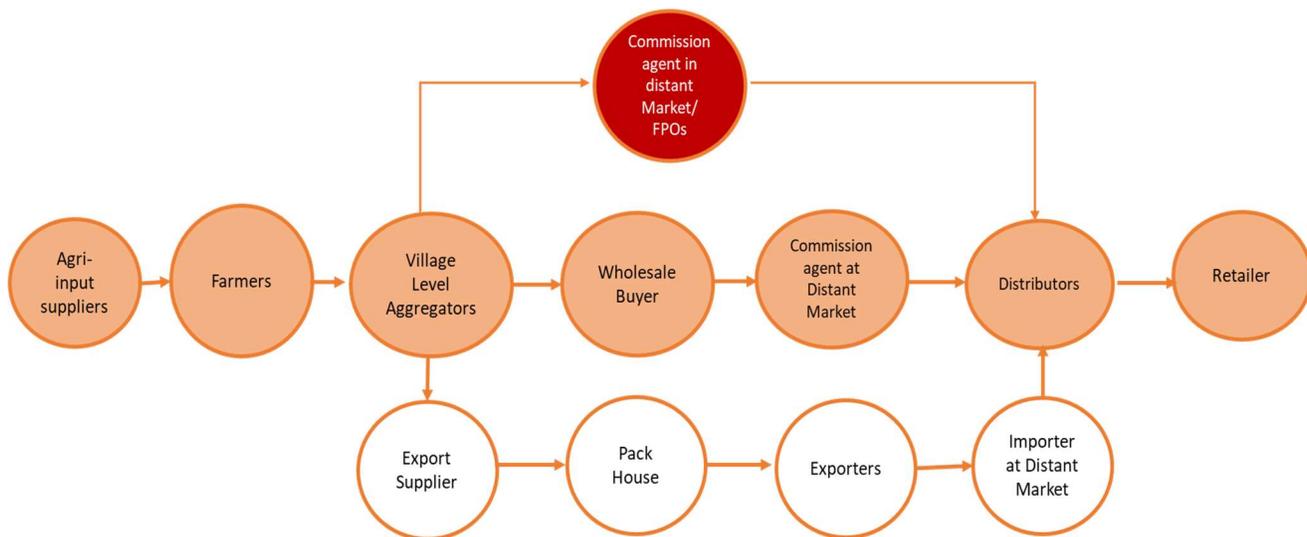
Actor	Profile and Role & Responsibilities
Agri-input dealer	<p>Chilli is a highly disease and pest susceptible crop, therefore, the input need for the crop is high. Starting from Seed, insecticides, fungicides and weedicide, all types of chemicals are used in the chilli cultivation.</p> <p>Agri-input dealers not only sell the required inputs to the farmers, to certain extent they are also advisors to the farmers on agri-input purchase.</p> <p>In case of chilli, most of the seed varieties are developed by the government research institutions. Major seed suppliers are State Seed Corporation and a large number of local seed companies.</p> <p>In absence of a lack of chilli crop-specific documented protocols for use of important brands, agri-input dealers and retailers are the main influencers to farmers on the use of these pesticides.</p> <p>Agri-input dealers also finance the agri-inputs, as large volumes of these inputs are given on the credit to the farmers. In all, agri-input dealers and retailers are highly influencing actor of the chilli supply chain.</p>
Farmers	<p>It has been discussed, chilli is a disease-prone and weather-sensitive crop; chilli production at times is a high-risk crop for farmers. Although in the cluster, most of the farmers cultivate chilli, however, there is wide variation in crop cultivation practices adopted and yield achieved by progressive ones compare to the others.</p> <p>In addition to high inputs, chilli is also a relatively labour-intensive crop as well. Starting from land preparation, sowing, fertilizer application, disease and pest management, weed management, harvesting etc., all the activities need good number of labours, which are managed by the farmers and the family.</p>
Local Aggregators	<p>In the project cluster, most of the chilli producers directly sell to the local mandi. Local aggregators are not very significant actors; however, a small quantity of chilli is marketed through them. These aggregators basically purchase products from small and marginal farmers, who have small quantities. For these farmers, taking it to the market generally costs higher.</p>

Actor	Profile and Role & Responsibilities
	<p>These aggregators collect chilli from farmers' field/homes and transport it to markets for further selling. Sometimes, these aggregators work on behalf of large traders for procurement.</p> <p>Local aggregators generally earn their margin through price differences at the village level and in the major market.</p>
Commission Agents	<p>Regulated markets are the major place for the marketing of chilli. In regulated markets, commission agents play role of transaction facilitators for the farmers through auctioning. The commission agent assures payment to the farmer on behalf of the buyer.</p> <p>Additionally, commission agents also fulfill the credit need of the farmers, either by giving a guarantee for the purchase of agri-input or providing funds as and when required for household needs (such as family functions and festivals etc.)</p>
Wholesalers/ Retailers	<p>Wholesalers purchase the chilli in the regulated markets (mandi) through auction and supply it to processors. Some wholesalers also have direct relations with the farmers and procure directly from the field.</p> <p>Wholesalers generally earn their margins through differences in the purchase price and selling price.</p> <p>wholesalers, after purchasing through auction, supply fruits to retailers, including organised players and online retailers.</p>
Market committees	<p>Agricultural market committees facilitate and regulate the trade of chilli (along with other agricultural commodities) in major production clusters. Market yards, having shops and sheds are provided by the market committees for conducting the transactions. Officials from committees ensure fair and transparent auctioning and record each transaction. In addition, market committees contribute in providing market price information to different stakeholders and online platforms such as www.agmarknet.nic.in.</p>
Pack-house operators	<p>For exporting Chilli, it shall be packed at APEDA certified pack-house having the adequate facility to packing of chilli as per the requirement of the destined market however, the export demand of green chilli is very limited and most are consumed in domestic market.</p>
Extension services providers	<p>For promoting improved production practices and training farmers on various other aspects, different government agencies are working in the field. National Research Centre for Seed Spices (ICAR), Ajmer, Krishi Vigyan Kendra (KVKs), at the district level and State Agricultural Universities are the key agencies providing extension services. In addition to the government agencies, some NGOs and private agencies (under CSR initiatives) also provide extension support to the farmers.</p>
Farmers Producer Organisations	<p>Farmers producer organisations (FPOs) are relatively very new institutions in chilli value chain. At this stage, most of the FPOs (in selected production cluster of Uttar Pradesh), working in chilli value chain are of nascent stage. Current</p>

Actor	Profile and Role & Responsibilities
	role is mostly limited to providing agri-inputs and marketing of small quantities of chilli in the market. It is expected that with government thrust on promotion and strengthening of FPOs from government side and also support extended by various private sector players, over period of the time, these institutes will have significant role in the complete value chain.

5.2 Commodity Flow Analysis

Approximately 99% of green chillies⁴ is sold in the domestic market, therefore the flow of product is predominantly controlled by the domestic supply chain players. Within the domestic supply chain, there are different channels by which chillies are made available to consumers. Ideally for chillies the following supply chain is presented in diagram below:



5.2.1 Domestic Supply chain –

In the domestic supply chain of chillies, there are multiple channels, out of which some are traditional ones and others are evolving channels as new institutional mechanisms are emerging and new players are entering the market. Most common channels have been discussed here under:

Channel 1: Marketing through commission agents in markets – This channel is the most common and dominant supply chain system for marketing chillies in Uttar Pradesh and controls as much as 80% of the total supply. Commission agents have licensed brokers in the regulated market, who take approximately 3% commission from farmers on the sale of the produce at relevant price, by treating a competitive environment between the (traders, wholesale, and processor) purchasers during the price evolution process. Commission agents are not directly involved in the trade process but facilitate trade process by arranging weighing machines, hamalli, transport and credit to the

⁴ Research paper- Prabhavati Krishna Kishor, Dr Seema

farmer, however, the numbers of commission agents working for green chilli in market are in small numbers as compared to the large numbers of producers in the district.

Although on the ground, this channel looks very rudimentary and rustic, as the supply chain players generally do not have any infrastructure for sorting/grading and packaging, most of the activities are performed at the farm level itself in open field manually by unskilled / semi-skilled laborers. However, the channel is most efficient from a financial perspective as there is hardly any overhead. Commission agents at markets generally do not add any physical value addition to the product but they take a guarantee of payment from the market (traders/wholesalers etc.) and supply the produce to the distributor.

Channel 2: Marketing through wholesale buyer– Wholesale buyers are the functionaries who purchase large quantities and sell them in bulk to commission agents at distant markets which then reach the distributors/retailers via channel 1. There are very few wholesalers belonging to local areas. For distant wholesalers depend on traders for purchasing these products as storage is the main constraint for them due to the perishability nature of the products. This is the major reason why transporting and bulk handling of products has become a huge challenge.

Channel 3: Marketing through exporters – This marketing channel is very limited as most of the green chili is consumed at the domestic level. For the export market, Primary processing like shorting, grading and packaging of green chilli happened through APEDA-authorized packhouses only. Uttar Pradesh is

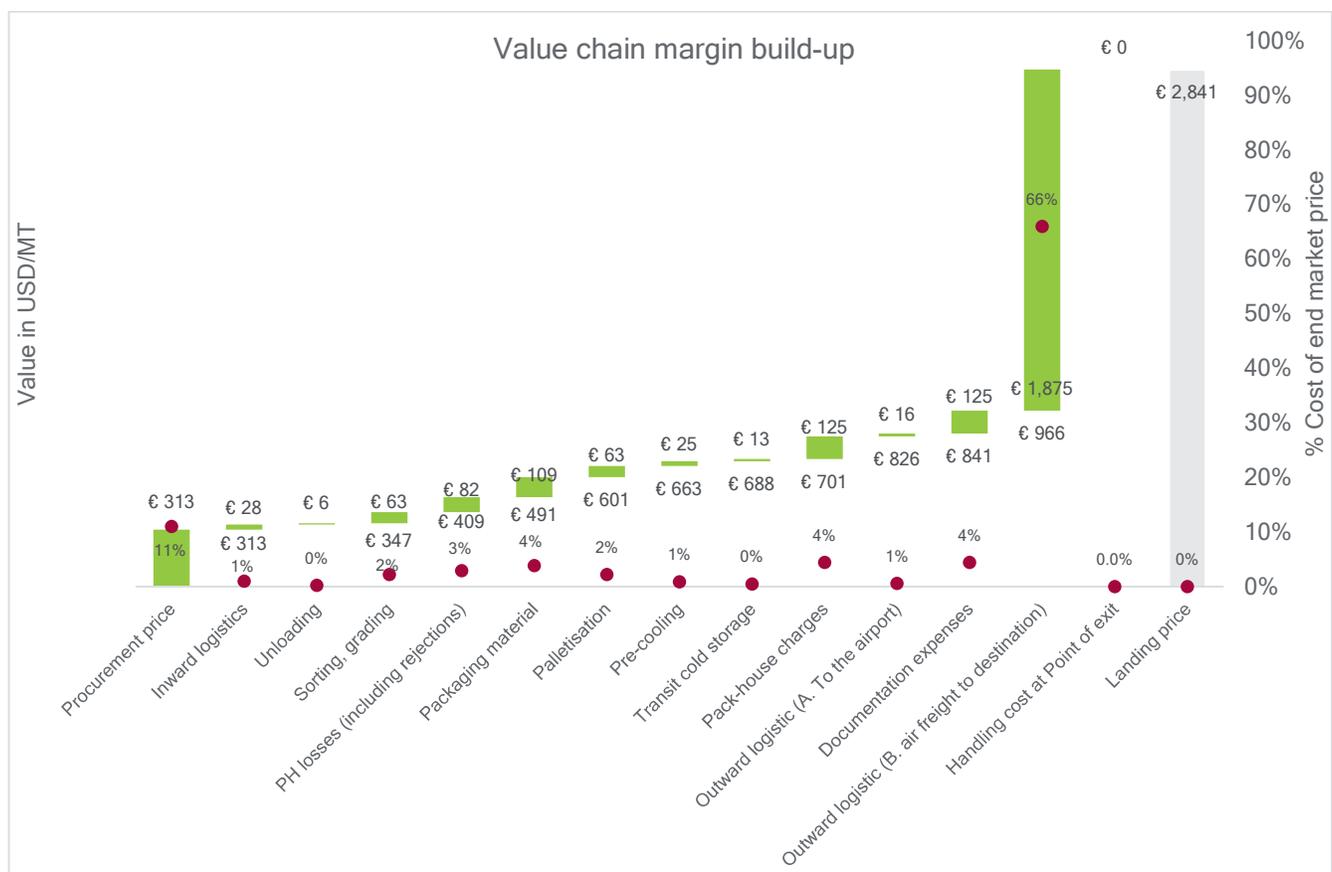
5.3 Price mark-up for Green Chilli

For estimating price markup at different stages of the chilli supply chain, two approaches have been used, one, by taking inputs from previous studies and second, by primary interaction with supply chain stakeholders. Specifically, for the cost of production, secondary information has been used. Major observations of cost mark-up are as under –

- The procurement price of chilli at the farm gate is around Rs. 25 per kg (€ 0.31).
- For inward logistics, trucks carrying load of 1 tonne to 1.5 tonne is used to transport chillies in gunny bags (30-40kg per bale) which comes to around Rs. 2.25 per Kg (€ 0.03).
- At APMC, primary Sorting and grading is done to check the quality of chillies before being supplied to distributors. By adjusting all these expenses sorting and grading costs around Rs. 5.00 per kg (€ 0.06 per Kg), however, this purely depends on market price realization.
- Probability of Rejection that happens due to damage of goods while handling and transporting is adjusted to around 20-25% which is adhered according to the sanitary and phyto-sanitary conditions. This is estimated to be between Rs. 6.55 - 8.19 per Kg (€ 0.08 - €0.10 per Kg).
- Exporter or export facilitator charges for pack-house operation. This includes the cost of inward transportation, sorting-grading, packaging and margin of the pack-house operator.
- One of the major cost components is the packaging material, which includes the cost of boxes and pallets etc. The total cost of packaging material is calculated at Rs. 8.75 per kg

(€ 0.11 per Kg). Cost of packaging material also varies depending upon packaging size and quality of packaging material.

- A small expense is incurred if chilli is pre-cooled or kept in transit cold storage to make a lot at the pack-house. Additionally, export also need to pay for documentation, which are organised by C&F agents. All these costs add to Rs. 7.50 – 8.00 per kg (€ 0.10 per kg). For transit storage and handling charge by pack house is approximately Rs. 10.00 per kg (€ 0.13 per kg)
- Biggest expense in the export supply chain of chillies is air freight from the sourcing country to the destination country. Approximately, this is Rs. 150.00 per kg (€ 1.88 per Kg) which is around 66% of the total cost of landing. A small amount is incurred at the destination port for handling of material.



The approximate landing cost of green chilli to Europe is approximately Rs. 227.00 per Kg (€ 2.84 per Kg) and based on these cost estimates, exporters further negotiate their price in the importing market. Given that the biggest differentiator of cost is air freight, large exporters try to negotiate hard with air carriers in advance as well as based on bulk booking in advance. Small exporters are not able to compete on cost optimization with large exporters.

5.4 Gaps in the Value Chain

Major problems faced by farmers and traders dealing with the marketing of green chilli was the lack of primary processing units. Due to the perishable nature of the product, it required timely delivery

to the end users. Other constraints are also affected in the value chain such as the monopoly of few middlemen in the market, lack of marketing information, lack of transport facilities etc. The numbers of commission agents working for green chilli in the market are in small numbers as compared to a large number of producers in the project area.

Export value chains are not very well structured and therefore, there are wide gaps at different stages, which need to be addressed to build an export-oriented value chain. During discussions with different stakeholders, these gaps were highlighted by the stakeholders in different manners and have been compiled here under-

Production Gaps:

Some of the important gaps highlighted at the production level by the stakeholders are as under –

- i) **Inadequate or excessive rainfall**– in the primary survey as well as in secondary research, this point was highlighted very prominently that a large number of chilli growers at project area complained of fluctuating nature of rainfall which damaged the crop.
- ii) **Pest and disease attack** – As chillies are highly disease and pest-susceptible crops, a small negligence in their maintenance can lead to huge damage. Due to lack of knowledge, Chilli farmers raised serious concerns about pest and disease management.
- iii) **Low productivity**- In absence of a scientific approach, pesticides (insecticides and fungicides) are used indiscriminately, which makes the produce residue laden.
- iv) **High Labour Cost** – Due to high labour intensive, the availability of manpower is limited especially season time, which impacts high on labour cost.
- v) **Access to finance** – There are very few organized credit facilities available for small and medium farmers. Despite that due to several documentations work it becomes difficult for small and medium farmers to provide substantial information and collateral for agricultural credit.

Harvest and Postharvest Management Gaps:

Due to lack of knowledge, most of the farmers do not follow the correct practice at the harvesting stages. Farmers are harvesting the crop before maturity and it has affected the quality of the crop. After harvesting, crop handling and transportation is one of the major challenges due to damages and degrading of quality for long transportation periods. There is a poor understanding of these aspects at the ground level amongst farmers and aggregators. Some of the specific challenges at this stage are as under –

- i) **Poor Sorting & Grading practices** – After harvesting, preliminary sorting & grading of green chillies is done by semi-skilled labour. For this, make-shift arrangements are used on the floor itself. This practice makes chillies vulnerable to various forms of damage and fungal infections. Additionally, the sorting & grading criteria are very limited such as size and colour, however, for export, sorting & grading need to incorporate many more criteria including maturity level, acidity content, chemical testing of chillies before harvesting etc.
- ii) **Lack of infrastructure for sorting, grading and packaging** – In Uttar Pradesh, setting up of large-scale infrastructure for sorting, grading and packaging by the private sector is not feasible. Therefore, to trigger the exports, initially, the government needs to take initiative in developing

these facilities. Once the minimum required volume for export is arrived at, private sector players may find it feasible to invest in pack-houses infrastructure.

Marketing Gaps:

Some of the specific marketing gaps, highlighted by the stakeholders are as under –

- i) **Lack of marketing information:** Due to lack of market information regarding prices, arrivals etc., prevailing in other markets, producers sell chillies to the aggregator directly.
- ii) **Adoption of grading:** Grading of green chillies ensures better prices for producers and better quality for consumers. However, the existing local markets are lagging behind in providing grading services.
- iii) **Inadequate cold storage & processing units:** Due to inadequate cold storage facilities, farmers are forced to sell their produce at lower rate or even at distressing rate.
- iv) **Training of producers:** The farmers are not properly trained in harvesting, and marketing Chillies. Training will improve their skill for better marketing of their produce.
- v) **Infra-structure facilities:** Due to inadequate marketing infra-structural facilities with producers, traders, and at the market level, the marketing efficiency is affected adversely.
- vi) **Landlocked production cluster and distance from the ports:** Chilli to Arab countries is transported through sea route from Mumbai or Mundra. This needs transportation of chilli in refrigerated containers from production cluster of Varanasi to pack-houses near these ports. This not only costs extra for the traders/exporter but also, has adverse impact on quality of the product.

6. RECOMMENDATIONS

6.1 Conclusion

Export of chillies from Varanasi (Uttar Pradesh) cluster is an opportunistic export and is possible only when there is price advantage compared to other production clusters of Maharashtra, which are otherwise nearer to the ports. Current exports of chillies are mainly to gulf countries only. Exports to European markets has been miniscule only.

However, the cluster can develop itself as Chilli export hub for Europe, as in case of transportation of chillies to Europe is mostly through the air and the price disadvantage of landlock cluster can be resolved.

With this background, to develop a competitive export hub for Chilli, the project shall adopt to a cluster approach and an intensive chilli production cluster shall be developed, which has all the characteristics and ecosystem for export. With this background, the following recommendations have been suggested for the project –

At the production cluster level –

- Identification and Promotion of chilli varieties suited to the destined market – Current varieties grown in the production cluster have become popular purely based on their yield levels and local market preferences. These varieties may not suit the market demand of Europe. Therefore, there is a need to assess the compatibility of existing varieties as well as the requirement for the promotion of desired varieties in the production cluster.
- Training on the improved package of practices (PoP) qualifying GAP certification – Farmers in the clusters have been practising the traditional packages of practices for chilli cultivation in the area. The project shall work on developing improved packages of practices, which ensure quality of chilli as well as adherence to the required level of pesticides and chemical residues in the product. Adequate PoPs can also help in getting these fields certified for GAP certification and other certifications, which are pre-requisite for the markets.
This single intervention will help in reducing the risk of rejection of material at the market end. Exporters shall support farmers in availing international certification schemes of the government departments and receiving financial benefits, if available.
- Reduction of cost of production – to remain competitive in the market, the cost of production of chilli in the cluster shall be substantially low compared to other competing clusters. To achieve this, multiple interventions are required at the field level –
 - Promotion of nurseries – this will help in increasing the yield levels and also controlling disease and pests in a much more effective manner at the early stage of production
 - Adoption of improved production technologies – use of drip irrigation, fertigation mechanism, use of modern machinery for pesticide spraying etc. can save a lot of labour required for different activities. These technologies can also help in increasing the yield and therefore in reducing the unit cost of production of chilli. Project can facilitate setting-up chilli production-centric Custom Hiring Centre (CHC) to make improved machinery affordable for small and marginal chilli producers.

- Weather advisory – Given that chilli is disease sensitive crop and most of the pests and diseases have a relation with the local weather conditions, appropriate advisory on time can help in taking precautionary measures.
- Much better pre-truck sorting and grading – Farmers shall be made aware of importance of proper sorting and grading of chillies at the farm level. This can help farmers in realising better prices and can help buyers in saving on these activities in the market, where the labour is costly.
- Training in appropriate harvest and post-harvest handling – for maintaining the quality of chilli, proper harvesting and post-harvesting handling is crucial for maintaining the quality of product during transportation. Chilli shall be transported in crates with proper aeration to avoid exothermic reactions and temperature increase, which trigger maturity and rotting of the chilli.
- Exporters and buyers need to integrate themselves into production decisions more closely and work closely with producers

FPCs in the Varanasi cluster have good exposure of working as back-end suppliers to exporters of chili and other vegetables and understand various aspects of export requirements. Therefore, for implementing various production-level activities of the project, these FPCs shall be partnered, and their capacities and capabilities shall be enhanced to ensure the effective implementation of these activities. For enhancing the capabilities of FPCs, a technical agency can be linked to the FPC with clear deliverables for the project period.

At post-harvest and packaging level -

- Post-harvest activities for handling of chilli starts from field itself. In Varanasi cluster, given that farmers have small-landholding, individual farmer cannot afford to create any kind of post-harvest infrastructure. Also, these small holdings create a challenge for buyers in collecting the produce from the individual farm. This requires the establishment of a community-level/collective collection centre near the farm-gate. These collection centre can have basic infrastructure of concrete floor, proper shed, required number of crates, weighing machine etc. Buyers/exporters or FPOs can be linked to these collection centres for aggregating the small quantities of chilli from individual farmers in an efficient manner.
The project shall facilitate in creation of these infrastructure by convincing farmer's groups, providing technical help in designing and sizing of CC infrastructure, helping them in getting financial assistance available through government schemes etc.
- Training of logistic services providers on appropriate packages for handling chilli during transportation.
- Currently, large exporters after purchasing the chilli from Uttar Pradesh, take it to pack-houses in Maharashtra. The absence of pack-houses at the local level demotivates local traders and FPOs to participate in direct exports. Therefore, the project shall facilitate the local FPOs in setting up a state-of-the-art pack-house for handling vegetables, including chilli. The pack-house shall be a multiproduct facility for optimising capacity utilisation.
- Developing a trained cadre at the local level, which has an understanding of fresh logistics, operation of pack-house, quality specification of various products for exports, supervision of

packaging, and documentation requirements for export handling and familiarity of various terminologies used in export business. This trained cadre can help exporters and FPOs in managing logistics and the operation of exports.

Project shall create a technical assistance cell and shall work on a cluster-based approach for providing various technical support to potential entrepreneurs and FPOs for setting-up modern and export compliant logistic and pack-house infrastructure.

Marketing support -

Marketing of chilli in export markets need detail understanding of the markets including terms of trade. This needs handholding support for new entrepreneurs including FPOs trying to access these markets. For this, the project shall create provision on the following aspects -

- Developing partnerships between different stakeholders, such as FPOs, exporters, transportation & logistic services provide, C&F agents etc. at the domestic level for easing the business process.
- Facilitate market linkages by organising physical or virtual buyer-seller meets for new exporters/suppliers.
- Develop a market profile with quantified demand for chillies of specific variety or with defined characteristics. There can be periodic updates (quarterly) to enable new entrepreneurs in planning their supplies.
- Create a market facilitation cell for providing continuous support and resolving various day-to-day issues of exporters.
- Take-up any innovative activity, which can facilitate / trigger the export of chilli.

Market facilitation will need partnerships among various agencies at the international, national, state, and local levels. This may include APEDA, customs officials, Airport officials, Quarantine officials, bank representatives, and others. Project shall facilitate this coordination by constituting a committee at the cluster level.

7. Actionable Interventions

Stage of Value Chain	S. No.	Proposed actionable intervention	Responsibility
Pre-harvest	1.	Development and Introduction of export-oriented agronomical practices	Indian Institute of Vegetable Research, Varanasi
	2.	Promoting required certification at the field level (Global GAP / EURO Gap / APEDA certification / any other)	Indo-German Cooperation on Agricultural Market Development, APEDA and State Horti dept
	3.	Developing a mechanism for product traceability	-Do -
	4.	Selection and promotion of varieties compatible with importing market	Indian Institute of Vegetable Research, Varanasi
Post-harvest	5.	Cluster-based multi-product pack-houses	Directorate of Agricultural Marketing and Foreign Trade and APEDA
	6.	Financial and institutional support for export-oriented (Air/Sea) logistic protocol	Directorate of Agricultural Marketing and Foreign Trade and APEDA
	7.	Product and market-based innovative packaging material	Indian Institute Packaging and Industry expert
Market development	8.	Product promotion in the destined markets	Indo-German Cooperation on Agricultural Market Development- APEDA
	9.	Market identification for an exclusive window	