Food and Agriculture Organization of the United Nations

STDF | STANDARDS and TRADE DEVELOPMENT FACILITY

SPICES BOARD INDIA

Strengthening the Spice Value Chain in India and Improving Market Access through Capacity Building and Innovative Interventions

STDF/PG/517 (MTF/IND/198/STF)

END OF PROJECT REPORT

January 2025

PROJECT INFORMATION

STDF/PG/517 (MTF/IND/198/STF)
Title Strengthening Spice Value Chain in India and Improving Market Access through Capacity Building and Innovative Interventions
Implementing agency Food and Agriculture Organization of the United Nations (FAO)
Partners Spices Board of India (Ministry of Commerce and Industry, Government of India)
Start date 15/10/2019
End date 30/09/2024 Original Project End Date: 31/10/2022 No-Cost Extension Period: 01/11/2022 to 30/09/2024
Beneficiary India
Budget Project Total Value: US$ 992 030 STDF contribution: US$ 508 830 Other contribution: • FAO: US$ 200 000 • Spices Board (kind contribution): US$ 283 200

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ABBREVIATIONS

APMC	Agricultural Produce Market Committees
BL	Baseline
EL	Endline
e-NAM	e-National Agriculture Market
EOI	Expression of Interest
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus Group Discussion
FIG	Farmer Interest Groups
FPO	Farmer Producer Organization
FSSAI	Food Safety and Standards Authority of India
GAP	Good Agriculture Practices
GHP	Good Hygiene Practices
GMP	Good Manufacturing Practices
HH	Household
ICS	Internal Control System
IEC	Information, Education, and Communication
IndGAP	India Good Agriculture Practices
IPM	Integrated Pest Management
KII	Key Informant Interviews
KVKs	Krishi Vigyan Kendras
MIDH	Mission for Integrated Development of Horticulture
MoUs	Memorandum of Understanding
MRLs	Maximum Residue Limits
NABARD	National Bank for Agriculture and Rural Development
NCRCP	National Contaminant and Residual Control Programme
NGO	Non- Governmental Organization
NSSP	National Sustainable Spice Networking Programme
OECD DAC	Organization for Economic Cooperation and Development's Development Assistance Committee
PIA	Project Implementing Agency
PIC	Project Implementation Committee
PKVY	Paramparagat Krishi Vikas Yojana
PMKSY	Pradhan Mantri Krishi Sinchayee Yojana
POP	Package Of Practices
QMS	Quality Management System
QCI	Quality Council of India

SB	Spices Board
SDG	Sustainable Development Goals
SPS	Sanitary And Phytosanitary
STDF	Standard and Trade Development Facility
ToTs	Training of Trainers
US	United States
USD	United State Dollar
WTO	World Trade Organization

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- date of project approval and implementation (start/end dates, extensions if any)
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- problem addressed by the project
- key results and achievements according to the project's logframe and any additional ones
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- actionable recommendations targeted at relevant stakeholders

1.1 Date of project approval and implementation (start/end dates, extensions if any):

The project concept was developed in 2017-2018 through a collaborative effort between the Spices Board of India, the Food and Agriculture Organization of the United Nations (FAO), and the Standards and Trade Development Facility (STDF) under an STDF project preparation grant (PPG 517). The project was approved and officially implemented from 15 October 2019 to 30 September 2024, spanning the states of Andhra Pradesh, Gujarat, Madhya Pradesh, and Rajasthan. Though the project was planned to be implemented in three years, the timeline was adjusted multiple times due to unforeseen challenges and delays, resulting in a number of No-Cost Extensions (NCEs).

In July 2020, the COVID-19 pandemic caused significant disruptions, delaying the implementation of project activities. As a result, the project was extended for 12 months, from October 2022 to October 2023, to accommodate these delays.

By July 2022, delays in implementing specific activities—largely due to delayed deliverables under the Letter of Agreement (LoA) with the Spices Board—caused a slight deviation from the project delivery schedule. This also affected interlinked activities, which had to be postponed to the next spices cropping season. Consequently, an 8-month extension, from November 2023 to June 2024, was granted to align these activities with the new timeline.

In April 2024, the Model Code of Conduct issued during the ongoing Parliament elections in India led to delays in conducting critical project activities. These included workshops, buyer-seller meets, video dissemination training, and data collection for post-evaluation/endline surveys. To ensure the successful completion of these activities and facilitate project closure, the project timeline was extended by an additional 3 months, from July 2024 to September 2024.

Despite these extensions, the collaborative efforts ensured that the project remained focused on its objectives, allowing for effective delivery and eventual closure by 30 September 2024.

1.2 STDF contribution to the project and total project budget:

Project Total Value: USD 992 030

STDF contribution: USD 508 830

Other contribution:

- FAO: USD 200 000
- Spices Board (kind contribution): USD 283 200

1.3 Main stakeholders (public and private) involved in project implementation and delivery:

Public and government stakeholders:

- Spices Board of India, Ministry of Commerce and Industry (MoC&I), Government of India
- Indian Council of Agricultural Research - National Research Centre on Seed Spices (ICAR-NRCSS)
- ICAR-Indian Institute of Spices Research (IISR)
- The Integrated Tribal Development Authority (ITDA)
- Certification Bodies (Quality Council of India - QCI, National Accreditation Body - NAB)

Private stakeholders:

- Smallholder farmers
- Farmer Producer Organizations (FPOs)
- Private exporters and traders
- Digital Green Trust
- Insight Development Consulting Group (IDCG)

1.4 Problem addressed by the project:

The project was highly relevant as it directly addressed critical challenges faced by the Indian spice sector, particularly in four spice-producing states – Andhra Pradesh, Gujarat, Madhya Pradesh and Rajasthan. Farmers in these states grappled with SPS compliance gaps, pesticide residue issues and limited access to high-value international markets. These challenges were compounded by frequent rejections of Indian spices in key export markets like the European Union and the United States, primarily due to aflatoxins, pesticide residues and Salmonella contamination, as evidenced by 149 European Union alerts and 1 053 rejections from the United States between 2014 and 2017. Such gaps in SPS adherence posed significant risks to consumer health, reduced market access and undermined the economic potential of Indian spices. By aligning with SPS priorities of local and international stakeholders, the project responded to the urgent need for quality improvement and safety standards in the spice value chain. It leveraged the expertise and resources of various institutions – including the Spices Board of India, Ministry of Agriculture and Farmers Welfare, National Bank for Agriculture and Rural Development (NABARD) and the Ministry of Commerce and Industry – to promote good agricultural practices (GAP), organic certifications and post-harvest management. These efforts positioned the project as a vital intervention to enhance export competitiveness, improve livelihoods and foster sustainable development in the spice-producing regions.

1.5 Key results and achievements according to the project's logframe and any additional ones

The project catalysed substantial improvements in farmer incomes, quality compliance, and market access. The average annual income from spice crops increased by 58 percent, from INR 78 107 at the baseline to INR 123 478 at the endline. Over 80 percent of tested spices collected from project beneficiaries met Codex MRL

standards, enabling exports to premium markets like the European Union and the United States. FPOs across the intervention states signed 25 formal agreements in the form of memorandums of understanding (MoUs) and expressions of interest (EoIs) with exporters and trading companies (Logframe Outcome 2, Annex I). Adoption of GAP and GHP reduced post-harvest losses and improved the quality of produce. Innovations like mechanized threshing and clean storage practices further boosted market readiness. The project's focus on empowering marginalized communities ensured inclusive growth, addressing both economic and social dimensions of development.

Six FPOs have been equipped with a quality management system (QMS) for GAP (Logframe Outcome 1, Annex I). By uniting farmers under collective entities, FPOs have provided smallholders –often marginalized in the market – access to training, resources and enhanced bargaining power. The introduction of QMS proved crucial in preparing FPOs for IndGAP certification by helping them standardize record-keeping, monitor quality at every stage of production, and manage pesticide residues. QMS ensured that FPOs maintained detailed documentation on farming practices and input usage, which is essential for certification.

Project output summary: The project focused on improving the safety, quality and marketability of four key spices – black pepper, coriander, cumin and fennel – through capacity building, farmer empowerment, market linkage enhancement and implementation of quality control systems. It aimed to train stakeholders on GAP and GHP, strengthen FPOs and establish a National Contaminant and Residual Control Programme (NCRCP). By addressing critical gaps in production, marketing and compliance with international standards, the project sought to boost farmers' incomes, increase exports and improve food safety. Most targets (as shown in the table below) were met or exceeded, demonstrating strong execution across all key outputs.

Additionally, following the successful completion of the spices project, FAO, in collaboration with the resource partner GIZ, is planning to scale up these interventions to other spices and commodities, including coffee, across India. This expansion underscores the project's significant impact and aims to replicate proven practices through private sector-led interventions. These efforts focus on improving agricultural practices, strengthening value chains, and expanding market access, contributing to sustainable growth and development in India's spice and commodity sectors.

Project output and achievement

Output	Indicator	Target	Achievement
Capacity building	Trainers trained, Package of Practices (POPs)/ Information, Education, Communication (IEC) materials developed	60 trainers, 4 POPs, 16 IECs	150 trainers, 4 POPs, 16 IECs
Farmer capacity	Farmers trained, FPOs formed, exposure visits	Training of 1 200 farmers and 50 value chain actors, 8 FPOs strengthened	1 700 farmers and 200 value chain actors trained, 8 FPOs strengthened across four project states.
Marketing linkages	IndGAP certification, FPOs enlisted, branding activities	4 FPOs certified on IndGAP	4 FPOs received training and applied for certification

Output	Indicator	Target	Achievement
		4 FPOs to enlist on web portals for spices trading	8 FPOs enlisted on National Sustainable Spice Networking Programme (NSSP) portal 8 buyer-seller meets organized
NCRCP implementation	Labs approved, NCRCP implemented	Labs identification for 4 spice crops over one cropping season	2 labs dedicated for NCRCP testing, NCRCP developed and implemented for 4 spices over one cropping season

1.6 Key challenges, experiences, and lessons:

Key challenges

While the project achieved remarkable success, several challenges came to the fore during implementation. However, practical and innovative solutions were introduced to overcome these obstacles.

- **Low participation of women:** One of the barriers was the limited involvement of women in the project's training programmes due to cultural barriers. To encourage more participation, training videos and street plays featuring women artistes were created and performed.
- **Limited primary processing capacity:** Quality control in post-harvest management was another challenge. Many farmers lacked access to essential processing tools, which affected the quality of the final product.
- **Slow transition to organic farming:** The transition from chemical-based to organic farming was slow, largely due to concerns over potential income loss during the adjustment period. To encourage this shift, the project established buy-back arrangements with exporters who were willing to purchase produce grown following GAP and GHP.
- **Climate-driven increase in chemical inputs:** Erratic weather patterns posed a major challenge, pushing farmers to use more chemical inputs as a safeguard. In response, the project began disseminating real-time meteorological updates via WhatsApp groups. This allowed farmers to make informed decisions about crop protection, reducing their reliance on harmful chemicals while optimizing yields based on accurate weather forecasts.
- **Limited access to testing infrastructure:** A significant hurdle was the farmers' lack of access to testing facilities for their produce. To address this, the project established basic testing labs accessible to multiple FPOs in a central location. This simplified access enabled more farmers to get their spices tested for quality

and safety, boosting their competitiveness in the market, although more such local testing facilities will need to be created over time.

Lessons learned

Below is a summarized list of lessons learned from the implementation of the project. Leveraging these insights can enhance the scalability and impact of similar initiatives, fostering inclusive, sustainable agricultural ecosystems.

1. The project highlighted the importance of gender inclusion, digital tools and decentralized infrastructure.
2. Gender-sensitive training methods, such as women-led street plays, increased participation and engagement.
3. Digital resources, including localized videos and WhatsApp advisories, proved effective in scaling outreach.
4. The need for accessible post-harvest facilities emerged as a critical area for improvement.
5. Expanding organic farming required financial incentives to offset transition costs.
6. The success of buyer-seller meetings underscored the value of structured market linkages.
7. Institutionalizing practices like NCRCP sampling and compliance monitoring can serve as a model for future projects.

1.7 Post-project sustainability plan:

The project's sustainability plan emphasized establishing NCRCP labs and strengthening farmer producer organizations (FPOs) to build long-term capacity for quality compliance. Four FPOs were trained for IndGAP certification, enhancing resilience within the spice value chain despite challenges like climate variability and resource limitations. To ensure sustained knowledge transfer, the FAO collaborated with Digital Green, an NGO, to produce 60 community-focused training videos in regional languages. These videos, covering Good Agricultural Practices (GAP) and Good Hygienic Practices (GHP) for cumin, black pepper, coriander, and fennel, were complemented by field demonstrations offering hands-on training for farmers and value chain actors. Widely disseminated on social media and integrated into Spices Board training programs, these videos maximized outreach and impact. To further enhance sustainability, FAO is coordinating efforts to integrate the videos into the VISTAAR (Virtually Integrated System to Access Agricultural Resources) mobile application, developed by the Ministry of Agriculture & Farmers' Welfare. This integration aims to provide farmers and stakeholders with accessible, accurate, and timely agricultural knowledge, ensuring the project's benefits extend far beyond its implementation period.

Technological sustainability was also addressed through the provision of tools such as pepper threshers and other equipment. By adopting GAP and GHP practices, farmers have embraced lasting behavioral changes, thereby supporting consistent quality standards and boosting the export potential of Indian spices in the global market.

1.8 Actionable recommendations targeted at relevant stakeholders:

The key recommendations emerging from the study to strengthen the spice value chain - targeting specific stakeholders responsible for their implementation - are presented below. Each recommendation aims to address identified gaps in capacity building, resource access, quality compliance, and sustainability.

Collaborate with women trainers for gender-sensitive programmes: Establishing a cadre of women trainers can drive higher women engagement and ensure that training programmes are relevant and accessible to all

farmers, fostering gender inclusivity in the spice sector. To further enhance women's participation in the future, stakeholders could organize women-only sessions, collaborate with self-help groups (SHGs) and cooperatives, develop family-centric training modules, offer flexible schedules and childcare support, provide digital training resources tailored for women, and establish incentives and recognition for women engagement.

Increase access to post-harvest inputs: Ensuring that essential post-harvest tools like tarpaulins, drying equipment, and processing and packaging resources are readily available will support farmers in meeting quality standards and achieving higher market prices.

Expand access to bio-inputs and digital pest management: Providing farmers with access to a wider set of bio-inputs and climate-resilient spice varieties, combined with additional digital farm advisory tools for pest management, will enable them to manage crops sustainably amidst changing weather patterns.

Establish advanced testing labs at APMC markets: Building decentralized testing labs at Agricultural Produce Market Committees (APMCs) will make quality testing more accessible, ensuring higher compliance with safety standards and enhancing market competitiveness.

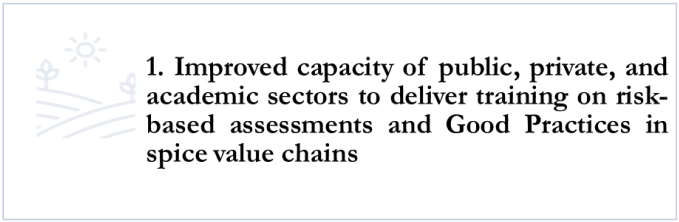
2. Overview

- *Project background and context*
- *SPS problem addressed by the project*
- *Approach taken by the project to address the problem (briefly explain the theory of change)*

1.1 Project background and context

The "Strengthening Spice Value Chain in India and Improving Market Access through Capacity Building and Innovative Interventions" project was initiated in 2020 by the Spices Board and the FAO, with support from the STDF which is based at the WTO. The overarching goal of the project was to expand exports of safe and high-quality spices – namely black pepper, coriander, cumin and fennel – from India to international markets. This is against the backdrop of Indian spice exports facing rejections in markets like Australia, the European Union and the United States due to non-compliance with SPS measures. In doing so, the project aimed to contribute to improved food safety and consumer health, both in Indian and overseas markets. Its focus was on building the capacity of those involved in the spices value chain through various activities designed to improve agricultural practices, strengthen the connections between farmers and exporters, and introduce traceability and certification systems. Additionally, the project sought to boost incomes for small-scale farmers, empower women farmers and producers belonging to marginalized (tribal) communities, and support efforts to reduce poverty (Sustainable Development Goal 1 or SDG 1) and hunger (SDG 2) in select spice-producing pockets of India.

The project's objective was to build the capacity of stakeholders within the spice value chain, enabling them to enhance the safety and quality of these spices. This, in turn, was expected to increase their market access through better compliance with global food safety standards. The project was implemented for the duration of almost four years – October 2020 to August 2024 – and had four main components:



The project, which spanned four states –Andhra Pradesh, Gujarat, Madhya Pradesh and Rajasthan – had a total budget of USD 992 030. Key activities included:

- **Implementing Good Practices:** The project promoted the adoption of GAP and GHP throughout the value chain, from cultivation to processing and packaging.

- **Building capacity:** Extensive training and awareness programmes were conducted for farmers, processors, traders and exporters, equipping them with the skills needed to maintain high-quality standards.

- **Strengthening market linkages:** Direct connections between farmers and exporters were established, reducing the need for intermediaries and ensuring that farmers received fair compensation.

- **Introducing certification systems:** Certification mechanisms were introduced to ensure that the spices met international quality and safety standards, which in turn helped improve market penetration and access to newer markets.

The project utilized innovative training techniques such as simplified video dissemination and street plays (*nukkad natak*) to effectively engage farmers and stakeholders. This ensured that knowledge related to GAP and GHP was easily comprehensible and adopted at the grassroots level. Since the four project states are home to poor smallholder farmers, including marginalized men and women from tribal communities in the Paderu region of Andhra Pradesh, the project focused on inclusive growth by specifically targeting women and tribal communities. It aimed to create sustainable improvements in the livelihoods of producers belonging to marginalized groups through increased market access and enhanced agricultural practices.

As a result, the project led to safer, higher-quality spices, increased competitiveness in global markets and boosted the incomes of smallholder farmers.

1.2 SPS problem addressed by the project

The project was designed to align with the SPS priorities of both local and international stakeholders, including farmers, government agencies and global buyers. The project was relevant to the specific needs of the targeted four spice-producing states where farmers faced challenges with SPS compliance, pesticide residues and limited market access. These issues were particularly pressing given the high rejection rates of Indian spices in international markets, especially the European Union and the United States, primarily due to aflatoxins, pesticide residues and Salmonella contamination. Between 2014 and 2017, European Union alerts totalled 149 cases, with aflatoxin being the top concern. In the United States, the rejection count reached 1 053, with Salmonella accounting for 688 cases. These issues highlight critical gaps in adherence to SPS standards, significantly affecting consumer health, market access and the economic potential of Indian spices.

Various organizations synergized their efforts to enhance Indian spice quality. The Spices Board drove export promotion, quality control, organic certification and innovation through initiatives like Spice Parks[1] and e-Spice Bazaar[2], while the Ministry of Agriculture and Farmers Welfare implemented the Mission for Integrated Development of Horticulture (MIDH) to support planting material, area expansion and post-harvest management with subsidies for farmers. The National Bank for Agriculture and Rural Development (NABARD) provided financial support to FPOs for value addition. The Ministry of Commerce and Industry facilitated export promotion, GAP and organic certifications while ensuring quality standards through the Export Inspection Council (EIC). These efforts collectively strengthened the spice value chain from the production stage to exports. The project's targeted approach, designed to meet SPS compliance and market access challenges, also considered the underlying social dynamics that shape agricultural participation.

1.3 Theory of Change

The Theory of Change (Figure 1) for this project was designed to enhance market access for safe, high-quality spices by building capacity across the spice value chain. At its core is the establishment of a National Contamination and Residue Control Programme, which aims to ensure food safety standards for key spices. Supporting this programme are three strategic pillars:

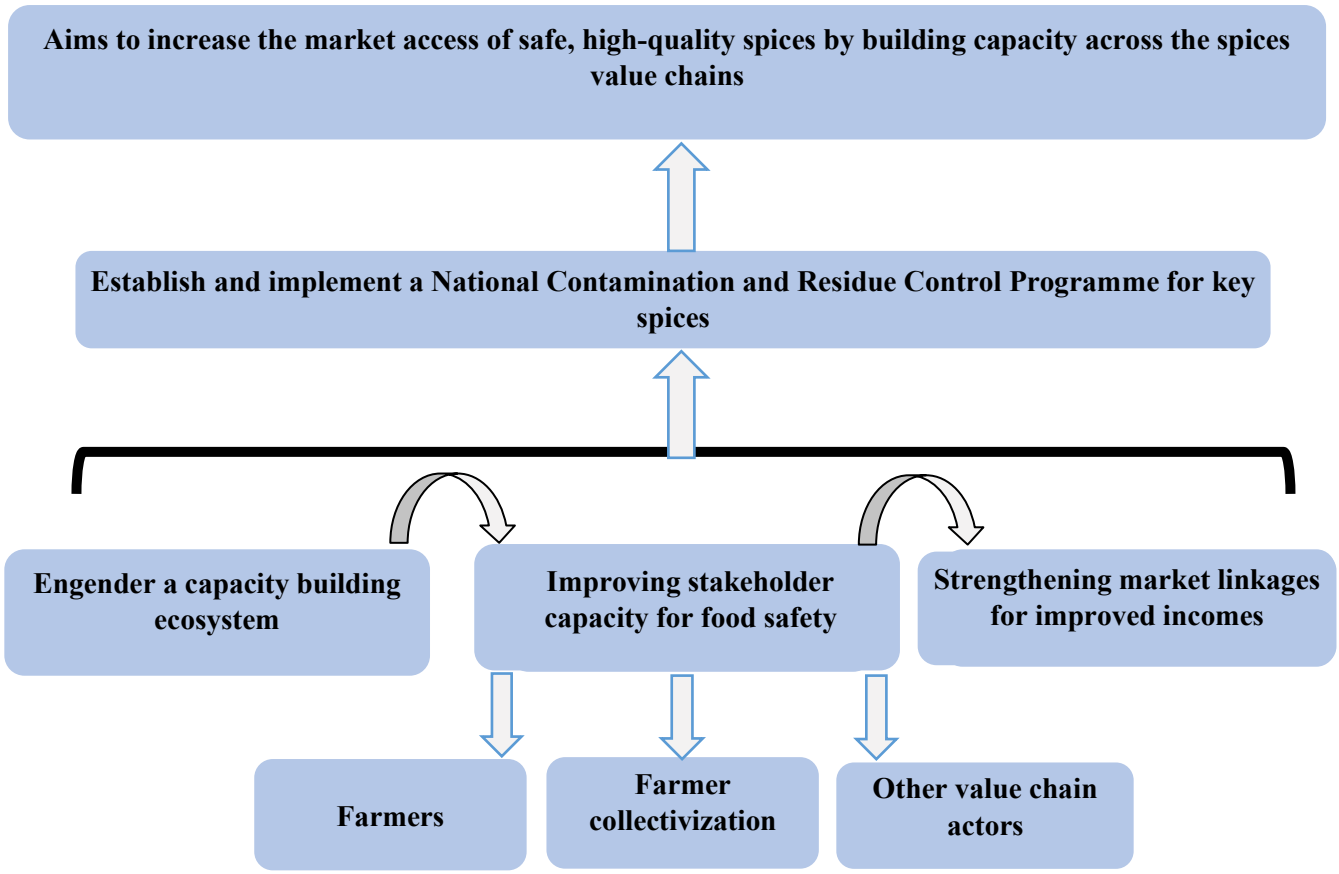
- creating a capacity-building ecosystem that empowers farmers to adopt GAP and GHP;
- strengthening stakeholder capacity to uphold food safety standards among farmer collectives, processors and other essential actors in the value chain; and
- improving market linkages to secure better income opportunities by connecting farmers and other stakeholders with quality-sensitive markets.

Together, these elements create a sustainable framework that not only tackles contamination and residue management but also boosts farmers' livelihoods by increasing their access to high-value markets and enhancing their income potential.

[1] Spice Parks: Specialized infrastructure facilities set up by the Spices Board of India to support spice farmers with post-harvest processing, value addition, storage, and direct market linkages.

[2] e-Spice Bazaar: A digital platform connecting farmers directly with buyers, traders, and exporters to ensure price transparency, quality assurance, and fair trade.

Figure 1: Theory of Change for the project



3. Project Implementation

3.1 Project timeframe including approval, contracting, implementation dates, extension(s) if any:

The project was initiated as a collaborative effort between the Spices Board of India, the Food and Agriculture Organization of the United Nations (FAO), and the Standards and Trade Development Facility (STDF). It was developed under an STDF project preparation grant (PPG 517) during 2017-2018 and received project funding approval from the STDF Working Group in October 2018. The process of signing the Implementation Assignment between FAO and WTO began in May 2019 and was finalized in September 2019. This agreement established the project's implementation period from October 15, 2019, to October 31, 2022. However, unforeseen challenges necessitated multiple timeline adjustments and No-Cost Extensions (NCEs).

In July 2020, the COVID-19 pandemic caused significant disruptions, delaying project activities. To address these delays, a 12-month extension was granted, extending the timeline from October 2022 to October 2023. By July 2022, additional delays arose due to pending deliverables under the Letter of Agreement (LoA) with the Spices Board. These setbacks affected interdependent activities, requiring their postponement to the next spices cropping season. Consequently, the project timeline was extended by another 8 months, from November 2023 to June 2024.

In April 2024, delays resurfaced due to the Model Code of Conduct enforced during the Indian Parliament elections, impacting critical project activities such as workshops, buyer-seller meets, video dissemination training, and data collection for post-evaluation surveys. To ensure the completion of these activities and facilitate project closure, a final 3-month extension was approved, with the project concluding on September 30, 2024.

3.2 Roles and responsibilities for project implementation (including any agreements/sub-contracts with service providers)

FAO India was responsible for the implementation and overall supervision of the project, with technical backstopping provided by the FAO Regional Office for Asia and the Pacific. The Spices Board of India acted as the local implementing partner, ensuring the execution and coordination of all project activities at the local level.

FAO signed four Letters of Agreement (LoAs) with the Spices Board throughout the project duration to implement various activities under the initiative. Additionally, an LoA was signed with Digital Green Trust to produce and disseminate localized videos on Good Agricultural Practices (GAP) and Good Hygiene Practices (GHP) for spices in four project states: Andhra Pradesh, Gujarat, Madhya Pradesh, and Rajasthan. Another LoA was signed with Insight Development Consulting Group (IDCG) to carry out the endline evaluation for the project. These collaborations were instrumental in achieving the project's objectives and ensuring the smooth execution of its activities.

3.3 Project management, including details on any Steering Committees

Project management

FAO India served as the budget holder and was primarily responsible for project execution and overall supervision. This role encompassed managing financial resources, coordinating activities, and ensuring compliance with the project's objectives. To support effective management, FAO India hired a National Project Manager (NPM), who played a pivotal role in ensuring regular coordination with the project's implementing partners, including the Spices Board of India, and other key stakeholders. This coordination was essential for fostering seamless collaboration and aligning efforts across all levels of the project.

FAO India also ensured regular reporting to the Standards and Trade Development Facility (STDF), maintaining transparency and accountability throughout the project's lifecycle. Additional responsibilities included revising work plans and budgets, monitoring project progress, and developing technical inputs to support the effective implementation of project activities. This comprehensive approach not only streamlined operations and ensured efficient resource utilization but also contributed to the successful delivery of the project's outcomes.

Steering Committee

a. **Project Steering Committee (PSC):** PSC was established at the national level to provide strategic oversight and ensure smooth implementation of the project. The committee was chaired by the Spices Board of India and included representatives from relevant Union and State ministries, departments, and stakeholders as members.

Members of the Project Steering Committee

- Food Safety and Standards Authority of India (FSSAI)
- National Horticulture Mission of India (Horticulture Commissioner)
- Ministry of Commerce (TPD Division)
- Export Inspection Council
- Indian Institute of Spices Research
- National Centre for Seed Spices
- Indian Pepper and Spice Trade Association
- Indian Spice and Foodstuff Exporters Association
- Implementing Partner (FAO)

Secretariat: An officer from the Spices Board served as the Secretary. This role was responsible for coordinating program-related issues and setting the agendas for PSC meetings.

Meeting Schedule: The committee met annually to approve the project's annual work plan and budgets, and to review progress reports. Additional biannual meetings were held to evaluate and address ongoing implementation challenges.

Ex-Officio Member: The National Project Manager (NPM) participated in the PSC as an ex-officio member, contributing to discussions and updates on project progress.

This governance structure facilitated a collaborative approach to decision-making, ensured alignment with national priorities, and provided a platform for stakeholders to contribute to the project's success.

b. **Project Implementation Committee:** Project Implementation Committees (PICs) were established for each project state to oversee the implementation of activities, ensuring alignment with the approved work plan and timelines. Each PIC was chaired by the Spices Board and included representatives from various stakeholders, such as traders, exporters, farmers, and relevant government institutions or departments. The committees convened biannually to review the progress of project activities.

Composition of PICs by State:

Andhra Pradesh

- Coffee Board
- Integrated Tribal Development Agency (ITDA)
- Girijan Cooperative Corporation (GCC)
- Representatives of traders, producers, and exporters
- National Project Manager (NPM)
- Spices Board (Secretariat)

Rajasthan

- Agricultural University Jodhpur (Vice-Chancellor)
- Agricultural Produce Market Committee (APMC) Chairman

- Federation of Indian Spices Stakeholders' Association
- Farmers' representatives from two selected villages
- Certification Body representative
- National Project Manager (NPM)
- Spices Board (Secretariat)

Gujarat

- Spices Research Station
- Agricultural Produce Market Committee (APMC) Chairman
- Federation of Indian Spices Association
- Farmers' representatives from two selected villages
- Certification Body representative
- National Project Manager (NPM)
- Spices Board (Secretariat)

Madhya Pradesh

- District Collector
- Representatives of traders and exporters
- Agricultural Produce Market Committee (APMC) Chairman
- Farmers' representatives from two selected villages
- National Project Manager (NPM)
- Spices Board (Secretariat)

This decentralized approach allowed for better coordination and engagement with local stakeholders, contributing to the overall success of the project.

4. Achievement of Results

- *Detailed description and analysis of the project's specific outcomes and outputs (based on the project's logical framework)*
- *The section should be organized starting with results at the goal and outcome levels followed by results at the output level.*
- *Quantitative data should be provided as far as possible for the project indicators, including disaggregated data when relevant.*

The project to strengthen the spice value chain for black pepper, coriander, cumin and fennel adopted a bottom-up approach, focusing on empowering farmers and fostering collaboration across the value chain. It aimed to enhance the safety, quality and market access of these spices through four interconnected components.

The first interconnected component involved farmer collectivization, where smallholder farmers were organized into FPOs. This enabled resource pooling for shared infrastructure like drying yards and grading facilities, group certifications and collective marketing. These efforts empowered farmers with better bargaining power, access to quality inputs and improved economies of scale, setting the stage for sustainable development.

Building on this foundation, the second component of the project focused on strengthening market linkages. Direct connections between farmers and buyers were facilitated, reducing reliance on intermediaries and ensuring fairer price realization. Platforms like the Spice Parks, and the National Sustainable Spice Networking Programme (NSSP) portal established by the Spices Board India, the World Spice Organisation (WSO), All India Spices Exporters Forum (AISEF), and international agencies like IDH and GIZ [Germany]), were leveraged to link producers with markets, while certification such as IndGAP allowed access to premium markets. Improved branding and traceability further aligned the spices with global market demands, enhancing their appeal.

The third component – improving stakeholder capacity for food safety – emphasized training farmers, processors and other value chain actors. These trainings imparted knowledge of GAP and GHP, equipping stakeholders to minimize risks like aflatoxins, Salmonella and pesticide residues. Enhanced awareness and skill development ensured safer production and post-harvest practices, strengthening compliance with international SPS standards.

The fourth component of the project focused on establishing and implementing a NCRCP. This critical intervention addressed contamination risks throughout the value chain, ensuring the spices met the stringent safety requirements of global markets like the European Union and the United States. The programme formed the backbone for quality assurance and supported broader efforts to build consumer trust in Indian spices.

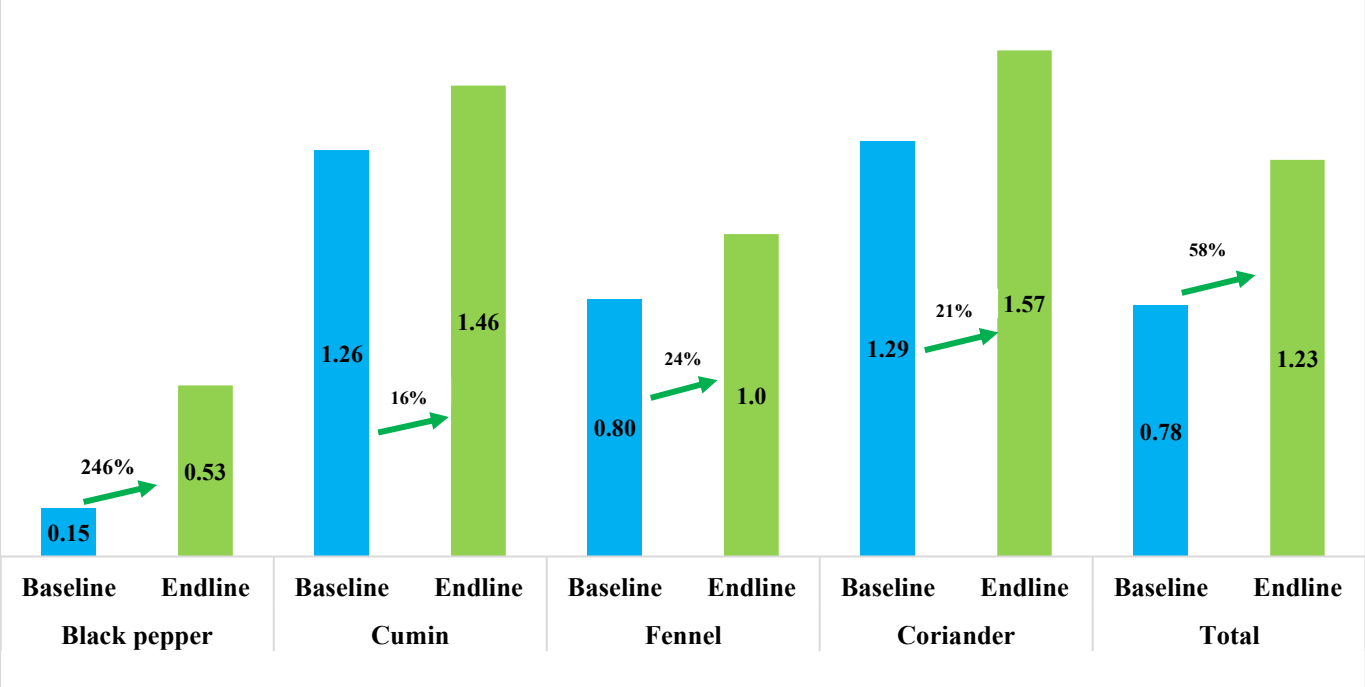
Underpinning all these components was the creation of a capacity-building ecosystem that connected farmers, processors, traders and market stakeholders. By fostering collaboration and knowledge sharing, the project ensured the adoption of improved practices and technologies across the value chain. This ecosystem was designed to sustain the project’s outcomes, empowering stakeholders to continue producing high-quality and safe spices. This approach strengthened the spice value chain from the ground up, increasing potential competitiveness in global markets and enhancing incomes for marginalized farming communities.

4.1 Project goal and outcome level results

The project catalysed significant improvements in income levels, crop quality and market access for farmers in the target regions. Average annual income from spice crops increased by 58 percent, from INR 78 107 in the baseline to INR 123 478 in the endline (Figure 2).

Additionally, over 80 percent[3] of spices tested under the NCRCP complied with Codex MRLs, increasing their export potential. Samples of key spices like cumin, coriander, fennel and black pepper were collected from various project sites – Jodhpur (44 samples of cumin and 41 samples of fennel), Unjha (5 samples of cumin and 3 samples of fennel), Guna (40 samples of coriander) and Paderu (11 samples of black pepper) – and tested in certified labs. The results showed high compliance with Codex MRLs in most cases, especially for cumin and black pepper, highlighting effective residue control. Key results include 100 percent compliance for 44 cumin samples from Jodhpur and 11 black pepper samples from Paderu. Fennel samples achieved 82.9 percent compliance in Jodhpur and 100 percent in Unjha, while 97.5 percent of coriander samples from Guna passed Codex MRLs. In some locations like Unjha and Jodhpur, however, non-compliance was noted, such as in specific fennel and cumin samples. These findings underscored the need to reinforce GAP and GHP to improve residue compliance further. Through NCRCP, the project boosted the export potential of Indian spices by helping them prepare to meet the stringent requirements of major markets like the EU and US. The programme also contributed to domestic food safety, ensuring that consumers benefit from spices with reduced pesticide residues.

Figure 2: Changes in annual spices income (in INR '000)



Following the project interventions, significant growth in income levels for the targeted farmers was seen across the states, influenced by several factors. The adoption of GAP, such as improved irrigation systems, timely sowing and a balanced use of fertilizers, helped farmers enhance both the quality and quantity of the spices. Additionally, buy-back agreements and stronger connections between farmers and exporters provided more stable and fair pricing.

[3] *Source: STDF sample analysis report 10/09/2024*

The adoption of GHP through better post-harvest practices was another key factor in boosting incomes. By using mechanized threshing and tarpaulin sheets provided under the project by the Spices Board, better storage methods and clean, well-ventilated transportation, farmers were able to reduce post-harvest losses and bring more produce to the market in good condition.

Additionally, the project's support for FPOs created a platform for community empowerment. The project was instrumental in connecting farmers more closely with FPOs. Through eight buyer-seller meetings (meetings held for potential buyers and sellers for negotiation) and four buy-back workshops agreements where a seller offers to repurchase a product from the buyer at a specified price or under certain conditions), the project facilitated 25 formal agreements between FPOs and exporters (Logframe Outcome 2, Annex I). An MoU was signed between ITC Ltd and Jaitaran Farmer Producer Company Ltd, while M/S Nedspice Processing India, purchased 88.3 quintals of black pepper from 17 farmers from the Paderu region. Flavourit Spices Trading Limited has started procuring seed spices from project areas. Nestlé Food Safety Institute India (NFSI) is currently engaged in discussions with the Spices Board to explore collaboration for the direct procurement of spices from FPOs within the STDF project areas. These agreements provided farmers with stable market access and guaranteed prices, effectively reducing the risks of price drops and tackling market instability. ITC Ltd. has assured that they will purchase IPM products from the farmers at a higher price margin.

Six FPOs have been equipped with a quality management system (QMS) for GAP (Logframe Outcome 1, Annex I). By uniting farmers under collective entities, FPOs have provided smallholders –often marginalized in the market – access to training, resources and enhanced bargaining power. The introduction of QMS proved crucial in preparing FPOs for IndGAP certification by helping them standardize record-keeping, monitor quality at every stage of production and manage pesticide residues. QMS ensured that FPOs maintained detailed documentation on farming practices and input usage, which is essential for certification. It also facilitated process improvements, reduced compliance risks and provided training to both FPOs and farmers on IndGAP protocols. QMS streamlined audits, increasing the likelihood of successful certification. As a result, FPOs became better positioned in the market, boosting buyer confidence and supporting long-term sustainability in the spice value chain.

4.2 Output 1: Capacity (in the public and private sector and academia) to deliver trainings on Good Practices improved

The initiative fostered a capacity-building ecosystem by strengthening public institutions, academia, and other key stakeholders to effectively conduct trainings on Good Agricultural Practices (GAP), Good Hygiene Practices (GHP). This approach aimed to improve the spice value chain by equipping stakeholders/participants with the skills and knowledge needed to maintain high production and handling standards.

Table 1: Planned vs. Achieved Targets for Activities (reported in numbers) under Output 1

Activities	Planned	Achieved
Trainers trained on good practices along the identified spice value chains	60	150
Package of Practices (POPs) on GAP reviewed and strengthened	4	4
POPs on GHP for post-harvest stages developed	4	4
Standardized training modules developed	4	4
Information, Education, Communication (IEC) material developed and disseminated	16	16

The project's ambitious yet focused goals entailed developing five key packages – four on GAP for black pepper, coriander, cumin, and fennel, and one GHP package each for market yards, auction centres, storage facilities and processing units (Table 1). Besides these, the project aimed to create standardized training modules as reference materials, with flexibility for adaptation based on local needs. This ensured consistency across future training programmes and formulation of valuable resources for trainers in the Training of Trainer (ToT) sessions.

Achievements:

- **Surpassing planned targets for capacity building of trainers through ToT**
  The project surpassed its targets by training a total of 150 trainers through its ToT programmes, with significant participation from the public and private sectors as well as academia. The trainers are now better equipped to transfer the knowledge and help farmers and other actors across the spice value chain adopt sustainable and safe practices.

- **Improvement of the POP for each spice**
  A comprehensive review and improvement of the POP was conducted for each spice, ensuring that the materials are current and aligned with the best practices in the field.

- **Enhancing awareness and adoption through IEC materials**
  The project played a key role in developing and disseminating IEC materials. These have been widely distributed to enhance awareness and facilitate the adoption of GAP and GHP throughout the spice-growing and handling community, ensuring a positive impact on the sector's long-term sustainability.

4.3 Output 2: Capacity of farmers and other value chain actors enhanced to adopt GAP / GHP for improving yields, quality and safety of spices.

The project's Output 2 targeted capacity building of farmers and other value chain actors to adopt GAP and GHP. Specific targets included conducting a baseline survey to support monitoring and evaluation, selecting 12 villages, training 1 200 farmers and strengthened eight FPOs. The project also aimed to provide one nursery for black pepper seedlings and facilitate eight study visits for farmers.

The project made remarkable strides in advancing its objectives, significantly surpassing its original training targets for farmers and FPO members in GAP and GHP. The training modules developed for GAP and GHP practices were based on the risk-based assessment undertaken during the project. By the end of the reporting period, the project had trained approximately 1 700 farmers (535 women and 1 165 men) and 200 other value chain stakeholders like FPO coordinators, government officials, exporters and traders across Andhra Pradesh, Gujarat, Madhya Pradesh and Rajasthan, exceeding the initial goals of 1 200 farmers and 50 stakeholders respectively (Table 2). This progress was achieved through a variety of engaging training formats, such as refresher courses, group activities and exposure visits, alongside the use of digital tools like animation videos with voiceovers. Apart from these, the project also developed 60 concise (3–4 minute) videos on GAP and GHP for the four spices, tailored to local contexts and languages (Gujarati (Gujarat), Hindi (Madhya Pradesh and Rajasthan) and Telugu (Andhra Pradesh) to ensure effective stakeholder engagement. These methods proved highly effective in simplifying complex concepts for farmers with diverse educational backgrounds.

To strengthen the FPOs, 10 moisture meters were distributed to six FPOs across Gujarat, Madhya Pradesh, and Rajasthan to improve the post-harvest practices. Additionally, Trichoderma for seed treatment was provided in ten project villages, benefiting 1,000 seed spice farmers. A total of 22 new Farmer Interest Groups (FIGs) were formed and registered with existing FPOs, grouping farmers into clusters of 15–20 at the village level. Six FPOs were equipped with a Quality Management System (QMS) for Good Agricultural Practices (GAP), improving record-keeping, quality monitoring, and pesticide residue management. This facilitated IndGAP certification, reduced compliance risks, and strengthened market positioning. FPOs also promoted peer learning, enhancing sustainable practices and gender-inclusive growth.

Table 2: Planned vs. achieved targets for activities (reported in numbers) under Output 2

Activities	Planned	Achieved
FPOs registered/strengthened	8	8
Farmers and value chain actors trained on GAP/GHP	Farmers: 1 200 Value chain actors: 50	Farmers: 1 700 (women: 535 and men: 1165) Value chain actors: 200
Farmers' groups exposed to practices in other states/area	8	212 farmers including 45 women (21 %)*
Farmers provided with seedling and healthy plants	-	200 black pepper farmers
* *Instead of the initially planned eight farmer groups, the study found that 212 farmers including women were exposed to practices in other states/area.*		

Achievements:

- **Training & Inputs Received:**

All the farmers participating in the project received comprehensive training in GAP and GHP in order to improve farming and post-harvest techniques. The key concepts were delivered through innovative methods. One of the

successes was the capacity-building component that surpassed the initially planned targets. Farmers gained an understanding of GAP and GHP, to enhance spice quality and meet the international food safety standards. Information, Education, and Communication (IEC) materials were widely distributed, ensuring accessibility to skill development for marginalized farmers.

Since capacity building of farmers played a pivotal role in the success of the project, the survey gathered insights on training of farmers for various practices. Among the surveyed farmers, 408 (96 percent) received training on GAP, which was crucial in promoting sustainable spice cultivation. Other training programmes, such as GHP and SPS, reached 347 (82 percent) and 212 (50 percent) farmers respectively (Table 3). However, specialized training on certification and export preparation appeared to reach only a smaller fraction, as some farmers struggled with recall and tended to underreport or misreport the support they received, often in the hope of securing additional assistance for their activities.

Table 3: Distribution of surveyed farmers who received training on various practices

Types of training received	Number of farmers (n=425)	% of surveyed farmers who received training
GAP: training to grow spices sustainably	408	96
GHP: training on keeping the spices clean and safe	347	82
SPS: training on how to prevent chemical residues in spices	212	50
Training on getting quality certification for spices	82	19
Training on preparing spices for export	55	13

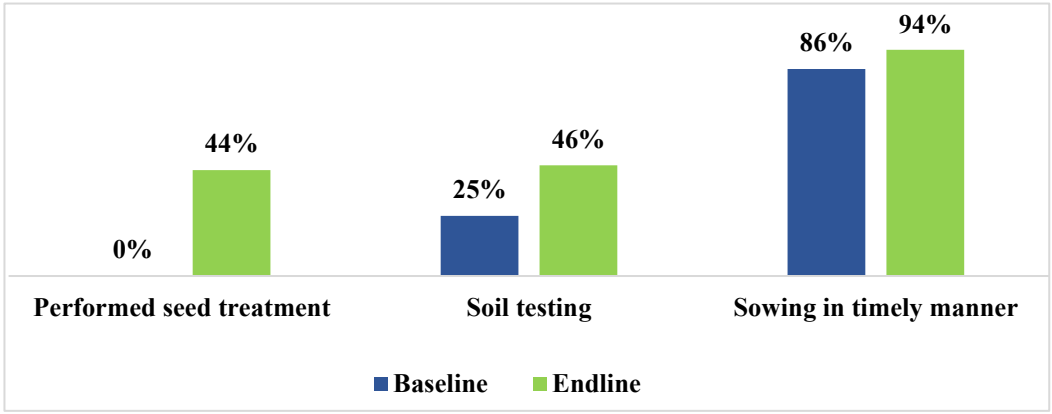
4.3.1 Training on GAP

As presented in Table 2, about 96 percent of the surveyed farmers received comprehensive training on GAP to promote sustainable and environmentally friendly farming methods. These practices are specifically designed to reduce the environmental footprint of agriculture while boosting productivity. GAP training equips farmers to optimize agricultural input use, improve crop management, and elevate produce quality. This aligns produce quality with the global market standards while boosting sustainable and environmentally responsible farming practices.

Pre-sowing activities

Three essential GAPs that the project promoted for cultivation of healthy crops in an environmentally sustainable manner are: seed treatment, soil testing and timely seed sowing. The endline study determined the change in the percentage of farmers adopting these practices prior to and following the training/intervention. As shown in Figure 3, an increase in the percentage of farmers adopting the individual practices was noted across all three practices, showcasing the impact of project interventions.

Figure 3: Percentage change in farmers adopting pre-sowing activities (pre and post intervention/training)



Efficient irrigation practices

The project promoted improved irrigation techniques to optimize water usage and support healthier crop growth. The endline study evaluated the change in the percentage of farmers adopting these practices before and after the intervention and found a significant increase (Figure 4). Similarly, there was a noticeable increase in respondents adopting water-efficient techniques like drip irrigation and border irrigation (Figure 5).

Figure 4: Percentage change in farmers adopting improved irrigation techniques (pre and post intervention)

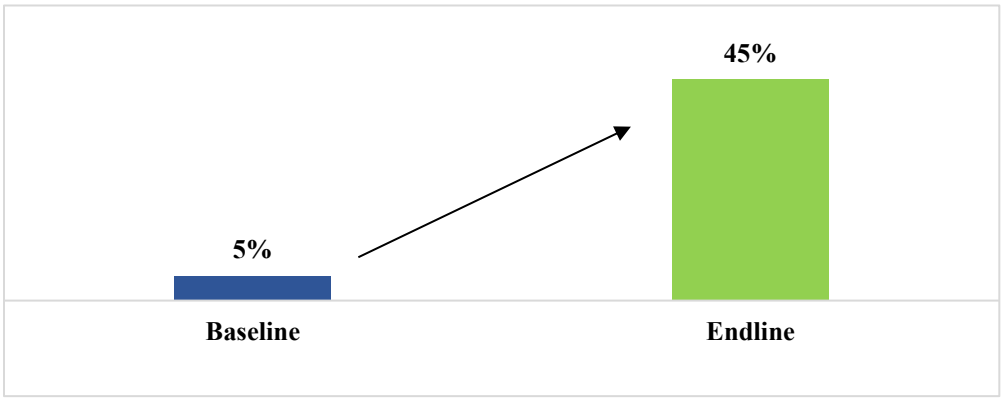
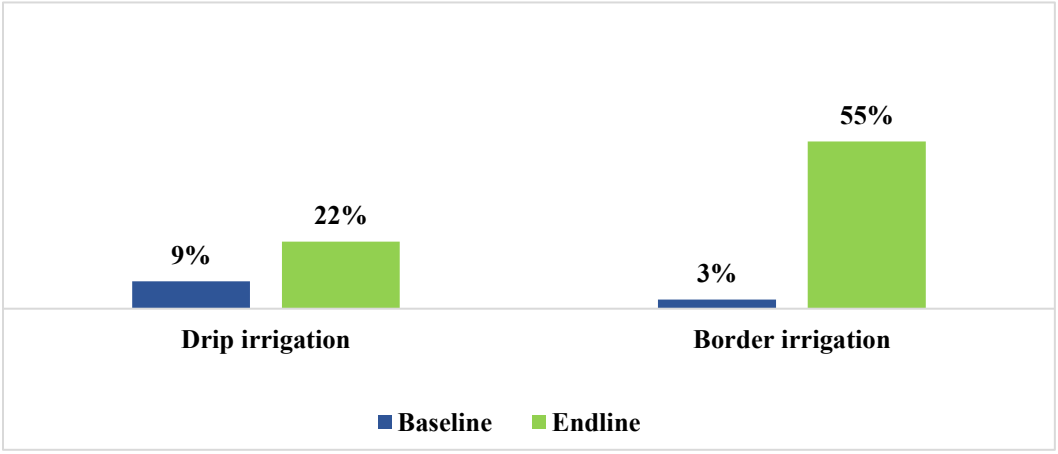


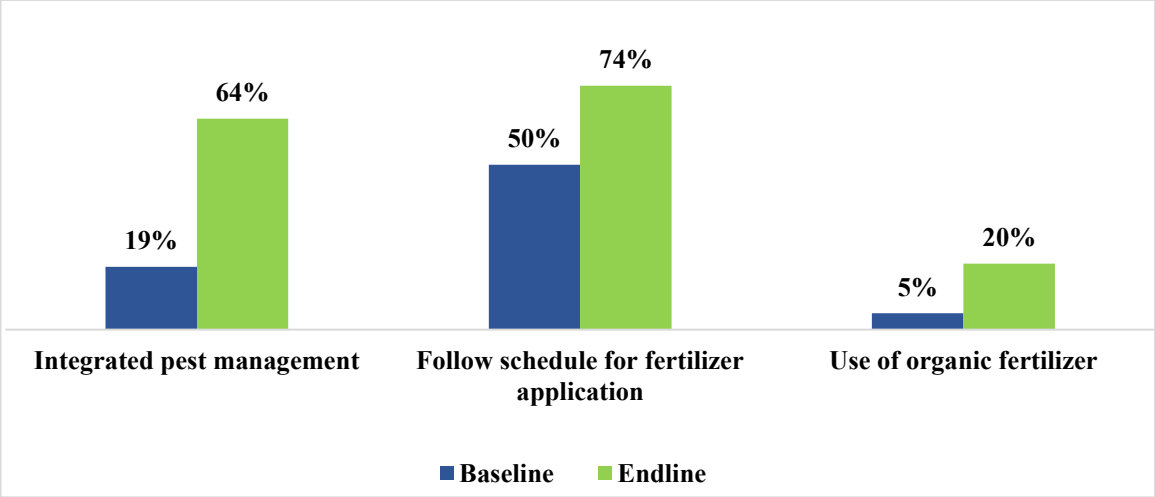
Figure 5: Percentage change in farmers adopting efficient irrigation methods (pre and post intervention)



Effective inter-cultural operations

Intercultural operations focus on nurturing crops post-sowing. For this purpose, the surveyed farmers implemented integrated pest management (IPM) to manage pests in a sustainable way, adhered to a scheduled application of fertilizers to ensure balanced crop nutrition, and used organic fertilizers to promote healthy soil while reducing reliance on chemical inputs. The adoption rates for these practices at baseline and endline are illustrated in Figure 6 and indicate an increase in the adoption of IPM and scheduled application of fertilizers among respondents. A perceptible shift towards organic fertilizers was also noticed during the endline.

Figure 6: Percentage change in farmers following inter-cultural operations (pre and post intervention)



Training on GHPs

The project not only strengthened farmers' connections with FPOs but also empowered them with critical resources and training to improve the quality and marketability of their produce. Farmers benefited from mechanized threshing, which improved seed cleanliness and reduced contamination, as well as the provision of breathable gunny bags for safe storage. Innovations such as blanching were introduced in black pepper to reduce microbial load, and practices like careful harvesting, safe drying techniques and transportation in well-ventilated vehicles ensured product integrity. These initiatives complemented the market access efforts by equipping farmers to consistently meet buyer quality standards, further solidifying their position in both domestic and export markets.

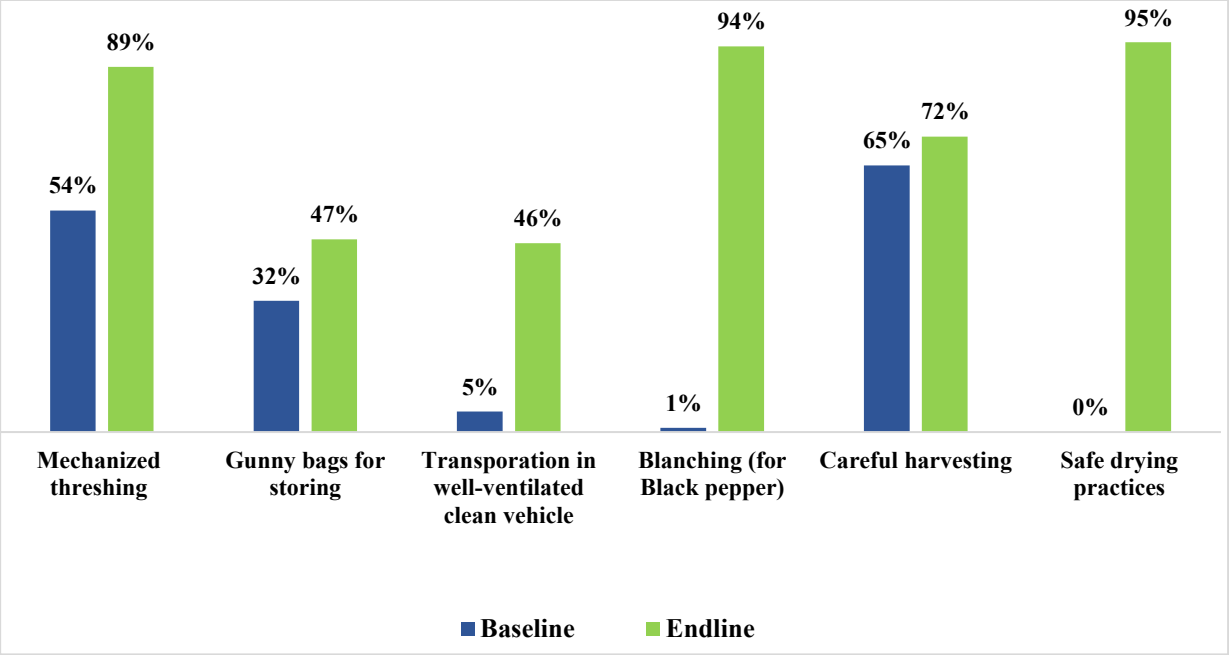
Eighty-two percent (247 men and 100 women beneficiaries) of farmers received training on GHP (Table 3), which is essential for maintaining the quality and safety of spices throughout post-harvest processes. The GHPs they were trained in were:

- **Mechanized threshing**: Improves efficiency in seed separation by minimizing contamination and improving cleanliness.
- **Gunny bags for storing**: Traditional, breathable storage that prevents spoilage and protects against pest infestation.
- **Blanching for black pepper**: A quick boiling pre-processing method that reduces microbial load while ensuring food safety.
- **Careful harvesting**: Gentle crop handling, avoiding contamination and damage during the harvest.
- **Safe drying practices**: Controlled moisture reduction to prevent mould growth and ensure product quality.

- **Transportation in well-ventilated vehicles**: This ensures proper air circulation, maintaining freshness and preventing contamination.

Figure 7 shows the uptake of GHP.

Figure 7: Percentage change in farmers practising safe post-harvest management (pre and post intervention)



Beyond classroom sessions, the project introduced innovative training methods such as video dissemination and street plays (*nukkad nataks*) to make learning more accessible and relatable for farmers. These approaches used storytelling and visual aids to simplify complex concepts like GAP and GHP, thus ensuring greater engagement, practical understanding and widespread adoption of improved practices.

4.4 Output 3: Strengthening marketing links with buyers (exporters/importers)

The project strengthened farmer-buyer linkages through FPO services, improving farmers' production practices, market readiness and product quality. Table 4 presents the activities undertaken for achieving the goal, and the achievement reported per activity.

Table 4: Planned vs. achieved targets (reported in numbers) for activities under Output 3

Activities	Planned	Achieved
FPOs certified on IndGAP	4	4 FPOs received training and applied for certification
FPOs enlisted on web-portals for spices trading	4	8
Buyer-seller meets organized across project States	-	8
Buy-back arrangements organized across project States	-	4

By creating a direct pathway to buyers and exporters, the project helped farmers move away from uncertain market cycles and secure more predictable incomes. The number of farmers associated with each FPO increased from 120 (30%) during the baseline survey to 284 (67%) at endline; helping farmers access larger markets with greater stability in Figure 8. FPOs were equipped to provide the farmers with a range of services. The assessment showed that 70% of the 425 respondents reported receiving support from FPOs, primarily in training, followed by procurement of produce, input support, and safe processing and post-harvest technologies, as illustrated in Figure 9. Eight FPOs were registered under the NSSP portal, facilitating access to larger markets and export channels. Through eight buyer-seller meetings and four buy-back workshops, 25 formal agreements were secured with exporters, providing farmers with stable market opportunities and guaranteed prices, reducing risks of price fluctuations and market volatility.

Figure 8: Farmers associated with FPOs

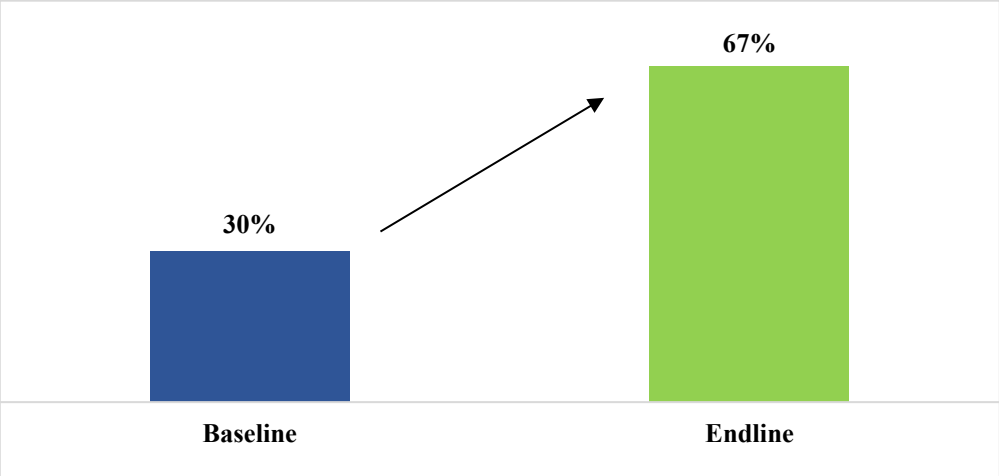
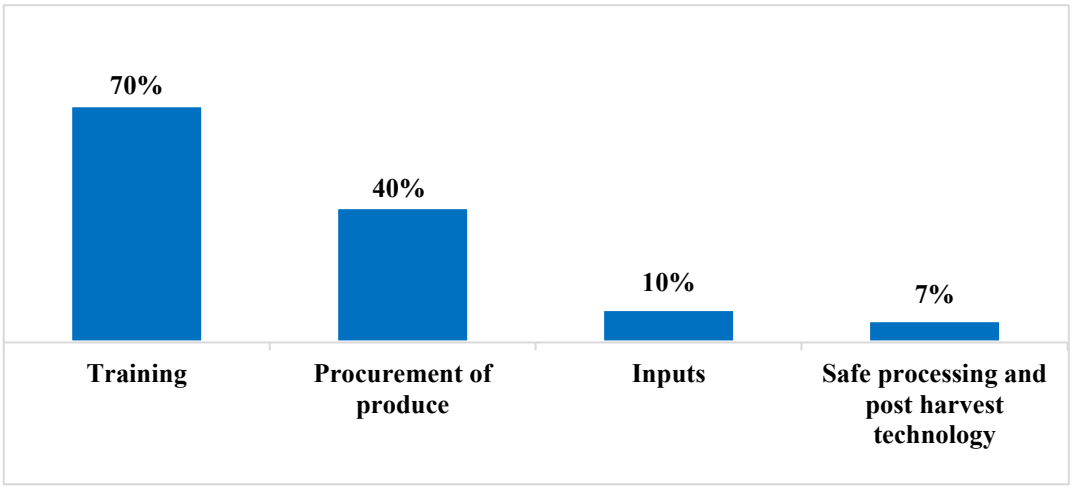


Figure 9: Services provided by FPOs



4.5 Output 4 : Establishment and implementation of a National Contaminant and Residue Control Programme (NCRCP) for identified spices

Output 4 achieved the successful establishment of the National Contaminant & Residue Control Programme (NCRCP) for spices. Two labs were equipped for pesticide residue testing, ensuring compliance with Codex Maximum Residue Limits (MRLs). NCRCP was implemented across project states, enabling Indian spices to meet international safety standards, boosting export potential to markets like the EU and US, and improving food safety by reducing harmful pesticide residues. Table 5 specifies the activities under Output 4, and the achievement reported for the same.

Table 5: Planned vs. Achieved Targets for Activities under Output 4

Activities	Planned	Achieved
Report(s) on lab capacities available	-	Two labs were chosen for testing seed spices
NCRCP developed and implemented for 4 spices over 1 cropping seasons	Yes	Yes

4.6 Other Unexpected Results

Knowledge spillovers: Through knowledge spillovers, an unplanned collaboration with Digital Green led to the development of 60 training videos on food safety hazards, detection, and management practices.

Other institutional spillovers: The project strengthened industry capacities, food safety programs, and product traceability models. Key institutional spillovers included signing MoUs and EoIs between FPOs and spice companies, fostering public-private partnerships and enhancing value chain collaboration.

Standards compliance spillovers: The project exceeded its targets, training 1,700 farmers and 200 value chain actors on GAP/GHP, surpassing the goal of 1,200 farmers and 50 stakeholders, demonstrating broader impact and outreach.

New projects being developed /funded: A new project titled "Mitigating Aflatoxin Contamination in Peanuts in India" is being developed, leveraging the lessons learned from the spices project. A key takeaway from the spices project is the establishment of the National Contaminant and Residue Control Programme (NCRCP), which will play a pivotal role in designing interventions for the peanut initiative. The NCRCP's framework, focused on addressing contaminants and ensuring food safety, will be instrumental in tackling SPS (Sanitary and Phytosanitary) challenges in peanuts. This initiative aims to improve the safety and quality of peanuts, enhance market access, and create international trade opportunities for India. The methodologies and insights from the spices project will provide a strong foundation for achieving the objectives of this initiative.

Additionally, following the successful completion of the spices project, FAO, in collaboration with the resource partner GIZ, is planning to scale up these interventions to other spices and commodities, including coffee, across India. This expansion underscores the project's significant impact and aims to replicate proven practices through private sector-led interventions. These efforts focus on improving agricultural practices, strengthening value chains, and expanding market access, contributing to sustainable growth and development in India's spice and commodity sectors.

5. Cross-Cutting

- *Gender*
- *Environment, biodiversity and climate change*

5.1 Gender

Beyond its immediate achievements, the project made significant strides in promoting gender inclusion, laying the groundwork for lasting changes in the spice value chain. Recognizing the essential role of women in agriculture, the project actively worked to boost their participation by organizing inclusive training sessions and street plays featuring women actors. Of the 1 700 participant beneficiaries, 535 (31 percent) were women farmers. Women's roles were also highlighted in the project's video materials, showcasing their contributions and encouraging broader gender representation in agricultural practices.

A major reason for the project's success was its thoughtful, multi-channel approach, which was designed to be inclusive and responsive to local needs. Initially, involving women fully in the trainings was challenging. However, the project quickly adapted and introduced gender-focused activities that resonated with the community. For example, street plays featuring women theatre artists were held in eight villages to highlight GAP and GHP. These performances drew over 1 500 attendees, of which 35.6 percent (537) were women, providing an engaging way to reach women farmers who might not have attended traditional training sessions. Additionally, women were featured in training videos, giving them a visible role in operations and making the materials more relatable. This inclusive approach helped boost engagement and ensured the training reached a wider audience. Horizontal issues like environmental impacts were also addressed, with 50 percent of respondents trained on SPS practices aimed at minimizing chemical residues in spices (Table 2). Building on the project's focus on SPS compliance and market access, the following sections examine how targeted interventions in training on GAP and GHP, as well as strengthened market linkages, fostered sustainable farming practices and increased export readiness among spice producers.

The STDF project inspired FAO to commission a study on the gender dimensions of the spice value chain, carried out by CUTS International. The study examined women's roles and participation in selected spice value chains, focusing on ways to strengthen the link between gender equality and safe trade in spices. It was based on desk research and field-level inputs gathered from growing regions in the states of Andhra Pradesh, Gujarat, Rajasthan, Madhya Pradesh, Meghalaya, and Kerala. Although the study was completed toward the end of the project, it generated valuable insights to support gender-sensitive approaches in future spice sector interventions. Improving women's participation in spice value chains requires a holistic strategy that includes forming collectives, providing targeted services, developing leadership, and strengthening market linkages. Training programs must be gender-responsive and culturally sensitive, accounting for women's time, mobility, and location constraints by adjusting schedules and choosing accessible venues. Peer learning plays a crucial role in building women's confidence, breaking stereotypes, and enabling mentorship. Finally, all Gender Equality and Social Inclusion (GESI) strategies must be rooted in specific hyperlocal contexts — geographical, socio-economic, cultural, and climatic—to be truly effective.

5.2 Environment, biodiversity and climate change

The project employed innovative strategies to address climate-related challenges, particularly the increasing unpredictability of weather patterns affecting yields, as a result of which farmers were using chemical inputs more than required in order to improve yields. Recognizing this trend, the project introduced real-time weather advisory services via WhatsApp for all regions targeted under the project, a tool both accessible and user-friendly for farmers. These updates offered timely, localized weather insights that allowed farmers to make informed decisions on irrigation, pest control and harvest timing, helping them minimize unnecessary chemical application.

The project empowered farmers to adopt sustainable practices like GAP-compliant methods and weather-aligned crop management strategies, reducing dependence on chemical fertilizers and pesticides. These efforts not only optimized yields but also improved soil health, biodiversity and long-term fertility. By fostering resilient agricultural systems capable of adapting to climate changes, the project is laying a strong foundation for a sustainable spice sector that aligns productivity with environmental stewardship.

These approaches are gradually reducing reliance on chemical fertilizers and pesticides, fostering healthier soil and biodiversity. By embracing these sustainable practices, farmers are creating more resilient agricultural systems capable of adapting to climate changes, which is crucial for the long-term health of the spice sector and the communities that depend on it. Through these efforts, the project is not only supporting current environmental goals but also strengthening the foundation for a sustainable and inclusive spice industry in the future.

6. Financial Overview

Provide an overview of the initial project budget, remaining funds and provide brief details on budget reallocations, if applicable.

The initial total budget of the project from STDF was US$ 508,830 with the total project expenditure of 96% as per Financial Statement enclosed in Annex II. The final certified expenditure amount may vary slightly after all commitments are liquidated, project services and reporting costs are charged, and any winding-up costs are finalized.

The initial timeline of the project was from October 15, 2019, to October 31, 2022. However, this timeline was adjusted multiple times due to unforeseen challenges and setbacks, resulting in three No-Cost Extensions (NCEs). These disruptions were primarily caused by the COVID-19 pandemic, delayed deliverables under the Letter of Agreement (LoA) with the Spices Board, and the postponement of some activities to the next spice cropping season due to the Model Code of Conduct issued during the ongoing Parliament elections in India, which hindered the completion of critical project activities. Ultimately, the project timeline was extended until September 30, 2024.

As a result of these extensions, a budget revision was carried out in April 2023 to reallocate resources for the required technical and input support, while accommodating the extended timeline and making necessary adjustments to support ongoing activities, personnel, travel, and operational costs. There was no change to the project's originally approved scope of work or total allocated budget.

Also provide brief information on how in-kind, and co-financial funds if applicable, were used by the project.

In addition to the STDF budget, the FAO Technical Cooperation Programme (TCP) contributed USD 200,000, which was fully utilized to support project activities under Project Output 1 and Output 2. This funding was used for developing technical content for the training modules, the package of practices for spices, and contributions to the Letter of Agreement (LoA) with the Spices Board, Ministry of Commerce and Industry, Government of India to implement project activities in the field, such as the Training of Trainers (ToT) programs, among others.

The Spices Board's in-kind contribution, valued at USD 283,200, played a crucial role in the success of the project. This included office space across four states, furniture, and the time of key officials throughout the entire project period. These resources were vital for supporting key activities aimed at enhancing the capacity of farmers and other value chain actors to adopt Good Agricultural Practices (GAP) and Good Handling Practices (GHP), ultimately improving the quality, yields, and safety of spices.

Moreover, the in-kind contributions helped strengthen market linkages by leveraging the Spices Board's regular program, the Buyer-Seller Meet (BSM), which connected farmers with buyers, including exporters and importers. The Board’s support was also instrumental in building the capacity of the public and private sectors, as well as academia, to deliver training and awareness programs on risk-based assessments and good practices along the spice value chains. This contribution was essential in improving the overall spice industry, including facilitating reviews of GAP and GHP packages by universities and research organizations, and organizing workshops for agricultural university faculty. Additionally, the Board facilitated the selection of villages and farmer groups, supported the development of a baseline for monitoring and evaluation (M&E), and helped establish group certification for FPOs with the involvement of Quality Council of India (QCI).

To further strengthen FPOs, the Spices Board provided specialized schemes such as the supply of harvesting and post-harvest machinery like threshers, ladders, and tarpaulin sheets at subsidized rates to farmers. The schemes also included the provision of moisture meters, bio-fertilizer (Trichoderma), and certified seeds for seed spices, all of which contributed to improving production quality.

The in-kind contributions also supported the procurement and propagation of healthy plants, particularly black pepper, which were then supplied to farmers. Additionally, the Spices Board helped map laboratory capacities at the district and state levels, while developing a national contaminant and residue control program. These efforts ensured a comprehensive approach to enhancing spice safety and quality.

7. Challenges, Risk & Mitigation

7.1 Overview of the key challenges and risks faced during the project, and risk mitigation measures taken.

While the project achieved remarkable success, several challenges came to the fore during implementation. However, practical and innovative solutions were introduced to overcome these obstacles.

- **Low participation of women**

One of the barriers was the limited involvement of women in the project's training programmes due to cultural barriers. To encourage more participation, training videos and street plays featuring women artistes were created and performed. By highlighting women's roles in spice farming, the project not only provided inspiration but also fostered a sense of inclusion and representation. Women were actively involved in key farming activities such as sowing, fertilizing, weeding and harvesting. They also played a crucial role in post-harvest activities, including threshing and processing. This recognition of women's contributions not only empowered them but also emphasized their critical role in the overall success of the spice farming value chain.

- **Limited primary processing capacity**

Quality control in post-harvest management was another challenge. Many farmers lacked access to essential processing tools, which affected the quality of the final product. To address this, the project distributed tarpaulins, ladders and threshers through the Spices Board. These tools allowed farmers to handle their produce more effectively, ensuring cleaner, safer and higher-quality spices that meet market standards.

- **Slow transition to organic farming**

The transition from chemical-based to organic farming was slow, largely due to concerns over potential income loss during the adjustment period. To encourage this shift, the project established buy-back arrangements with exporters who were willing to purchase produce grown following GAP and GHP. This guaranteed market access helped incentivize farmers to adopt more sustainable practices without the fear of financial instability.

- **Climate-driven increase in chemical inputs**

Erratic weather patterns posed a major challenge, pushing farmers to use more chemical inputs as a safeguard. In response, the project began disseminating real-time meteorological updates via WhatsApp groups. This allowed farmers to make informed decisions about crop protection, reducing their reliance on harmful chemicals while optimizing yields based on accurate weather forecasts.

- **Limited access to testing infrastructure**

A significant hurdle was the farmers' lack of access to testing facilities for their produce. To address this, the project established basic testing labs accessible to multiple FPOs in a central location. This simplified access enabled more farmers to get their spices tested for quality and safety, boosting their competitiveness in the market, although more such local testing facilities will need to be created over time.

8. Communication and Outreach

Overview of communications and outreach activities carried out to make the project visible to different stakeholders, results achieved, communications products produced (e.g., brochures, websites, films) produced, media coverage (with web links, as relevant), quotes and/or short case stories of how people are benefitting from the project.

The project implemented extensive communication and outreach activities to engage stakeholders and farmers. Key outputs included four POPs each on Good Agricultural Practices (GAP) and Good Hygiene Practices (GHP), 16 IEC materials in local languages, and 60 short training videos. These efforts reached approximately 6,000 people, promoting awareness and adoption of best practices.
Training of Trainers (ToT) program trained 70 Master Trainers, who further educated over 1,700 farmers. Training materials and digital tools, including animated videos, were widely distributed. A baseline assessment and M&E plan tracked progress, while beneficiary stories showcased the project's positive impact on agricultural and hygiene practices.

If communications and outreach materials are available online, please provide links in this section.

List of GAP and GHP Training Videos with Video Links:

- **Cumin videos in Hindi**: https://drive.google.com/drive/folders/1P3B9cEGg_2mlH4qfgH8piO9BcDYcWdis
  - **Cumin videos in Gujarati**: https://drive.google.com/drive/folders/1joA3N5EVx9WSMSx2sduaT7ICMaD6orYe
  - **Cumin videos in Hindi with English subtitle:** https://drive.google.com/drive/folders/12qjuDhK34UAHK4ueOZ3Dkqo75z-44Vni
  - **Cumin videos in Hindi for dissemination through WhatsApp:** https://drive.google.com/drive/folders/1IMxQZjNMigTuQHdMGnzyWxR4qGf1WMGC
  - **Cumin videos in Gujarati for dissemination through WhatsApp:** https://drive.google.com/drive/folders/1cGRMuIcp-dkxIvki5xN8lSle-sYLe4Pq

Please share few very short quotes (1 to 3 short sentences) from key project stakeholders (ensuring representation from the different stakeholder groups-public, private, academia, NGO etc.- would be appreciated).

1. *"The STDF pilot project revolutionized the spices value chain by promoting sustainable practices like GAP and GHP. These efforts improved product quality and expanded market access. With over 23 exporters, including ITC, signing MoUs with FPOs, the direct trade of 895 MT of seed spices at premium prices boosted farmer incomes and strengthened collaboration among stakeholders."* — **Dharmendra Das, Deputy Director, Spice Board**

2. *"Exposure visits and the use of tools like yellow sticky traps transformed my farming practices, reducing costs and increasing profits for my fennel crops."* — **Patil, Gujarat**

3. *"Technologies such as zero-tillage and subsidized threshers improved my coriander crop's quality and significantly increased my earnings."* — **Pradeep Kumar, Madhya Pradesh**

4. *"Adopting GAP practices enhanced my crop production, while FPO MoUs provided better market access and new growth opportunities."* — **Harinder Singh, Rajasthan**

5. *"The use of pepper threshers and tarpaulin sheets improved the quality of my black pepper, enabling me to earn 15-20% higher prices."* — **Dimple Devi, Andhra Pradesh**

9. Sustainability & Follow-Up

Provide an overview of efforts made and discussions undertaken with different project stakeholders to secure project follow-up actions and ensure project achievements are sustained, scaleup and/or replicated.

Efforts to ensure the sustainability and replication of project achievements focused on institutional capacity, partnerships, and policy alignment:

1. **Institutional Support:** Local Master Trainers and Extension Workers, along with the Spices Board and universities, continue to disseminate training materials and knowledge on GAP and GHP, ensuring widespread adoption and scalability.
2. **Strengthening FPOs:** Six FPOs established Quality Management Systems, and four obtained IndGAP certification. Membership under the FPOs rose from 30% at the baseline to 67% at the endline evaluation, with formal agreements with exporters securing stable markets and better prices.

3. **Policy Alignment:** The project aligned with government schemes like IPM, embedding chemical-free farming goals into national frameworks for long-term support.
4. **Technological and Economic Sustainability:** Digital tools for pest management and market linkages ensure continued efficiency and income growth (58% increase). Training videos and resources enable widespread replication.
5. **Gender Equality:** Women-focused training and activities promoted inclusion, laying the foundation for broader social and economic empowerment.
6. **Digital Communication tools:** Under the project, 60 short, community-based training videos were developed in regional languages, focusing on promoting Good Agricultural Practices (GAP) and Good Hygiene Practices (GHP) for four spices: cumin, black pepper, coriander, and fennel. The VISTAAR mobile application platform, developed by the Ministry of Agriculture & Farmer's Welfare, could be utilized to integrate these videos, ensuring wider access to these training resources for farmers and relevant stakeholders. These digital tools will provide farmers with accurate and timely information on agricultural practices, supporting the long-term sustainability of knowledge and practices beyond the project period.

7. **Scaling Up of Initiatives:** Following the successful implementation and completion of the project, the initiatives have gained considerable interest for further expansion. The resource partner, GIZ, has approached FAO to support the scaling up of these interventions on a larger scale. This proposed expansion aims to replicate the successful practices and methodologies, extending them to other spices and additional commodities, such as coffee, across India. This scaling-up effort underscores the project's significant impact and demonstrates its potential for broader application. By enhancing agricultural practices, strengthening value chains, and creating market opportunities, this initiative represents a crucial step toward sustainable growth and development in India's spices sector and related commodities.

These efforts ensure the project's achievements are sustained, scaled, and replicated, contributing to a resilient and equitable spice sector.

10. Lessons Learned

- *Lessons learned related to what worked well, elements of success*
- *Lessons learned related to what did not work so well, constraints faced*

While the project has made significant strides in the promotion and adoption of GAP, GHP and SPS best practices and linking farmers to FPOs, there is still much potential for continued growth and sustainability. Expanding the reach of organic farming, increasing women's participation, and providing more decentralized testing facilities are critical areas for future development. Additionally, continuous support for FPOs to scale up their operations and explore new market opportunities will be key to ensuring the long-term success of these initiatives.

The project has set a strong foundation for a sustainable and high-quality spice value chain, making strides in areas like farmer empowerment, quality improvement and market access. However, key lessons from the project's innovative approaches offer insights for future endeavours. For instance, the use of street plays proved highly effective in fostering rapid adoption of GAP and GHP, by simplifying complex concepts for farmers in culturally relatable ways. Similarly, enabling women's participation, despite socio-cultural constraints, highlights the importance of tailored engagement strategies that resonate with local contexts.

The successful organization of buyer-seller meetings stands out as a lesson for similar initiatives – the project's ability to secure formal agreements, unlike many past efforts, was rooted in meticulous planning, stakeholder alignment and providing tangible value to both buyers and farmers. Furthermore, the project's success in establishing a new FPO in Andhra Pradesh underscores the need for comprehensive farmer mobilization, access to resources like training and equipment, and incentives such as market linkages and price premiums. The approach to implementing the NCRCP also offers critical takeaways, showing how structured sampling, compliance monitoring and strong institutional backing can effectively align local practices with international quality standards.

Expanding these innovative efforts, while addressing challenges like decentralized testing as well as scaling operations of FPOs, will be critical for building on these achievements. By drawing from these lessons, other projects can replicate the success of this project, fostering inclusive and sustainable agricultural ecosystems.

11. Recommendations

Identify actionable recommendations targeted at relevant organizations, including partners and stakeholders involved in and/or benefitting from the project.

The key recommendations emerging from the project for strengthening the spice value chain, targeting specific stakeholders responsible for their implementation are presented below. Each recommendation is aimed at addressing identified gaps in capacity building, resource access, quality compliance, and sustainability.

- **Develop a cadre of women trainers to lead gender-sensitive programmes**
  To boost women's participation in spice farming and capacity-building activities, it is essential to cultivate women leadership. The Spices Board and local FPOs can collaborate to establish a cadre of women trainers, ensuring that training programmes are relevant and accessible to all farmers. This can drive higher women engagement by fostering gender inclusivity in the spice sector. Women trainers, acting as role models, can make training experiences more relatable, encouraging other women to take up farming and leadership roles. Support from STDF can further enhance women's involvement by funding initiatives like women-only sessions, partnerships with self-help groups (SHGs), and family-focused training modules. Offering flexible schedules, childcare support, and incentives can create an empowering environment, bridging the gender gap and fostering a resilient spice value chain.

- **Increase access to post-harvest inputs**
  A key challenge identified during the project was limited access to post-harvest tools and infrastructure. The Spices Board and Government (Agriculture and Allied Departments) can collaborate to ensure the availability of essential post-harvest inputs like tarpaulins, drying equipment, and processing tools, at affordable prices. By supporting the procurement of these resources and their distribution to the farmers, the quality of spices can be improved, reducing losses and aiding in receiving higher market value.

- **Cover income loss during the transition to organic farming**
  Transitioning from chemical to organic farming, though has long-term benefits, but often results in short-term income loss due to lesser yield in initial years; discouraging farmers to make the shift. To address this, the Government (Agriculture and Allied Departments) and donors can collaborate to introduce premium pricing or compensation schemes during the initial years of transition. This incentivization will mobilize and motivate more farmers to adopt organic methods, compensating for lesser yield and thus, less income during the transition time; and promoting enhanced adoption of environment friendly organic practices.

- **Increase access to bio-inputs, climate resilient crops varieties and digital pest management**
  As climate-related challenges grow, providing farmers with bio-inputs like organic fertilizers and bio-pesticides becomes vital. The Spices Board and Krishi Vigyan Kendera (KVKs) can collaborate to promote climate-resilient spice varieties, reducing dependence on chemical inputs. The Digital Green Trust and project partners can also support the dissemination of digital information and material for pest management through local platforms like WhatsApp, offering real-time advisory services. This approach will enable farmers to implement sustainable and effective crop management strategies.

- **Establish advanced testing labs for spices at Agricultural Produce Market Committee (APMC) markets**
  Ensuring the safety and quality of spices is critical for maintaining market competitiveness. The Government (Agriculture and Allied Departments) and Spices Board should prioritize establishing advanced testing laboratories at Agricultural Produce Market Committee (APMC) markets. These labs would allow farmers to conveniently test for pesticide residues and other contaminants, and ensuring compliance with domestic and international standards. Support from STDF can enhance the awareness among farmers to access and use these facilities, and improving the product quality.

- **Sustainable long-term impact**
  While the project has been impactful, its benefits could have been even more widespread and sustainable, had the intervention lasted for a longer duration, ideally covering three to four cropping seasons. Extending the project for multiple cropping seasons would allow farmers to adopt the trainings received and implement GAP/GHP, adapt to new farming techniques in a more gradual manner in a supportive environment. This would also provide better opportunities for monitoring progress and impact, addressing evolving challenges and refining strategies based on real-time results. In this regard, the Government (Agriculture and Allied Departments), and STDF can contribute by collaborating to secure and provide funding and resources for the extended project duration.

Annexure I: Updated log frame with results

Goal/Outcomes	Project Description	Measurable Indicators / Targets	Results	Sources of Verification	Assumptions and Risks
Goal ***Improved safety and quality of four spices (fennel, coriander, cumin, and black pepper) to increase market access*** *and support efforts to reduce poverty (SDG 1) and hunger (SDG 2) in the selected project areas in India.*	1) Increased exports of safe and high-quality spices from India to overseas markets. 2) Improved food safety and consumer health in India and export markets. 3) Increased/boosted incomes of small-scale farmers, and women and other marginalized (tribal) communities empowered,	1) 50% increase in the number of farmers/value chain actors whose sample spices are safer in terms of reduced pesticide residues and contaminants 2) 20% increase in the incomes of project beneficiary farmers 3) Number of new markets accessed for the targeted spices	• Over 80%[4] of spices tested under the NCRCP complied with Codex MRLs • 58% increase in spice income of project beneficiary[5]	• Export data on spices • Test reports before and after the project • Evaluations- baseline and endline	• Economic and political conditions in global and domestic markets conducive. • Weather conditions favourable.
Outcome 1	1) Improved safety and quality of three seed spices (cumin, fennel and coriander) and black pepper for increased market access.	1) 75% farmers have improved understanding of Good Agricultural and Hygiene Practices (GAPs and GHPs) 2) 4 Farmer Producer Organizations (FPOs) have control system (Quality Management System) for GAPs 3) 4 FPOs certified on IndGAP	• 409 (96%) (men: 305, women: 104) beneficiaries received training on GAP, 347 (82%) (men: 247, women: 100) received training on GHP • 6 FPOs have control system (Quality Management System) for GAPs	• Project reports • Evaluation reports	• Farmers, exporters, universities and other value chain stakeholders are motivated to join the programme

[4] *Source: STDF sample analysis report 10092024*

[5] *The reported income growth in the spice sector reflects improvements in farming practices, market linkages, and financial stability. However, it does not account for fluctuations in commodity prices, which may have influenced overall income changes during the three-year project period, beyond the control of the project.*

Goal/Outcomes	Project Description	Measurable Indicators / Targets	Results	Sources of Verification	Assumptions and Risks
			• 4 FPOs received training and applied for IndGAP certification		
Outcome 2	1) Links between exporters and importers facilitated	1) At least 1 FPO per spice* signs a direct procurement agreement with an exporter *(*fennel, coriander, cumin, black pepper)*	• 4 buy-back arrangements organized across project states, 25 MoUs / EOIs signed		
Expected results (Outputs)					
Output 1 Capacity (in the public and private sector and academia) to deliver trainings on risk-based assessments and Good Practices improved.	1.1. Training of Trainers (ToT) on risk-based assessments and Good Practices along the identified spice value chains	1) 60 Trainers trained through TOTs	• 150 Trainers trained on good practices along the identified spice value chains	• Project Reports including documentation like Training records and IEC materials	• Support from Agricultural Universities and Research Centres • Low motivation of farmers and other value chain actors to implement good practices, and may continue with existing practices
	1.2. Package of Practices (POP) on GAP reviewed and strengthened 1.3. Package of Practices (POP) on GHP for post-harvest stages developed 1.4. Training modules based on POP of GAP and GHP developed-one for each spice 1.5. Information-Education-Communication (IEC) material developed and disseminated	1) 4 POPs on GAP reviewed and strengthened– one for each spice 2) 4 POP on GHP for post-harvest activities developed- one for each spice 3) 4 training modules based on POP of GAP and GHP developed-one for each spice 4) 4 IEC materials developed for each spice	• 4 POPs on GAP reviewed and strengthened • 4 POPs on GHP developed one for each spice • 4 training modules developed • 16 IEC material developed and disseminated		

Goal/Outcomes	Project Description	Measurable Indicators / Targets	Results	Sources of Verification	Assumptions and Risks
Activities	1) Review of existing POPs for farmers on GAP based on international standards 2) Development of Package of GHPs for market yards/ auction centres, storage godowns, pre-processing / simple processing units 3) Development of standardized training modules based on POPs developed. 4) Organization of workshops on the POPs for related Agriculture University faculties/ others				
Output 2 Capacity of farmers and other value chain actors enhanced to adopt GAP / GHP for improving yields, quality and safety of spices.	2.1. Baseline and endline studies conducted at start and end of project covering different aspects such as level of awareness on Sanitary and Phytosanitary (SPS) issues, income levels, current production data, rejection data, etc. 2.2. Villages and farmers selected, and FPO established/strengthened in each village 2.3. Farmers and management representatives FPOs trained on improved production and Control Systems (Quality Management System) 2.4. Other value chain actors trained on GHP and certified	1) 1 baseline and 1 endline survey conducted 2) 8 FPOs registered/strengthened 3) 1200 farmers and 50 other value chain actors trained on: • GAPs/GHPs • Good Manufacturing Practices (GMPs) 4) 8 other farmer groups exposed to practices in other states/ areas	• 1 baseline and 1 endline survey conducted • 8 FPOs registered/strengthened • 1700 farmers and 200 value chain actors trained on GAP/GHP • Instead of the initially planned 8 farmer groups, the study found that 212 farmers including 45 (21%) women were exposed to practices in other states/area.	• Registration document for new FPOs/ Report(s) on achievement of strengthening of existing FPOs against • Project Reports • Evaluation studies • Reports	• Consensus on equipment to be supplied • Number of farmers interested in organising as a group

Goal/Outcomes	Project Description	Measurable Indicators / Targets	Results	Sources of Verification	Assumptions and Risks
	2.5. Farmers equipped with nurseries, seedlings, and healthy plants 2.6. Delivery of trainings of trainers (TOT) programmes.	5) Number of farmers provided with seedlings and healthy plants.	• 200 black pepper farmers provided with seedlings and health plants		
Activities	1) Identifying and selecting of villages, farmers/ farmer groups and other value chain actors 2) Developing baseline benchmarks (at start of project) for Monitoring and Evaluation (M&E); and comparing the same with progress/ achievement at end of project (endline) 3) Questionnaire(s) for baseline/endline developed 4) Questionnaire(s) filled by farmers/ farmer groups and other value chain actors at beginning (baseline) and end of project (endline) 5) Developing/ strengthening FPOs at community level for improved production and value-added technologies (including organic / GAP certification) a) New FPOs developed/ existing FPOs strengthened at community levels in each village. b) – Basic facilities/ equipment/ material identified for each village for group use; and procured (based on cost sharing project)				

Goal/Outcomes	Project Description	Measurable Indicators / Targets	Results	Sources of Verification	Assumptions and Risks
	6) Developing nurseries and providing seedlings to farmers (only for black pepper) a) Procurement of healthy plants and propagating these in nurseries by Spices Board. b) Supply of plants to farmers by Spices Board. 7) Rolling-out training programs for farmers and other relevant stakeholders on the POPs developed under Output 1 a. – Trainings on GAP/ organic practices/ certification/ maintaining documentation and records at individual farmer and group level. b. Assist in establishing ICS and group management c. Facilitate group certification of farmers, including support for first year certification fees (linking with other schemes such as NABARD) d. Communication and awareness generation through street plays, posters, TV programmes. 8) Organizing/conducting study visits; and sharing of experiences and lessons learnt				

Goal/Outcomes	Project Description	Measurable Indicators / Targets	Results	Sources of Verification	Assumptions and Risks
	a. Visits of 5 farmers from each village to other farms (total 60 farmers) b. Results/ experiences disseminated to other farmers c. Results and experiences shared in national/ stakeholder workshops				
Output 3 Strengthened marketing and links with buyers (exporters/ importers).	1) Connecting farmers and buyers through Web portal e-spice bazaar 2) Conducting Branding and marketing exercise(s) for all 4 spices	1) 4 FPOs enlisted on web-portals for spices trading	• 8 FPOs enlisted on NSSP portal for spice trading • 8 buyer-seller meet organized	• Project Reports	
Activities	1) Enhancing e-spice bazaar portal to cover black pepper cumin, fennel and coriander (to connect farmers with buyers); and also to cover local languages and include foreign buyers: a. Portal enhanced b. Information of all farmers/FPOs from selected villages compiled and uploaded on the web portal c. Information of major buyers in the region and/or at national/ global level compiled and uploaded onto the portal. 2) Registering exporters and linking them to producer groups for direct procurement 3) –Organizing image development/enhancement and				

Goal/Outcomes	Project Description	Measurable Indicators / Targets	Results	Sources of Verification	Assumptions and Risks
	branding activities for GAP certified spices 4) Making available SPS requirements of major buyers on website				
Output 4 Establishment and implementation of a National Contaminant and Residue Control Programme (NCRCP) for identified spices.	1) Labs approved for testing of required parameters 2) NCRCP for spices developed and implemented	1) Report(s) on lab capacities available 2) NCRCP for the 4 spices developed and implemented over 1 crop season	• Two labs were chosen for testing seed spices • NCRCP developed and implemented for 4 spices over 1 cropping seasons	• Project Reports	

Annexure II: Final Signed Financial Report

Attached is the unsigned financial report outlining the tentative project expenditure. The final certified amount may vary slightly after all commitments are liquidated, project services are charged, and any winding-up costs are finalized.

Annexure III: List of key documents produced under the project

Title and type of document	Author	Place and date of issue	Number of pages
Training Module on Good Agricultural Practices and Good Hygiene Practices for Black Pepper (For Andhra Pradesh)	FAO team	New Delhi	98
Training Module on Good Agricultural Practices and Good Hygiene Practices for Coriander (For Madhya Pradesh)	FAO team	New Delhi	90
Training Module on Good Agricultural Practices and Good Hygiene Practices for Cumin (For Gujarat and Rajasthan)	FAO team	New Delhi	94
Training Module on Good Agricultural Practices and Good Hygiene Practices for Fennel (For Gujarat and Rajasthan)	FAO team	New Delhi	86
Package of Good Agriculture Practices on Black pepper (For paderu in Andhra Pradesh)	FAO team	New Delhi	38
Package of Good Agriculture Practices on Fennel (For Gujarat and Rajasthan)	FAO team	New Delhi	45
Package of Good Agriculture Practices on Cumin (For Gujarat and Rajasthan)	FAO team	New Delhi	45
Package of Good Agriculture Practices on Coriander (For Madhya Pradesh)	FAO team	New Delhi	44
Package of Good Hygiene Practices for Cumin (For Rajasthan and Gujarat)	FAO team	New Delhi	44

Package of Good Hygiene Practices for Coriander (For Madhya Pradesh)	FAO team	New Delhi	36
Package of Good Hygiene Practices for Fennel (For Rajasthan and Gujarat)	FAO team	New Delhi	36
Package of Good Hygiene Practices for Black pepper(For Andhra Pradesh)	FAO team	New Delhi	38
Leaflet on Good Hygiene Practices for Coriander in Hindi	FAO team	New Delhi	4
Leaflet on Good Hygiene Practices for Cumin in Hindi	FAO team	New Delhi	4
Leaflet on Good Hygiene Practices for Fennel in Hindi	FAO team	New Delhi	4
Leaflet on Good Hygiene Practices for Black pepper	FAO team	New Delhi	4
Leaflet on Good Hygiene Practices for Cumin	FAO team	New Delhi	4
Leaflet on Good Hygiene Practices for Coriander	FAO team	New Delhi	4
Leaflet on Good Hygiene Practices for Fennel	FAO team	New Delhi	4
10 Hindi videos on fennel	FAO team	New Delhi	2-4 Mins
10 Hindi videos on cumin	FAO team	New Delhi	2-4 Mins
10 Hindi videos on coriander	FAO team	New Delhi	2-4 Mins
10 Telugu videos on black pepper	FAO team	New Delhi	2-4 Mins
10 Hindi videos dubbed in Gujarati on fennel	FAO team	New Delhi	2-4 Mins
10 Hindi videos dubbed in Gujarati on cumin	FAO team	New Delhi	2-4 Mins
Baseline survey Report	FAO team	New Delhi	41
Endline survey Report	FAO team	New Delhi	82
1st STDF PROJECT PROGRESS REPORT	FAO team	New Delhi	11
2nd STDF PROJECT PROGRESS REPORT	FAO team	New Delhi	11
3rd STDF PROJECT PROGRESS REPORT	FAO team	New Delhi	12
4th STDF PROJECT PROGRESS REPORT	FAO team	New Delhi	14
5th STDF PROJECT PROGRESS REPORT	FAO team	New Delhi	15
6th STDF PROJECT PROGRESS REPORT	FAO team	New Delhi	17

7th STDF PROJECT PROGRESS REPORT	FAO team	New Delhi	12

Annexure IV: List of key training workshops, outreach events, study tours, etc. organized under the project including dates, location, number of persons (M/F)

No. of Participants	Title of Study/Training Tour	Place	Date
32	Project inception workshop (Virtually) report	New Delhi	22-Oct-20
44	Training and distribution of seedling to the farmers (only for black pepper)	Paderu	31-May-21
19	Conducting fieldwork for baseline data collection followed by enumerator training/workshop		26-Jul-21
49	Conduct of consultation workshop with Agriculture Universities and GAPs and GHPs		
68	Conduct of Study tour for Black Pepper farmers in Paderu	Paderu	
61	Conduct meeting of the Project Implementation Committee meetings.		
58	Conduct Project Steering Committee meeting.		
59	Conduct market linkage programme for seed spices.	Jodhpur	
121	Training of Trainers Programme on Good Agricultural Practice and Good Hygienic Practice Of Cumin and Fennel For Strengthening Spice Value Chain in India	ICAR-NRCSS, Ajmer, Rajasthan	18 - 20 May 2022
46	Training of Trainers Programme on Good Agricultural Practices and Good Hygienic Practices In Black Pepper for Strengthening Spice Value Chain in India	Paderu, Andhra Pradesh	26-29 April 2022
39	Training of Trainers Programme on Good Agricultural Practices and Good Hygienic Practices In Coriander for Strengthening Spice Value Chain in India	Guna, Madhya Pradesh	09-11 June 2022
56	Farmers Training Program on Good Agriculture and Hygienic Practices of Fennel in, on 28th September 2022	Ber Kallan Village, Jaitaran TQ, District Pali, Rajasthan	28-Sep-22
50	Study tour organized for selected fennel farmers from Umta Village, Gujarat	Umta Village, Mehsana, Gujarat	21-23 September 2022
288	Buyer Seller Meet For Black Pepper In Araku Valley, Asr District, Andhra Pradesh	Araku Valley, Asr District, Andhra Pradesh	29-Nov-22
28	Video Making Training: Workshops were held in Guna, ASR, Unjha, and Jodhpur to train farmers, Spices Board field coordinators, and FPO members on video production.	Guna, Unjha, ASR and Jodhpur	19-30 January 2024
40	Video Dissemination Training: Dissemination training sessions were conducted across the four states between May and July 2024	Guna, Unjha, ASR and Jodhpur	May-July 2024
6000	Video dissemination through Social media and projectors	Guna, Unjha, ASR and Jodhpur	July-August 2024
112	Buyer sellers meet	Guna MP	10 August 2024
63	conduct market linkage programme for black pepper in Araku Valley	Andhra Pradesh	22 August 2024
676	Roll-out of communication and awareness programmes to the farmers and other stakeholders, through street play	Guna, Unjha, ASR and Jodhpur	April-July 2024
120	Terminal workshop of project	New Delhi	27-Sep-24

Annexure V: List of key persons (including names and contact details) involved in the project from the implementing organization, other partners, beneficiary organizations, etc.

FAO international implementing agency

Name	Function
International staff	
Sridhar Dharmapuri	LTO
National staff	
Takayuki Hagiwara	FAO Representative
Konda Reddy Chavva	Assistant FAO Representative (Program)
Vinay Singh	Project Manager
CP Mohan	Consultant-Technical Review of Package of Practices
Ujjwal	Consultant-M&E
Bhagirath Choudhary	Consultant-training module development
Rajbhan Tomar	Consultant- Food System Expert
Seetha Parthasarathy	Copy Editor
Nitisha	Designer -Training Modules

Spice Board as a local implementing agency

No	Organisation	Name& Address
1	Spices Board	Shri D. Sathiyan IFS, Secretary
2	Spices Board	Dr. A.B. Rema Shree, Director (Research and Development
3	Spices Board HQ team	Dharmendra Das(Director(Dev)
4	Spices Board HQ team	Brajendra Dev Sarma, Deputy Director
5	Spices Board HQ team	Prathyush.T.P,Deputy Director(Publicity)
6	Spices Board HQ team	Shaneeja.V.M,Assistant Director
7	Spices Board HQ team	Kishan.K.,Assistant Director
8	Spices Board HQ team	Mohammed Shameer Cheriyath,Asst Director

9	Spices Board HQ team	Kuldeep Rai,Senior Field Officer
10	Spices Board HQ team	Smt.Bhawna Jeswani,Editor
11	Spice Board RO Guna	Bharath Gudade,Scientist C
12	Spice Board RO Guna	Ashish Jaiswal,Assistant Director
13	Spice Board RO Jodhpur	Jugal Das,Deputy Director
14	Spice Board RO Jodhpur	Shrishail Kullolil,Senior Field Officer
15	Spice Board RO Warrangal	Vijeeshna V,Assistant Director
16	Spice Board RO Paderu	Kalyani Boddu,Senior Field Officer
17	Spice Board RO Unjha	Sapna Tomar,Deputy Director
18	Spice Board RO Unjha	Jyotish K,Assistant Director
19	HR supported by the project	12 Field Coordinators and 4 FPO Coordinators for field-level support

Annexure VI: Any Other Relevant Documents

Case study – 1

Transforming Traditional Farming: The Journey of Mr. Om Prakash Chaudhary in Kishanagar

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" Now, there is no harm to health either"

In the heart of Village Kishanagar, Pali, Rajasthan, Mr. Om Prakash Chaudhary has long been a steadfast figure in the world of agriculture. At 56 years old, he reflects on his 35-year journey as a fennel farmer with a sense of both pride and anticipation. His farm, spanning 16 beegha, showcases his deep-rooted commitment to agriculture. Originally, his farm was a testament to mixed farming practices, featuring not only fennel but also chilli. However, his land has since evolved: 6 beegha are now dedicated to fennel, 4 beegha to cumin, 2 beegha to wheat, and the remaining 4 beegha to methi and jowar, which are used as feed for his animals.

Land (Total 16 Beegha)	Usage
6 beegha	Fennel
4 beegha	Cumin
2 beegha	Wheat
4 beegha	Methi, jowar (for animals)

For many years, Mr. Chaudhary relied on conventional methods to maximize his yields. He used chemicals generously, purchasing them from local stores without seeking professional guidance. This approach, while effective in boosting production, took a toll on the soil, water, and broader ecosystem. The harmful effects of these chemicals were not immediately apparent to him, but he continued to see diminishing returns in the long run. The turning point in Mr. Chaudhary's farming career came when he encountered the STDF project through the Farmer Producer Organization (FPO). Intrigued by the project's potential, he decided to participate in its training sessions, which would eventually transform his farming practices and outlook.

The training was a revelation for Mr. Chaudhary. He learned about Good Agricultural Practices (GAP) and Good Hygiene Practices (GHP), concepts that were new to him but immediately captivating. The sessions, conducted by experts from various institutions, provided him with insights into better farming techniques. He was struck by how simple adjustments and the adoption of natural methods could dramatically improve the quality of his produce. The training covered essential topics such as proper sowing methods, processing and storage techniques, and pruning. More importantly, it highlighted the adverse effects of chemicals on the environment and health, which spurred Mr. Chaudhary to rethink his farming practices.

"The training taught us what, when, and how to do things'

Embracing these new methods, Mr. Chaudhary transitioned to organic farming. The impact was both immediate and profound. Previously, his fennel fetched Rs. 70-80 per kg. With the shift to organic practices, he now commands a price of Rs. 120-150 per kg. Additionally, the reduction in chemical inputs has lowered his costs to Rs. 1,500-2,000. This has led to a substantial increase in his income, from Rs. 10,000 to Rs. 15,000 per beegha. The financial benefits of organic farming were clear, but Mr. Chaudhary's motivation extended beyond mere profit.

Aspect	Before Organic Practices	After Organic Practices
Price per kg of Fennel	Rs. 70-80	Rs. 120-150

Cost of Chemical Inputs	Higher	Rs. 1,500-2,000
Income per Beegha	Rs. 10,000	Rs. 15,000

Concern for the environment played a significant role in his transition. He had long been troubled by the impact of pesticides on bees, which are crucial for pollination. The training sessions helped him understand how to protect these essential pollinators while also improving soil and water quality. This newfound awareness led Mr. Chaudhary to adopt personal protective equipment (PPE), including masks, gloves, and kits, which he now uses to mitigate health risks associated with chemical exposure. His commitment to environmental sustainability is evident in his ongoing efforts to further improve his farming practices.

Mr. Chaudhary's investment in infrastructure has also been a game-changer. He installed a drip irrigation system with a 90% government subsidy, which has proven effective in conserving water and reducing fungal infections in the soil. He is now planning to implement a rainwater harvesting system to enhance water conservation. These upgrades have not only improved his farming efficiency but have also contributed to the long-term sustainability of his agricultural practices.

The training sessions have been pivotal in his journey, equipping him with knowledge and skills that extend beyond mere farming techniques. He has attended 6-7 training sessions annually, both locally and in Jodhpur, and these have played a crucial role in his development. Despite his achievements, Mr. Chaudhary was initially unaware of the organic certification process. However, he plans to apply for certification soon, aiming to further validate his commitment to organic farming.

Mr. Chaudhary's transformation has made him a role model in his community. Other farmers look to him for guidance and inspiration, seeking advice on organic practices. His proactive approach and willingness to share knowledge have established him as a respected figure in Kishanagar. He hopes the project will expand to educate more farmers about GAP, GHP, and other sustainable methods, thereby amplifying the benefits he has experienced.

Mr. Om Prakash Chaudhary's journey from conventional to organic farming is a testament to the power of education and innovation. His dedication to learning and implementing new practices has not only enhanced his own farm but has also inspired others in his community. His story reflects a broader narrative of agricultural transformation, highlighting the potential for positive change through commitment to sustainability and best practices.

Case study – 2

Shift to Organic: Pusaram's Transformation to Organic Cumin Farming in Udaliyawas

In the village of Udaliyawas, Pali, Rajasthan, Mr. Pusaram's story is one of transformation and resilience. A seasoned cumin farmer, Pusaram began his agricultural journey alongside his father. Together, they harbored a desire to switch to organic farming, driven by a shared vision of sustainable and healthy agriculture. However, their plans were tragically interrupted when

Pusaram's father passed away suddenly from a heart attack. The loss left Pusaram grappling with the challenges of farming alone, and he attributed many of his struggles to the extensive use of chemicals and pesticides.

For three years, Pusaram attempted to adopt natural farming practices, but his lack of knowledge and technical support made the transition difficult. It was only when he discovered the STDF project through the FAO that he found the guidance he needed. The project's training sessions proved to be a turning point for him, offering valuable insights into organic farming and reigniting his motivation. Over the past three years, Pusaram has remained actively engaged with the project, attending 4-5 training sessions in the last year. These sessions have provided him with comprehensive knowledge on pre-seed treatment, sowing techniques, irrigation, and the principles of Good Agricultural Practices (GAP) and Good Hygiene Practices (GHP).

Mr. Pusaram has been cultivating cumin since 2010 on his 16 beegha of land, which he allocates as follows: 7 beegha for cumin and 9 beegha for a variety of other crops, including coriander, fennel, moong, bajra, kalonji, and cluster beans. His area is known for its soil with good water retention capacity during the rainy season. However, the continuous application of chemicals and pesticides had led to soil compaction and increased tilling requirements. Organic farming has addressed this issue by improving soil structure and reducing the need for excessive tilling.

Land (Total 16 Beegha)	Usage
7 beegha	Cumin
9 beegha	Coriander, fennel, moong, bajra, kalonji, cluster beans, etc.

Despite the fact that organic farming yields are lower than those achieved with chemicals, the higher market prices for organic produce have made it financially viable. For example, while chemical-treated cumin yields between 2.5 to 3 quintals per beegha, with input costs of Rs. 12,000 to 15,000 and market prices of Rs. 12,000 to 15,000 per beegha, organic cumin yields between 2 to 2.5 quintals per beegha, with input costs of Rs. 10,000 to 12,000 and market prices ranging from Rs. 14,000 to 18,000 per beegha.

Farming	Yield per beegha	Input cost per beegha	Prices per beegha
Chemical	2.5 –3 quintal	Rs. 12-15k	Rs. 12-15k
Organic	2 – 2.5 quintal	Rs. 10-12k	Rs. 14-18k

The shift to organic farming has also brought practical benefits for Pusaram. Local organic buyers now visit his field to purchase his produce, which has significantly reduced his transportation costs. Additionally, Pusaram is an active member of a WhatsApp group that connects him with

fellow farmers, scientists, and trainers, providing a platform for discussing challenges and exchanging ideas.

Soil testing has become a routine part of his farming practice, with tests conducted every alternate year at a cost of Rs. 500-700 per test. He receives the results within a week, allowing him to make informed decisions about his farming practices. Pusaram has also observed improvements in his health and his mother's well-being since switching to organic food, which has further reinforced his commitment to organic farming.

To support his farming operations, Pusaram has invested in a drip irrigation system for his entire land, funded by a 90% government subsidy. This system conserves water and helps prevent fungal infections in the soil. He has also established a rainwater harvesting storage facility at his home, enhancing his water management practices.

Pusaram is a strong advocate for organic farming and believes that more farmers should adopt these practices. He suggests several improvements, including the establishment of local testing labs, dedicated organic mandis, and enhanced marketing linkages. He also recommends that training materials be better aligned with practical farming needs and timeframes. Furthermore, he supports the expansion of the project to larger areas to reach and educate more farmers.
Pusaram's transition from conventional to organic cumin farming highlights the significant benefits of informed and supported agricultural practices. His journey demonstrates how education, technical support, and community connections can drive positive change in farming methods and personal well-being. His experience serves as an inspiring example of the potential for growth and success in organic farming.

Case study – 3

Satellite (Top Shoot) Nursery of Pepper in Araku Valley Mandal, ASR District, Andhra Pradesh

In the hilly terrains of Paderu and Araku Valley mandals in ASR District, Andhra Pradesh, 10 farmers have embarked on a pioneering initiative to establish satellite nurseries, also known as top shoot nurseries, for the cultivation of pepper. This initiative is supported by the Spices Board under the Standards and Trade Development Facility (STDF) project, which aims to enhance the livelihoods of smallholder farmers by promoting sustainable and profitable pepper cultivation.

Project Implementation:
Under the guidance of the Spices Board, 10 farmer beneficiaries were selected to participate in this innovative nursery program. Each farmer was provided with 500 top shoots of the Panniyur 1 variety of pepper and 500 polythene bags. The Panniyur 1 variety is known for its high yield and disease resistance, making it an ideal choice for the region's climatic conditions.

Training and Capacity Building:
The Spices Board conducted extensive training sessions for the farmers, focusing on the best practices for raising top shoot nurseries. The training covered essential aspects such as the selection of healthy top

shoots, preparation of the polythene bags with fertile soil, and the management of the nurseries to ensure optimal growth.

Nursery Establishment Process:
The farmers prepared the polythene bags by filling them with fertile soil, ensuring that the soil was well-drained and rich in nutrients. The top shoots were then carefully placed in the bags and kept under shade for 45 days. During this period, the shoots developed roots and began to shoot two leaves, signaling that they were ready for transplantation.

Outcome and Impact:
The establishment of these satellite nurseries has provided the farmers with a reliable and sustainable source of high-quality pepper saplings under the projec. By the end of the 45-day period, the saplings were robust and ready for transplanting, allowing the farmers to expand their pepper plantations significantly. This initiative not only addresses the local need for quality planting material but also empowers the farmers to improve their income through enhanced pepper production.

Conclusion:
The satellite nursery project in Paderu and Araku Valley mandals serves as an excellent example of how targeted interventions, combined with proper training and support, can lead to sustainable agricultural practices. The success of this project has the potential to be replicated in other regions, contributing to the broader goal of improving spice cultivation in India.

Case Study- 4: Cultivating and Processing White Pepper in Andhra Pradesh

D. Babu Rao, a farmer from Modapalli Village, Paderu Mandal of Alluri Seetharama Raju District of Andhra Pradesh owns 2 acres of land where he cultivates 500 kg of pepper annually. Traditionally, Babu Rao focused on producing black pepper, a common practice in his region. However, after participating in a training program under the Standards and Trade Development Facility (STDF) project, he learned the process of preparing white pepper—a product that fetches a higher market price than black pepper. Ms. Kalyani Boddu, Regional Officer of Spices Board involved in STDF project informed that Babu Rao is one such farmer who has fully utilised the benefits of training under STDF.

White Pepper Processing:
The process of making white pepper differs significantly from black pepper and involves several key steps:
1. Harvesting: Babu Rao begins by selecting fully ripe pepper berries, which are crucial for producing high-quality white pepper. The ripe berries are red or yellowish in color, indicating that they have reached full maturity.
2. Soaking: After harvesting, the ripe berries are soaked in water for 7-10 days. This process, known as retting, helps soften the outer skin of the peppercorns.
3. Removing the Outer Skin: Once the berries have been adequately soaked, Babu Rao manually removes the softened outer skin, revealing the inner white seed. This step is labor-intensive but essential for achieving the distinct appearance and flavor of white pepper.
4. Drying: The peeled pepper seeds are then thoroughly dried in the sun. Proper drying is crucial to prevent mold and ensure the pepper retains its quality and shelf life.

5. Final Product: The dried white peppercorns are then ready for sale. White pepper typically commands a higher price in the market, with rates ranging from ₹600 to ₹650 per kilogram, compared to ₹500 to ₹550 for black pepper. This price difference is due to the additional processing required and the distinct flavour profile of white pepper, which is milder and more refined than black pepper.

Impact and Benefits:
After adopting white pepper processing, Babu Rao has experienced a significant increase in his income. The additional training he received through the STDF project has not only equipped him with new skills but also enabled him to diversify his product offerings, making his farming enterprise more profitable and sustainable. The switch to white pepper production has also allowed him to tap into a niche market, where there is growing demand for high-quality spices.

Conclusion:
D. Babu Rao's transition from black pepper to white pepper production highlights the potential for small-scale farmers to enhance their livelihoods through training and skill development. By adopting improved processing techniques, he has increased his income and contributed to the value-added spice market in his region.

1. A glance of Good Agricultural Practices in Spices: https://drive.google.com/file/d/1B10bxswelNWuYt2kk18rXbIPJwpubQA7/view?usp=drive_link

2. Importance of Personal Protective Equipment in Cultivation of Spices: https://drive.google.com/file/d/1ennCtm-U3UXoQYfQ5pSTRInKrvMuK2yb/view?usp=drive_link

3. Project Impact Video - Enhancing India's Spice Value Chain and Market Access via Capacity Building and Innovative Solutions: https://www.youtube.com/watch?v=FUwbi_jc580

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