CEE

Centre for Environment Education

Towards Green and Socially-Sound Recovery in Rural and Farm Sector

CASE STUDY OF CHILLI FARMERS IN CHOTILA BLOCK, DIST. SURENDRANAGAR, GUJARAT

Photo : Navneet Wadkar

ABOUT US

Centre for Environment Education (CEE) was established in 1984 as a Centre of Excellence of the Ministry of Environment and Forests, Government of India. As a national institution, CEE's mandate is to promote environmental awareness nationwide.

CEE develops innovative programmes and educational material and builds capacity in the field of Education for Sustainable Development (ESD). It is committed to ensuring that Environmental Education (EE) leads to action for sustainable development. It undertakes field projects that demonstrate and validate the role education can play in sustainable development.

With partners including State Governments, Foundations and Corporates through CSR funding, CEE has undertaken projects in rural and urban development, waste management, biodiversity conservation, quality improvement in school education, marine conservation and others. Working with the government, CEE has made significant contributions to international negotiations in the area of ESD.

ACKNOWLEDGMENTS

Our sincere thanks to our partners: Mr. Shantaram Pandere and Ms. Mangal Khinwasara (Lok Paryay, Aurangabad), Mr. Mahesh Patankar (MP Ensystems, Mumbai), Mr. Manish Rajanakar, Mr. Patiram Tumsare, Ms. Shalu Kolhe & Mr. Nandlal Meshram (Foundation for Economic and Ecological Development) for their domain expertise and facilitation, and Mr. Ravi Thombade, Ms. Vijaya Padekar, Mr. Shripad Konde, Mr. Eknath Bagul and Mr. Appasaheb Ghadage for community level data collection in the different clusters across Maharashtra and Mr. Subodh Kumar for Bihar.

We would also like to express our gratitude towards the Forest Department, Kalsubai Harishchandragad Wildlife Sanctuary, Govt. of Maharashtra; PO, Aurangabad, Tribal Development Department; DFO Aurangabad, Fisheries Department, Dr. Ramchandra Sabale; Mr. Kiran Auti, Gramoorja Solutions Pvt. Ltd., Pune, Mr. Nitin Ingale, Mr. Nikhil Padole from Knitcon Solutions pvt. ltd. Pune and Ameya Kekare, Studio Indesign, Pune from Maharashtra. From Gujarat viz. Agriculture Department, Jasdan, APMC Jasdan, APMC Gondal, Agriculture University, Junagadh; Agriculture University, Anand; Agriculture University, Navsari; Mr. Pradip Kalariya and Mr. Dhaval Singh; Rajkot Dairy and TinyTech. From Bihar viz. Director, Banana Research Institute, Goraul, Dist. Vaishali, ATMA Hajipur, Dist. Vaishali; ATMA Muzaffarpur, KVK, Saraiya, Dist. Muzaffarpur, and KVK Hariharpur, Dist. Vaishali; Fisheries Department & Horticulture Department of Muzaffarpur and Vaishali districts; Sudha Cooperative Milk Society, Muzaffarpur; National Research Centre on Litchi, Mushahari, Muzaffarpur. Last but not the least, number of farmers, forest dwelling community members, fisherfolks, entrepreneurs, academicians, whose direct and indirect contributions made these multi-state, multi-commodity/livelihoods studies possible.

We thank all the study participants who took the time to respond to our questions from a range of data collection tools and for sharing information and their valuable insights.

Editorial team: Satish Awate, Sanskriti Menon
Coordination: Navneet Wadkar, Satish Awate
Comments: Madhavi Joshi
Design: Ashok Thorave
Copyediting and Proofreading: Shweta Venkatesh

PROJECT TEAM

Overall Lead and Maharashtra: Sanskriti Menon, Satish Awate, Navneet Wadkar, Baswant Vithabai Babarao, Puja Shelkande
Bihar: Preeti R. Kanaujia, Neeraj Pal, Vipin Verma, Subhodh Kumar
Gujarat: Suman Rathod, Kurshid Alam, Nitin Agravat

INTRODUCTION

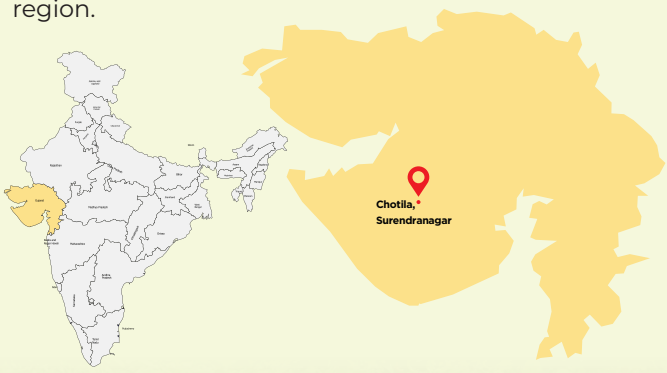
Chilli is one of the most important commercial crops in India. It is grown almost throughout the country. Different varieties are grown for use in spices, condiments, sauces, and pickles. It occupies an important place in the Indian diet. The chilli produced on farms is sold either in the green form or in the dried red form. In order to produce red chillies, farmers let the chillies ripen on plants and then harvest them to dry in the open air under sunlight. Climate change has an impact on chilli production and post-harvest drying of chilli. Chilli grows best at 20-30°C. Growth and yields suffer when the temperature exceeds 30°C or drops below 15°C for extended periods (Sabaritnathan, 2016). An increase in the number of rainy and cloudy days has increased the frequency of pest attacks. The untimely rain spoils the chillies laid out to dry in the open sunlight and causes huge losses. The value chain of chilli was also disrupted during the COVID-19 pandemic-induced lockdown. Therefore, this study was conducted to assess the impacts of COVID-19 on chilli farming and to understand the value chains of the chilli production system. The aim was also to assess the possibilities of green and socially-sound recovery strategies.

APPROACH

1. The GHG emissions for agriculture inputs and outputs supply chain inventories and primary processing (sorting, grading, storing) was calculated using the Cool Farm Tool (CFT). The data required for the Cool Farm Tool was collected using the GHG emission data collection tool.
2. To study the value chain of chilli, both primary and secondary data were collected by interviewing various value chain intermediaries such as farmers, transporters, traders, and APMC commission agents and using datasets from the Centre for Monitoring Indian Economy (CMIE) and APMCs.

STUDY AREA

The study has been conducted in two villages Bhetsuda and Pipaliya, of Chotila taluka, District Surendranagar, of Gujarat. The total geographical area of the two villages Bhetsuda and Piplaliya is 1,635.3 ha, of which 1,026.7 ha is agricultural land. Out of total agricultural land, 421 ha of land is irrigated while 604.9 ha of land is under rainfed agriculture. The sample size was 50 chilli growers from these two villages. 77.7 per cent are marginal farmers and 22.3 per cent are small farmers. The 50 chilli growers together hold 207 acres of land of which 33.5 acres (16.8%) is under chilli cultivation. People in the study area are largely dependent on agriculture for livelihood. Groundnut, chilli, cotton and vegetables are the popular crops in this region.



Demographic characteristics of Bhetsuda and Pipaliya villages

Name of Village	Total Area (Ha)	Total Population	No. of Households	Schedule Caste Families
Bhetsuda	565.3	1583	252	135
Pipaliya (Dholkuva)	1070	1558	287	47
Total	**1635.3**	**3141**	**539**	**182**

Source: (Registrar General of India, 2011)

Production system at national, state and district levels

1. Chilli is an economically very important and valuable crop throughout the world. New Mexico is considered the centre of origin of chillies. The world's total production of chillies is approximately around 3.47 million tonnes. India is the world's largest producer, consumer and exporter of chillies. Other major chilli-producing countries are China, Bangladesh and Peru.
2. In India, the area under cultivation of chilies has increased by 40.6 per cent in the past five years and the production of chillies has increased by 47.6 per cent (Directorate of Economics Statistics, 2021).
3. The average yield of chillies in India has increased from 10.1 MT/ha in 2015-16 to 10.6 MT/ha in 2020-21 (Directorate of Economics Statistics, 2021) but it is lower than other high-production countries. The chilli yield of China is 16.72 MT/ha while that of the USA is 30.9 MT/ha (CMIE, 2022).
4. In India, Andhra Pradesh, Telangana, Madhya Pradesh, Karnataka, Odisha and Tamil Nadu are the largest chilli-producing states in terms of quantity. Andhra Pradesh is the largest producer of chilli in India with 26 per cent of the total production. The share of Maharashtra state is 15 per cent, of Karnataka and Odisha is 11 per cent each, and of Madhya Pradesh is 7 per cent. Gujarat has a share of 2 per cent in the total production of chilli across India while the remaining states' shares are 28 per cent each. (CMIE, 2022).

Major States	2017-18		2020-21 (Final)		2021-22 (Adv.Est)	
	Area (ha)	Production (tonnes)	Area (ha)	Production (tonnes)	Area (ha)	Production (tonnes)
Andhra Pradesh	119260	618350	177456	796653	160000	700000
Telangana	73780	340800	89156	536541	85000	433122
Madhya Pradesh	94410	232700	122198	315598	118295	303069
Karnataka	100340	191480	85598	147049	100000	184533
Odisha	71700	69280	71700	69280	71699	69257
Tamil Nadu	44120	18100	55716	25648	53518	24117
Gujarat	11350	22070	11930	23345	11990	22359

5. Gujarat state has 11,930 ha under chilli cultivation and produces 23,345 MT of chillies. Andhra Pradesh state has the highest yield of 41.9 MT/ha and Gujarat has a yield of 21 MT/ha (CMIE, 2022). Within Gujarat, Gondal, Dwarka, and Rajkot are the highest chilli-producing districts.
6. The month-wise arrival of chillies in various APMC markets of Rajkot is high during the months of September, October and November. Out of the total number of arrivals in the Rajkot APMC, 20.2 per cent of chillies arrived in the month of September, 16.1 per cent in the month of October and 15.2 per cent in the month of November. During pre-COVID pandemic years, the arrival of chillies in the APMC markets was higher as compared to the post COVID-19 years. There is no specific trend in the prices of chilli in the APMC markets of Rajkot and prices fluctuate throughout the year.

Key findings from the study cluster

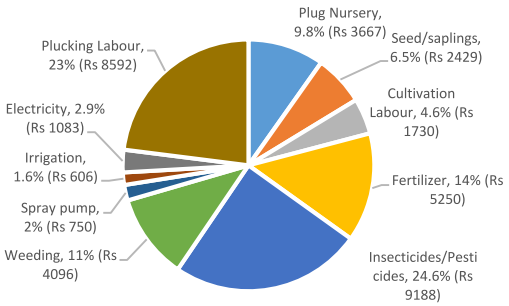
1. The total cultivable land of the 50 farmers selected in this study cluster is 207 acres. The area under chilli farming is 33.5 acres which is 16.2 per cent of total land. The farmers grow other crops such as cotton, groundnut, pulses and vegetables on the remaining land.
2. In a sample of farmers selected for the study, 39 farmers (78%) own less than one acre of land, 9 farmers (18%) own land of 1-2 acres and 2 farmers (4%) own land of 2 to 4 acres. They are engaged in multiple crops of short duration farming to increase farm productivity and their income. Most of the farmers in the project area are marginal and small farmers.
3. The various varieties of chillies preferred by farmers in this area are *US-730*, *Garuda, G-4, Vadhvani* etc. The reasons for preferring these varieties are fair market price, disease resilience, market demand and suitability of the soil.
4. In the study area, about 13 varieties are being grown. *US-730* is widely cultivated due to the higher productivity and profits that it offers. This variety is water intensive and therefore usually preferred by farmers who have an assured source of water for irrigation. It is also a weather-sensitive variety and minor changes in weather


Photo : Nitin Agravat

may cause large amounts of loss. It also requires greater care and is prone to the risk of viral diseases and pest attacks. Pesticides need to be sprayed after intervals of 3-4 days and plants need irrigation upto 7-8 times. The price of the *US-730* variety rises high upto Rs. 100-110 per kg during the summer.

5. Most farmers grow saplings in a small nursery in the field in the month of May and transplant them into the field after one month. If the seed quality is not good, many saplings do not form which results in a loss for the farmers. Overall, around 30 per cent of seeds do not germinate. The price of seeds ranges from Rs. 300-800 for a 10 gm packet which contains around 1,000 seeds. The seeds do not germinate due to several reasons such the farmer's lack of knowledge of seed treatment, delay in watering and fertilizer application, extreme weather and pest attacks.
6. The average cost of chilli production for the farmers in the project village is Rs. 37,391 per acre. Out of the total cost, the major costs are the cost of insecticides which accounts 24.6 per cent, plucking labour of 23 per cent and fertilizer cost of 14 per cent.

Distribution of input cost per acre of chilli farming (Rs. 37,391 per acre)

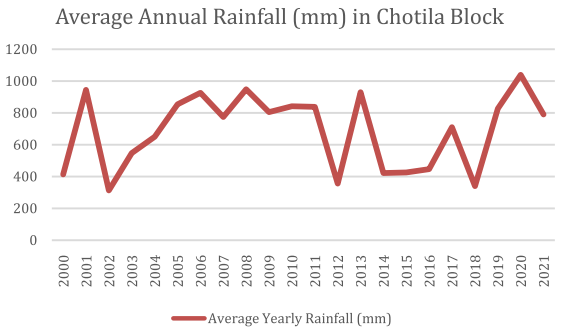


7. During the COVID-19 pandemic-induced lockdown, the supply chain of agriculture input was also impacted. Inputs such as fertilizers, seeds, and pesticides were available in the village but at a higher cost. As labour was not available, farmers relied on family labour.

8. Out of 50 chilli farmers in the village, only 5 farmers had conducted soil testing of the farmland. Farmers were using a mix of inorganic/synthetic and organic fertilizers for the cultivation of chilli in the project area.

9. Chili crops and plants face diseases and pest attacks such as anthracnose, fruit rot, bacterial wilt, mosaic, leaf spot, powdery mildew, pod borers, thrives, grubs, nematodes, aphid mites. In Bhetsuda village, farmers are experiencing climate change-related extreme events. The rainfall in the Bhetsuda block has been very erratic in recent years. In some years, there is above-normal rainfall, and in some the rainfall is deficient. The overall cloudy days have increased and there is the usual delay in monsoon arrival. It has created favourable conditions for pests and diseases.

10. Pest and insect attacks are a major reason for crop loss. Around 64 per cent of farmers lost up to 10 per cent of production, 20 per cent up to 10-50 per cent of total production and 16 per cent lost more than 50 per cent of the total production of chillies.



11. For irrigating chilli farms, farmers are dependent on rainwater in the months of June, July and August. For other months, the major source of irrigation in the village is groundwater. The crop has low water intensity, rarely requiring two irrigations per week. However, if it is a summer crop, chilli farms require 7 to 8 irrigations per week. It is observed that farmers generally use flood irrigation methods due to which soil erosion takes place, which deteriorates the quality of soil and increases the need for fertilizers and pesticides. Only one farmer among those surveyed has installed a drip irrigation system. The water use efficiency of drip, sprinkler and flood irrigation systems are 90-95 per cent, 80-85 per cent and 60-70 per cent respectively. Drip and sprinkler systems potentially increase the productivity of crops by 30-90 per cent (Narayanamoorthy, 2021). Farmers are aware of this fact but drip and sprinkler irrigation systems are cost intensive. Therefore, they are unwilling to adopt these irrigation methods.

12. The chilli farmers spent an average of Rs. 2,238 on energy usage per month per acre and out of total expenses, major expenses are the electricity bill of water pumps, daily transportation to the market to purchase agriculture inputs and fuel required for the tractor.

Energy consumption and expenses on energy in chilli farming

	No. of farmers (%)	Average fuel consumption (lit.)	Average expenses (Rs.)	Per cent of total energy expenses
Water pump	49 (98)	NA	1763	78.8
Tractor	9 (18.0)	2.2	205	9.2
Two or four-wheeler	2 (4.0)	25	270	12.0
Total			**4643**	**100**

13. The arrival of chillies in the APMC markets was higher before the pandemic-induced lockdowns than in the post COVID-19 years. There is no specific trend in the prices of chillies in the APMC markets of Rajkot and prices fluctuate throughout the year.

14. After one month of preparing saplings in the nursery and transplanting them to the field, farmers usually start harvesting chillies from the month of September till December. The picking cycle varies as per variety. The *Vadhvani* and *Garuda* are harvested in three-day cycles. This requires manual labour as mechanised picking technologies are not available. The non-availability or shortage of labour delays the harvesting which impacts the quality of the chilli produce. The chillies are sold either in green or dried red form. Post-harvest care is crucial to maintain the quality of dried red chillies by keeping their stalks intact.

15. Grading is a prerequisite for modern marketing and trade. Chillies are graded mostly by farmers based on colour and size. The damaged, dis-coloured and immature pods are graded as grade-2 chillies. Among the surveyed farmers, 12.1 MT of chillies were of grade-1 while 0.6 MT were of grade-2 of the total production of chillies.

16. The sorted and graded chillies are usually sold in the Rajkot APMC market which is at a 50 km distance. The transportation cost to the Rajkot APMC market is Rs. 25 for a 20-kilogram bag of chillies which means it costs Rs. 125 for transportation of a quintal of chillies. Grade-1 chillies are primarily sold at the APMC Rajkot market. The market price of chillies varies from Rs. 10-15/kg in the Rajkot and Gondal markets and contrarily, the price received in the local market is very low. The average price for chilli received by farmers from Bhetsuda and Pipaliya villages in 2020-21 in the Rajkot APMC market was Rs. 13.71 per kg with a net profit of 49.3 per cent.

17. As per the price data received from farmers, the average price across months and for different grades of chillies is Rs. 1,371 per quintal. Farmers earned a net profit of Rs. 453.18 per quintal at the Rajkot APMC market, which is equivalent to 49.3 per cent of the total cost of production.

Chilli Farmer's net income in Chotila block

Farmer's Net Income	Rajkot APMC
The average cost of cultivation (Rs/acre)	37391
Average yield (q/acre)	50
The total cost of production (Rs/q)	747.82
Cost of transportation to the Rajkot APMC market (Rs/q)	150
APMC Market expenses (Rs/q)	20
Total price received in the Rajkot APMC market (Rs/q)	1371
Net profit (Rs/q)	453.18
Profit percentage	49.30

18. During the COVID-19 pandemic-induced lockdown, 14 farmers could not sell their entire produce. Their total produce of 21,816 quintals of chillies could not be sold and was wasted at the farmgate due to the complete fall in demand during the COVID-19 pandemic. The average price of the product was also reduced to Rs. 4.9 per kg and the transportation cost was increased by 7.8 per cent which forced farmers to sell the chillies in local markets or to discard them in farms.

19. Sun-drying is the traditional method to preserve the chillies for further processing and value addition. Pods are well-ripened and partially withered on the plant itself. Harvested pods are kept in heaps either indoors or in the shade away from direct sunlight for 2 or 3 days to develop a uniform red colour and then dried in the sun by spreading them on clean dry polythene sheets. Dried pods are heaped and covered with clean gunny bags/polythene sheets.

20. Green chilli production in one acre is approximately 50 quintals and the average price received in the Rajkot APMC market is Rs. 1,371 per quintal. Value addition in green chillies towards dry chilli powder would provide multi-fold incremental income from the same quantum of produce. 25 kg of dry chilli can be produced from 100 kg of green chilli and the cost of one kilogram of dry chilli powder is Rs. 200 in the wholesale market. The total gross income from the sale of red chilli powder is Rs. 5,000 per kilogram. In the Chotila cluster, the chilli powder is made in a makeshift type of chilli powder-making unit. The farmers bring their dried red chillies to these processing units and prepare chilli powder for household consumption. Chilli processing units are seasonally installed for the processing of chillies and the equipment is operated using diesel gensets.

GHG Emissions from Chilli Farming

1. The total emissions due to various activities at the pre-production, production and post-production levels of chilli farming in the Chotila cluster in the form of carbon dioxide equivalent is as follows:

GHG emissions from chilli farming

Total Emission	Emission per acre	Average emission per kg
1377.39 MT CO_2e	6070.5Kg CO_2e	3.83 Kg CO_2e

2. The marginal farmers who own land up to 3 acres produce less emissions per acre while average emissions per kilogram of chilli are lower for farmers who own more than 6 acres of land. The emissions per acre of chilli farm is highest for farmers who own more than 6 acres of land. The emissions from chilli farms of small farmers who own land between 3-6 acres are moderately high as compared to marginal farmers.

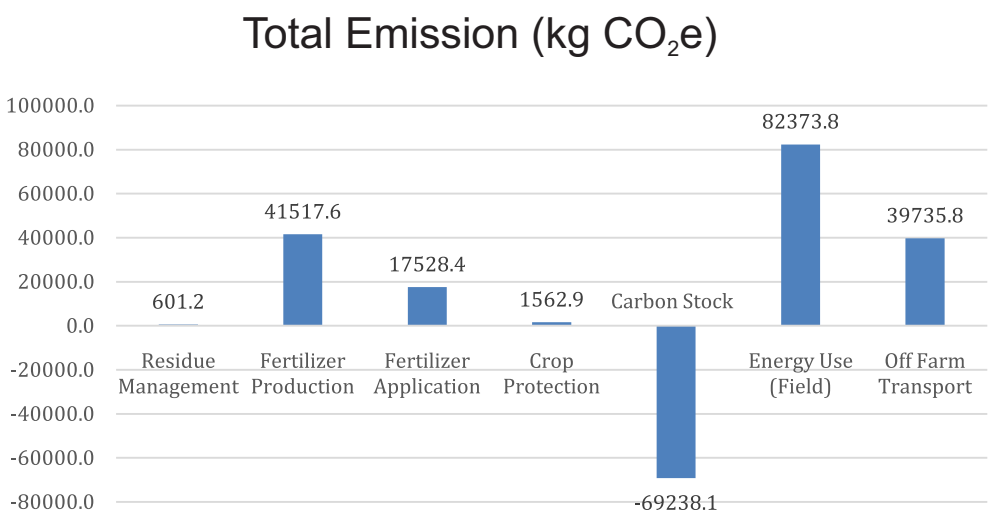
GHG emission from chilli farming as per land holding

Sr. No.	Landholding (acre)	Total Emission (MT CO_2e)	Emission per acre (kg CO_2e)	Average emission per kg of chilli (kg CO_2e)
1	Up to 3	35.03	1952.29	8.19
2	3 – 6	24.56	2283.15	8.25
3	More than 6	15.16	2367.60	7.30

GHG emissions from various activities from chilli farming

Sr. No.	Sources	Up to 3 acres		3 - 6 acres		More than 6 acres	
		Per acre of chilli	Per Kg of chilli	Per acre of chilli	Per Kg of chilli	Per acre of chilli	Per Kg of chilli
1	Residue management	13.29	0.032	18.89	0.043	25.19	0.073
2	Fertilizer production	1235.70	4.05	1243.88	3.603	1270.0	3.644
3	Fertilizer application	525.32	1.17	527.81	2.36	545.23	2.726
4	Crop protection	45.36	0.111	47.46	0.184	43.94	0.188
5	Carbon stock	-1959.63	-4.89	-2150.0	-5.89	-2150.0	-5.85
6	Energy use (field)	2082.25	7.70	2581.2	7.92	2620	6.49
7	Off-farm transport	9.99	0.022	13.93	0.034	13.24	0.032

3. If we analyse the data of greenhouse gas emissions from various activities related to chilli farming, the energy use in the field such as electricity consumption for water pumps and use of tractors for ploughing produces the highest amount of greenhouse gases. The emissions from fertilizer production and off-farm transport are also moderately high.



VALUE CHAIN OF CHILLI

1. The overall value chain of chilli mainly comprises agriculture input suppliers, producers/farmers, commission agents, traders, wholesalers, retailers, exporters, processors and consumers
2. The varieties of chillies are chosen by the end user, depending on the use. Industrial users who prepare chilli powder prefer varieties with dark red colour and pungency, fleshy skin and fewer seeds. Domestic users prefer a range of varieties for different uses and occasions.
3. However, at the trader's level, the other important quality parameters are moisture and stalks. Apart from the apparent characteristics of colour, size, moisture and stalk of the pods, the other parameters like seed and fruit (pod) ratio, seed hardness, the thickness of the skin of the pod and pungency are also important.


Photo : Navneet Wadkar

4. The net profit for various supply chain intermediaries is calculated using the cost of production/value addition, net selling price, and losses at each stage. The expenses are highest at the farmer's level (917.82 per quintal) while the APMC trader and retailer incur the lowest expenses. The farmers receive a net profit of Rs. 455.3 per quintal while APMC traders receive a 7 per cent net profit from the sale of chilli. Of the total net profit on the sale of chilli, 49 per cent goes to farmers, 26 per cent goes to wholesalers, 7 per cent goes to traders, and 36.4 per cent goes to retailers. Retailers receive the highest percentage of profit.

Supply chain intermediaries	Cost of production and market-related expenses (Rs/q)	Selling price (Rs/q)	Net profit (Rs/q)	Net profit (%)
Farmer	917.82	1371	453.18	49.4
Commission Agent/APMC Trader	1371	1466.97	95.97	7.0
Wholesaler	1587	2000	413	26.0
Retailers	2200	3000	800	36.4

RECOMMENDATIONS

The research team observed that small and marginal farmers do not possess access to enough water resources therefore their livelihood is dependent on monsoon, especially in semi-arid and drought-prone regions. In many villages of Surendranagar, farmers are still tilling their land traditionally, which adds to the cost of inputs, lack of knowledge about scientific nursery preparation, lack of weather advisories and improper packages of practices which lead to losses at the farmgate, low quality produce and less income.

There is an opportunity for the greening of production and the value chain by facilitating the shift to organic cultivation in chilli, use of solar energy devices for irrigation and processing, and improving irrigation efficiency with drip or sprinkler systems. Facilitating the creation of decentralized infrastructure in clusters to support harvesting, storage, solar drying, and value addition with solar-based technology, zero-emission transport services, and improved information on marketing channels will help enhance farmers' incomes and reduce carbon emissions. Formation of farmer-centric producer organizations and strengthening their capacity to collectivize for input management, knowledge sharing and technology adoption in a group can help sustainably transform farmer's livelihoods. Following are recommendations from this study:

1. Introduction of cluster-level Chilli Nursery model using small polyhouse techniques ensuring access to quality and affordable access to saplings by small and marginal farmers.
2. A three-year cluster-based organic chilli production programme providing risk coverage until the production system stabilizes will encourage farmers to make the gradual shift towards safe food production
3. Solar-based irrigation pump set with drip irrigation system to be provided to small farmholders. The existing PM-KUSUM scheme for irrigation needs to be revised with additional subsidies that can be given to small farmers and expanding reach.

4. Small chilli producers need to be collectivized into Farmer Producer Organizations to access better inputs, share the transportation and marketing cost and to be able to negotiate the selling price.
5. Subsidized solar-based dryers at the community level for drying the chillies efficiently should be provided to the chilli farmer's Collectives. Introducing solar dryers to dry chillies hygienically in a much shorter time as compared to the traditional method would help in enhancing income. Further, solar dryer technology also reduces the risk of weather uncertainties such as untimely rainfall, and hot spells that affect the colour and yield of the produce.
6. Community-based small warehouses to be installed along with the support of subsidies to encourage the chilli growers to store the dried chillies safely and avoid wastage due to extreme and unpredictable weather.
7. Solar-based chilli powder processing units should be installed in place of the present diesel-based powder-making units. There is a need to demonstrate mobile models in Gujarat's context where the existing marketplace combines chilli purchase and customized powder-making facility.
8. Real-time market information and advisory services need to be provided to farmers in order to improve productivity and enable them to take well-informed decisions about the sale of produce in different markets.
9. For the promotion and development of FPCs and organic production, a single window facility to obtain the organic farming certification, FSSAI licence, export licence and mandi licence is something necessary

BIBLIOGRAPHY

- CMIE. (2022). Crop-wise Area Sown, Production and Yield: Chillies. https://commodities.cmie.com/
- Directorate of Economics Statistics. (2021). Agriculture Statistics at a Glance 2021.
- Narayanamoorthy, A. (2021, December 6). Tap drip irrigation to save water. The Hindu Businessline. https://www.thehindubusinessline.com/opinion/tap-drip-irrigation-to-save-water/article27688289.ece
- Registrar General of India. (2011). Population Census 2011. https://censusindia.gov.in/census.website/
- Sabaritnathan, S. (2016). A Study on the Marketing of Chillies in Sivagangai District. Indian Journal Of Research, 5(12), 427–428. https://www.worldwidejournals.com/paripex/recent_issues_pdf/2016/December/a-study-on-the-marketing-of-chillies-in-sivagangai-district_December_2016_1190071650_6214360.pdf
- Spice Board of India. (2021). Spice Board of India. Ministry of Commerce and Industry, Govt. of India. http://www.indianspices.com/spice-catalog/chilli-1.html

Photo : Navneet Wadkar

Centre for Environment Education

CEE Rural Programme Group (RPG Gujarat)
PO Jasdan, Opp. Hero Showroom, Vinchiya road, Rajkot 360050
Phone : +91 8511758081

CEE Central
Pinewood Apartment, S No 233/1/2, Vidhate Colony, Near Aundh Telephone Exchange, Aundh, Pune 411067 Phone : 020 27298862

CEE Head Office
Nehru Foundation For Development, Sargam Marg, Thaltej Tekra, Ahmedabad 380054 Phone : 079 26858002

care@ceeindia.org www.ceeindia.org