

Evaluation of the “Food-loss reduction through improved postharvest handling and value addition of key fruits and vegetables” project in Ethiopia

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**Evaluation of the “Food-loss reduction
through improved postharvest handling and
value addition of key fruits and vegetables”
project in Ethiopia**

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Abstract

The evaluation of the “Food-loss reduction through improved postharvest handling and value addition of key fruits and vegetables” project in Ethiopia was undertaken by the Office of Evaluation (OED) of the Food and Agriculture Organization of the United Nations (FAO) with a view to assessing project outcomes, their sustainability and impact, as well as identifying future actions to ensure the continuity of the processes developed.

In addition to providing accountability to the donor – the German Federal Ministry of Food and Agriculture – key national counterparts and project beneficiaries, the evaluation draws lessons on the postharvest handling of fruits and vegetables that will inform the development of future interventions and the mobilization of funds for a new phase of work in Ethiopia.

The evaluation covered all activities implemented by the project from 1 June 2016 to 31 December 2019 in three regions (Amhara, Oromia and the Southern Nations, Nationalities and Peoples’ Region) for four value chains (potatoes, tomatoes, bananas and mangoes). Data collection was mainly conducted through online and telephone interviews due to the constraints of the COVID-19 pandemic and the deterioration of the security situation.

The project addressed one of the major challenges faced by producers – postharvest losses. Farmers have adopted project postharvest management practices, techniques and technologies that have helped to reduce losses and increase food security by boosting income and making more produce available for household consumption. The results will be sustainable because of the economic gains the farmers are seeing and the adaptability of practices and technologies. FAO should now work to ensure that the planned processing facilities finalized and running and that practices, techniques and technologies are scaled up to other areas.

The project was a good pilot for institutionalizing postharvest management in Ethiopia’s agricultural extension system; it now features heavily in its horticultural development strategy. Institutional reform to raise the status of horticulture is a prime illustration of project sustainability. FAO should mobilize resources for a second phase, focusing on consolidating operations in the original project communities and replicating the initiative in other areas where the production potential is higher.

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The evaluation benefited from the inputs of many other stakeholders, including government officers and experts from the Ethiopian Ministry of Agriculture and the bureaux of agriculture in Oromia, Amhara and the Southern Nations, Nationalities and Peoples Region (SNNPR). In the target project *woredas*, project focal points, development agents, cooperative representatives and beneficiary farmers responded to evaluation questions. Their contributions were critical to the team's work and are sincerely appreciated.

Abbreviations and acronyms

DLS	Diffused light storage
FAO	Food and Agriculture Organization of the United Nations
OED	FAO Office of Evaluation
SNNPR	Southern Nations, Nationalities and Peoples' Region

Executive summary

1. The evaluation of the “Food-loss reduction through improved postharvest handling and value addition of key fruits and vegetables” project in Ethiopia was undertaken by the Office of Evaluation (OED) of the Food and Agriculture Organization of the United Nations (FAO) with a view to assessing project outcomes, their sustainability and impact, as well as future actions to ensure the continuity of the processes developed.
2. In addition to providing accountability to the donor, key national counterparts and project beneficiaries, the evaluation draws lessons on the postharvest handling of fruits and vegetables that will inform the potential upscaling of the project in Ethiopia, the development of future interventions and the mobilization of funds for a new phase of work.
3. The evaluation covered all activities implemented by the project from 1 June 2016 to 31 December 2019 in three regions (Amhara, Oromia and the Southern Nations, Nationalities and Peoples’ Region [SNNPR]) for four value chains (potatoes, tomatoes, bananas and mangoes). Data collection was mainly conducted through online and telephone interviews due to the constraints of the COVID-19 pandemic and the deterioration of the security situation.

Summary of main findings and conclusions

4. The project aligned well with national priorities and filled an existing gap in data on the extent of fruit and vegetable postharvest losses in Ethiopia. By tackling postharvest losses, the project addressed one of the major challenges faced by producers. Due to a lack of appropriate storage facilities and an inability to process the produce, losses are very high. The project focused on four value chains which are highly relevant to the beneficiaries and the Ethiopian economy, both in terms of production, food security, nutrition and income.
5. The project introduced improved technologies and practices. These techniques have been widely disseminated, with capacity-development and awareness-raising exercises conducted in the target areas and beyond. Fruit and vegetable processing centres were constructed, and equipment was supplied for use by processing cooperatives. Twenty-four cooperatives (12 focused on fruit and vegetable production and marketing and 12 on processing) were established, supported and registered.
6. The project’s training approach was effective, reaching a large number of beneficiaries and stakeholders in the extension sector. Capacity-development activities on postharvest handling and value addition, including processing and marketing, were conducted for government personnel, farmers, cooperative members and other stakeholders, consisting of training, awareness-raising workshops and the development of manuals. Stakeholder awareness was raised on topics including the causes, extent and mitigation of postharvest losses and the management and strengthening of cooperatives. While postharvest losses happen all along the value chain, FAO’s capacity-development efforts with regard to postharvest loss reduction focused mainly on producers and did not target other actors in the chain.
7. Farmers have adopted project postharvest management practices and technologies and as a result, postharvest losses in target fruits and vegetables have been reduced. The project directly contributed to greater availability of food for household consumption over longer periods. In addition, beneficiaries interviewed indicated increased incomes thanks to the rise in quality and quantity of produce and improved storage facilities that enabled farmers to choose an appropriate time to sell, when prices were high. The results will be sustainable because of the

economic gains the farmers are seeing and the adaptability of practices and technologies. No evidence was found that demonstrated an increase in dietary diversity.

8. The evaluation found that the overall outcome and end goal of the project were only partly achieved, as the cooperatives organized for processing fruits and vegetables were not yet operational, as the equipment yet to be installed. The completion of the processing centres was delayed in part by prolonged administrative processes for acquiring land and also by the limitations of certain implementation arrangements which affected project efficiency. The budgetary revision approval process also required long time. In addition, the profitability of the processing businesses is not yet known as no feasibility study was conducted. Young people trained in processing for these centres have been waiting for activity to start. They are unemployed, so desperate to earn a livelihood from the business.
9. Key informants said that marketing has been a major challenge for horticultural products and will continue to be when the processing centres are completed. Moreover, not all types of horticultural produce can be processed by the centres. Tailored intervention is needed for the marketing cooperatives as their requirements differ from those of the processing cooperatives. A shortage of working capital, inappropriate transport facilities, a lack of proper storage, a dearth of management skills and market linkages are all key areas that need to be addressed.
10. The study conducted for this project provided evidences of the size and significance of post-harvest losses, which were previously undocumented. It also showed how use of technologies and techniques for postharvest handling and processing could help reduce postharvest losses and boost food security, nutrition and income. Information generated was instrumental in bringing about the inclusion of postharvest management in Ethiopia's agricultural extension strategy. Postharvest management also features heavily in the country's 10-year horticultural development strategy prepared by the Ministry of Agriculture. Moreover, a national horticulture development roadmap is being developed, which will cite quality assurance as key to commercialization and export.
11. The horticulture sector has started to benefit from institutional reform in the agricultural sector. As part of the new emphasis placed on horticultural development, the sector is now overseen by a state minister, while experts have been assigned to fill postharvest management positions at the country's Ministry of Agriculture and regional bureaux of agriculture. Institutional reform to raise the status of horticulture is a prime illustration of project sustainability. Upscaling and expansion will require greater effort and support, however, as the sub-sector is young and lacking capacity. Further efforts in this regard should be supported, especially the mainstreaming of postharvest management in the extension system, guideline development and capacity-building training.
12. The project did not address gender imbalances or gaps, focusing merely on the inclusion of beneficiaries based on gender and age. There was no gender analysis to identify inequities or interventions that could lessen gender inequality. It did not consider the importance of promoting women's economic empowerment, decision-making, confidence or leadership capacity. This could be attributed to FAO Ethiopia's lack of gender-dedicated personnel. The lack of gender analysis meant the project was unable to include gender-responsive indicators and gender-specific activities that could alter the gender power balance and promote gender leadership.
13. Project activities were implemented in partnership with government institutions from federal to *kebele* level. The arrangement ensured ownership and sustainability and could contribute to the potential upscaling of project results. While it was efficient for the most part, the inclusion of the

agricultural offices of administrative zones made no significant contribution to project outputs. Financial transfers were based on letters of agreement between FAO and the implementing offices. This generally worked well, except for the last instalment, which was based on a reimbursement. The implementing partners found themselves short of resources to implement activities and had to mobilize resources elsewhere so they could apply for repayment. The cost-sharing arrangement adopted by the project was generally effective as an approach, but the real cost for communities and implementing partners were not adequately estimated in the planning phase.

Recommendations

14. Based on the main findings and conclusions, the evaluation proposes various actions to complete, consolidate and expand on the results achieved by the project.
15. The evaluation recommends that FAO ensures the processing units become operational by completing the construction work, equipping the centers and installing all the required facilities. Once the work has been completed, refresher training will be needed for the cooperatives on processing and business management and operational capital will need to be secured to run the businesses. The evaluation also suggests organizing capacity-development activities for the agencies in charge of supporting the processing cooperatives. Proper feasibility studies and cash-flow analyses should also be conducted for the processing cooperatives. Further support should be provided to the marketing cooperatives by developing their capacity and management skills, providing appropriate storage and transport facilities and promoting market linkages.
16. To consolidate and expand the results of this project, FAO should work to ensure that technologies, techniques and practices are scaled up. This can be done by supporting the mainstreaming of postharvest management in Ethiopia's extension system, the development of postharvest handling guidelines and the provision of capacity-building training on a broader scale. FAO should also mobilize resources for a second phase, focusing on consolidating results in the original *woredas* and allowing the replication of successful project activities elsewhere.
17. To ensure the success of future interventions, FAO should review its letters of agreement with regard to payment schedules to adopt a more flexible and inclusive arrangement that considers partners' financing capacity. Attempts should be made to improve procurement and financial flows, including speedy approval of budgetary revisions. In addition, as recommended by the Evaluation of FAO's programme in Ethiopia (FAO, 2020) gender capacity in the Country Office should be strengthened to ensure that gender is properly mainstreamed in future activities and gender awareness training be provided to personnel, as well as to key implementing partners.

1. Introduction

1.1 Purpose of the evaluation

1. The project donor, the German Federal Ministry of Food and Agriculture, requested an evaluation of the “Food-loss reduction through improved postharvest handling and value addition of key fruits and vegetables” project (GCP/ETH/088/GER) during the project formulation stage. The evaluation was undertaken by the Office of Evaluation (OED) of the Food and Agriculture Organization of the United Nations (FAO) with a view to identifying project outcomes, their sustainability and impact, as well as future actions to ensure the continuity of the processes developed.
2. The purposes of the evaluation are:
 - i. to ensure accountability to the donor, key national counterparts, including the Ministry of Agriculture of Ethiopia, and project beneficiaries, providing evidence on how resources were used and the primary results achieved; and
 - ii. to draw lessons on the postharvest handling of fruits and vegetables, both from project implementation and the results achieved, to inform the potential upscaling of the intervention in Ethiopia, to develop future projects and to mobilize funds for a new phase of work.

1.2 Intended users

3. The intended users of the evaluation are the FAO Ethiopia Country Office and the funding agency, the German Federal Ministry of Food and Agriculture, as well as the various national partners involved in the project’s implementation. These include the Ethiopian Ministry of Agriculture and, more specifically, the Horticulture Development and Technology Transfer Directorate; the Ethiopian Society of Postharvest Management; the regional bureaux of agriculture in Amhara, Oromia and the Southern Nations, Nationalities, and People's Region (SNNPR); the *woreda* offices of agriculture in the geographical areas targeted by the project; and Jimma University.

1.3 Scope and objectives of the evaluation

1.3.1 Scope of the evaluation

4. The evaluation covered all the activities implemented over the course of the project life, from when it started, on 1 June 2016, to when it ended, on 31 December 2019. Data collection took place from October to December 2020.
5. The evaluation covered all the three regions (Amhara, Oromia and the SNNPR) and all four value chains selected for the intervention (potatoes, tomatoes, bananas and mangoes). A sample-based data-collection method was used to collect data efficiently and effectively within the given timeframe and resources and given the constraints of COVID-19.

1.3.2 Evaluation objectives

6. The objectives of the evaluation were to:
 - i. assess the relevance, efficiency and effectiveness of the project’s design and implementation in view of the country’s policies and strategies;

- ii. assess actual project outputs and potential outcomes and evaluate the sustainability of results achieved and the drivers of sustainability;
- iii. assess project performance and achievements in terms of gender mainstreaming and gender equality;
- iv. identify lessons learned on project design, implementation and management and assess whether knowledge-sharing mechanisms were put in place; and
- v. propose priority actions for scaling up project experiences and make recommendations on areas of work that the project did not cover, and which could be included in the future.

1.3.3 Evaluation questions

- 7. OED, in consultation with project personnel and the donor, translated the evaluation objectives into eight key questions that guided the evaluation process. The evaluation questions (Box 1) aimed to generate relevant information and data to assess project performance against the Organisation for Economic Co-operation and Development (OECD) Development Assistance Committee (DAC) evaluation criteria (OECD DAC, 2019).
- 8. Starting with these questions, the evaluation team developed a series of sub-questions in the evaluation matrix, which also identified the main sources of information in response to each question.

Box 1. Main evaluation questions

- i. **Relevance:** To what extent was the project relevant to national priorities and responsive to beneficiaries' needs?
- ii. **Coherence:** Was the project coherent with other projects on fruit and vegetable production and food loss implemented by FAO or other partners in the same areas?
- iii. **Effectiveness:** Have project activities contributed to the achievement of the main project outputs?
- iv. **Impact:** To what extent did the project contribute to its overarching outcome, namely, "reduced postharvest losses through improved postharvest handling and processing technologies and equipment" and its final goal of "improved food security and increased consumption of fruits and vegetables for the resource-poor rural population in Ethiopia"?
- v. **Sustainability:** To what extent are the project results sustainable?
- vi. **Efficiency:** Have the project activities been implemented in an efficient manner?
- vii. **Gender:** Did project design and implementation reflect gender-equality considerations?
- viii. **Capacity building:** What are the project's key results in terms of capacity development?

1.4 Methodology

- 9. The evaluation followed the 2016 United Nations Evaluation Group (UNEG) Norms and Standards for Evaluation and the 2020 UNEG Ethical Guidelines for Evaluation (UNEG, 2016; 2020).
- 10. It was conducted in all three project regions, in five of the six *woredas* (districts), encompassing bananas in the Arba Minch Zuria *woreda* in SNNPR, mangoes in the Bahir Dar Zuria *woreda* of Amhara region, potatoes in the Arsi Negele *woreda* of Oromia region and the Sinan *woreda* of Amhara region, and tomatoes in the Dugda *woreda* of Oromia region.
- 11. Data were collected by interviewing the focal points of implementing partners, including *woreda*-level agricultural offices, the Ethiopian Ministry of Agriculture, regional bureaux of agriculture and

the country's postharvest management platform. The selection of key informants was undertaken in consultation with project personnel, based on criteria such as good participation in the implementation of project activities, so that the respondents could provide the genuine and reliable information needed to fairly evaluate project results.

12. Interviews were organized with beneficiary cooperative leaders and members (male and female, one member per cooperative) and with youth cooperative members chosen to benefit from value-adding fruit and vegetable interventions. Efforts were made to include women beneficiaries to hear their views and assess their level of project participation. Primary data were also gathered by interviewing FAO personnel in the Country Office and in regional field offices.
13. In total, 43 people were interviewed (35 percent of them female), of which 20 were project beneficiaries (50 percent female). Only five of the implementing-partner respondents were female. Table 1 provides an overview of those contacted for data collection; a full list can be found in Appendix 1.

Table 1. Overview of people contacted for data collection

Regions	Woreda	Beneficiaries			Implementers			Total		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
Amhara	Bahir Dar Zuria	3	2	5	1	1	2	4	3	7
	Sinan	1	1	2	1	1	2	2	2	4
Oromia	Dugda	3	2	5	2		2	5	2	7
	Arsi Negele	1	3	4	2		2	3	3	6
SNNPR	Arba Minch Zuria	2	2	4	2	1	3	4	3	7
Federal Ministry of Agriculture					1	1	2	1	1	2
Regional Bureaux of Agriculture					2	1	3	2	1	3
FAO personnel					7		7	7		7
Total		10	10	20	18	5	23	28	15	43
%		50	50		78	22		65	35	

Source: Evaluation Team

Note: Beneficiaries include farmers and processing cooperatives; implementers include *woreda* agricultural offices, Ministry of Agriculture and Bureau of Agriculture officials and FAO personnel.

14. Checklists were prepared based on the evaluation matrix and questions. Because of the COVID-19 pandemic and the security situation, interviews with beneficiaries were held by telephone. Phone and Zoom interviews were held with implementing partners, with the exception of the Ministry of Agriculture Root Crops Directorate, the Oromia Bureau of Agriculture and the FAO Oromia field office, where face-to-face interviews were conducted.
15. Interviewing different project partners, implementers and beneficiaries enabled the triangulation and crosschecking of data, so the team could arrive at concrete conclusions.
16. Quantitative data on project outputs, especially on investment in capacity development at different levels, were based on the monitoring and evaluation information provided by the project team and a review of project implementation reports, as well as verified in interviews with implementing partners and beneficiaries. The review of documents served as important source of information, especially when it came to verifying the relevance and coherence of interventions.

17. The evaluation team also undertook a review of secondary data and documents on relevant policies and strategies. The data from these sources were analysed and integrated into the report. Data collected from all sources were cross-checked and/or triangulated and analysed before being used in this report.

1.5 Stakeholder engagement

18. FAO led the project design, in addition to managing and providing technical support for the implementing partners. FAO field-office coordinators and technical personnel, in particular, were instrumental in implementing the project. They worked closely with regional and *woreda* focal points to make participatory activity plans for implementation and liaised with the regions and project management at the FAO Country Office.
19. *Woreda*-level government focal points were also crucial to project implementation. The project created an opportunity for the *woredas* to engage in postharvest horticultural extension. The focal points in all *woredas* were found to be engaged in the implementation of project activities at cooperative and *kebele* (ward or community) level. The *woreda* cooperative promotion office was also involved in organizing and registering cooperatives.
20. The other project stakeholders were Jimma University, the Ethiopian Society of Postharvest Management, the cooperatives that were established or supported, and the end beneficiaries (farmers and youth). Table 2 summarizes the stakeholders, their roles in the project and how they could benefit from this evaluation.

Table 2. Project stakeholders and how they could benefit from this evaluation

Key stakeholders	Role or participation in the project	Potential use of the evaluation
Funder and implementer <ul style="list-style-type: none"> FAO Ethiopia Country Office (project personnel, implementer). German Federal Ministry of Food and Agriculture (funding agency). 	<ul style="list-style-type: none"> Coordinating with FAO Country Office, Regional and Sub-regional Office personnel. Providing funding for project implementation. Coordinating implementation and collaborating with key project stakeholders and implementing partners (government agencies and civil-society organizations). 	<ul style="list-style-type: none"> See evidence of project outcomes, sustainability and actual or potential impacts, which serve as the basis for designing future development projects. See evidence of how resources have been used and the key results achieved. For planning and learning lessons to inform development projects in the future.
Implementing partners <ul style="list-style-type: none"> Ministry of Agriculture. Oromia Regional State Bureau of Agriculture. Amhara Regional State Bureau of Agriculture. SNNPR Bureau of Agriculture. 	<ul style="list-style-type: none"> Capacity building, technology promotion, handover of processing technologies, provision of land for cooperatives, support for the establishment and registration of cooperatives, facilitation of market linkages, project coordination at federal and regional level. Overall coordination and implementation of project activities through assigned focal points. Provision of technical support and organization with relevant stakeholders; liaison and supervision; monitoring and evaluation. 	<ul style="list-style-type: none"> Use the lessons drawn from the evaluation to inform future project development. Scale up and replicate similar interventions and approaches elsewhere. Use the results for planning purposes.
<ul style="list-style-type: none"> Jimma University. 	<ul style="list-style-type: none"> Value-chain studies. 	<ul style="list-style-type: none"> Use lessons drawn from the evaluation to inform future studies and capacity-building activities.
<ul style="list-style-type: none"> Ethiopian Society of Postharvest Management. 	<ul style="list-style-type: none"> Steering committee member; expected to participate in field visits and review of project plan and implementation. 	<ul style="list-style-type: none"> Learn lessons for future projects.
Grassroots beneficiaries <ul style="list-style-type: none"> Main end beneficiaries in six <i>woredas</i> in the Oromia, SNNPR and Amhara regions: Dugda, Arsi Negele, Ezia, Sinan, Arba Minch Zuria and Bahir Dar. Target communities were small-scale farmers, horticultural retailers and cooperatives engaged in processing and marketing. 	<ul style="list-style-type: none"> Using the best postharvest management options identified to handle mangoes, tomatoes, bananas and potatoes. At cooperative level, participation in practical training and receipt of larger processing equipment (jam-, paste- and juice-making machinery, potato flour-making machines) and packaging inputs (filling and canning machines, glass jars, plastic foils, etc.) for the benefit of members. Rural farmers, women and youth groups receive small-scale processing equipment, training on postharvest handling, value addition and preparation of business plans. Women and men farmers participate in training in fruit and vegetable processing methods. 	<ul style="list-style-type: none"> Use evaluation results as inputs for future performance and lesson learning via feedback through the extension system. Become beneficiaries of change arising from the evaluation (directly or indirectly).
Marketing cooperatives <ul style="list-style-type: none"> Twelve fruit and vegetable marketing cooperatives established or supported in Arsi Negele, Dugda, Ezia, Sinan, Bahir Dar Arba Minch. 	<ul style="list-style-type: none"> Participating in capacity building and enhance knowledge and skills. Participating as a member of potato producing and marketing cooperatives in market linkages (Senselet agro-industry). Participating in capacity building in fruit and vegetable production, processing and marketing and market linkage. 	<ul style="list-style-type: none"> Use evaluation results as inputs for future performance in fruit and vegetable production, processing and marketing. Become beneficiaries of changes arising from the evaluation process.

Key stakeholders	Role or participation in the project	Potential use of the evaluation
<ul style="list-style-type: none"> • Potato producing and marketing cooperatives in Sinan, Ezia and Arsi Negele. • Lante and Kanchama banana-marketing primary cooperatives in Arba Minch Zuria. • Two mango cooperatives in Bahir Dar Zuria and two tomato cooperatives in Dugda. • Twelve newly established fruit and vegetable processing cooperatives (two in each <i>woreda</i>) to set up the processing of fruits and vegetables. 		

Source: Evaluation Team.

1.6 Limitations

21. The final project evaluation was conducted at a time when the COVID-19 pandemic continued to limit mobility. It was necessary to observe preventive protocols, such as social distancing and the wearing of masks. As a result, face-to-face meetings were constrained, and many people were reluctant to participate. The team also decided to limit travel to reduce the risk of exposure and the spread of COVID-19. Consequently, many stakeholders were contacted virtually.
22. There have also been security concerns in Ethiopia, creating uncertainty about safe travel to project areas. As a result, data collection was done virtually, through Zoom or phone calls with project beneficiaries. Phone interviews can affect data collection, as people tend to spend less time talking on the phone than in face-to-face interviews. The restrictions also limited the number of people interviewed. In the absence of site visits, the evaluation team could not observe the investments on the ground to check quality of project outputs. Moreover, due to limited travel to the project *woredas* and social-distancing requirements, it was not possible to conduct focus-group discussions with beneficiaries. Therefore, the team missed out data that could have been gleaned from group discussions or face-to-face communications.
23. Nonetheless, the team managed to collect the requisite data by focusing on people who worked closely with the project and tried to engage with them numerous times by phone, showing perseverance and patience even when communication networks were not working properly. Interviewing continued with as many people as possible until the chance for getting new information was low (data collection reached saturation point) and all the main findings had been triangulated and confirmed.

2. Background and context

2.1 Project context¹

24. Ethiopia is endowed with a diverse agro-ecology that is favourable for growing a variety of fruit and vegetable crops. Millions of Ethiopian smallholder farmers produce fruit and vegetable crops for food and income. However, government figures suggest that around 30 percent of fruits and vegetables are lost in postharvest activities, from transportation and storage to consumption. Studies conducted as part of the project on the causes and extent of postharvest losses in four main fruit and vegetable value chains show significant losses – 38.7 percent for tomatoes, 32.2 percent for mangoes, 31.8 percent for bananas and from 37 to 67 percent depending on the *woreda* for potatoes.
25. Smallholder farmers lack awareness, skill and access to intermediate processing technologies to effectively manage fruits and vegetables after harvest. They do not have appropriate on-farm processing and value-adding technologies, for example, for the drying and cleaning of perishable fruits and vegetables to reduce spoilage. Lack of effective postharvest management not only affects individual farmers, but also foreign-currency earnings and the economic growth of the country, as quality product is required to compete successfully on the international market.
26. Fruits and vegetables are a crucial part of diet, providing an important portion of the daily human requirements of micronutrients (vitamins and minerals). Today, individual intake of fruits and vegetables in Ethiopia is far below the World Health Organization (WHO)/ FAO recommendation. This is partly attributed to low supply of fruits and vegetables due to low production and productivity, coupled with significant proportion of agricultural output losses from harvesting to consumption. Increasing the availability, access to and consumption of a good fruits and vegetables improves diet and food-based nutrition, and would contribute significantly to tackling malnutrition problems in Ethiopia.

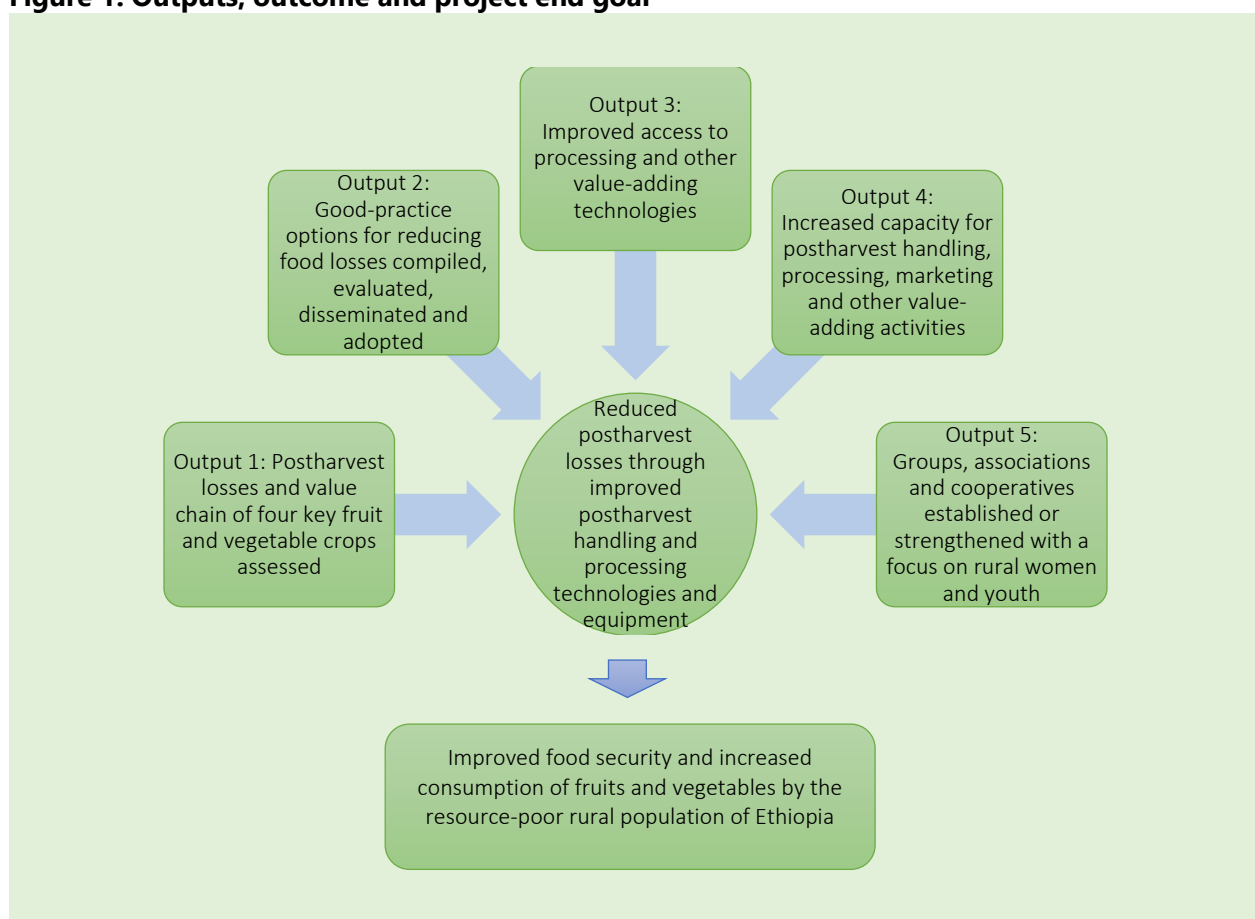
2.2 Project description

27. The “Food-loss reduction through improved postharvest handling and value addition of key fruits and vegetables (GCP/ETH/088/GER)” project, funded by the German Federal Ministry of Food and Agriculture, was implemented by the FAO Ethiopia Country Office between 1 June 2016 and 31 December 2019, with a total budget of USD 2 million. The project was designed by FAO and the Ethiopian Ministry of Agriculture to address huge gaps in postharvest handling and the value addition of agricultural products in general and fruits and vegetables, in particular.
28. The project was implemented in three regions – Oromia, SNNPR and Amhara – the major producers of the target value chains (potatoes, tomatoes, bananas and mangoes). The main beneficiaries of the project in the target communities were small-scale farmers, horticultural retailers and cooperatives engaged in horticultural crop production and processing. The project initially planned to reach 4 000 households engaged in the production of the commodities in question, but only 3 000 were eventually selected across the six *woredas*. The target number of households was revised as the project was aimed at those with good production potential in terms of land-holding capacity and irrigation use.

¹ The context is based on information provided in the project document and in the Postharvest Extension Bulletin, FAO Ethiopia: January – March 2019.

29. The main project outcome was to reduce postharvest losses through improved handling and processing technologies, equipment and practices, thus contributing to better food security and boosting the consumption of fruits and vegetables by Ethiopia's resource-poor rural population. To achieve this and the end goals set out in the project document, the project implementation focused on five outputs:
- i. assessment of postharvest losses and the value chains of four key fruit and vegetable crops;
 - ii. the compilation, evaluation, dissemination and adoption of good practices for reducing food loss;
 - iii. improved access to processing and other value-adding technologies;
 - iv. increased capacity for postharvest handling, processing, marketing and other value-adding activities; and
 - v. the establishment and strengthening of groups, associations and cooperatives with a focus on rural women and youth.
30. The project results chain is shown in Figure 1. The activities undertaken to achieve the various outputs can be found in the next chapter.

Figure 1. Outputs, outcome and project end goal



Source: Project document.

3. Findings

31. In this section, the team presents its findings by evaluation question, along with supporting arguments and justification.

3.1 To what extent was the project relevant to national priorities and responsive to beneficiaries' needs?

Finding 1: The project aligned well with national priorities and filled an existing gap in data on the extent of fruit and vegetable postharvest losses in Ethiopia.

32. The project objectives and activities are considered relevant and aligned with major national priorities in the agricultural sector. As emphasized by Ministry of Agriculture interviewees, project intervention packages involving value addition, capacity building and nutrition promotion have underpinned government development initiatives.
33. The project is also relevant to the global agricultural development agenda. It is aligned with the globally agreed 2030 Agenda, as the project outputs make a direct contribution to the attainment of the Sustainable Development Goals (SDGs), as well as the Agenda 2063: The Africa We Want.
34. The project responded to a lack of information on the scale and significance of postharvest fruit and vegetable losses. This absence of data meant limited attention was paid to postharvest losses in national agricultural development policies, strategies and programmes, which mostly focus on increasing production and productivity. For instance, the Ethiopia Growth and Transformation Plan II, the main national development plan, focuses on quality assurance for increased commercialization without taking into account postharvest activities, though postharvest management plays a critical role in ensuring the quality of produce, as evidenced by the project.
35. The studies conducted in six *woredas* showed postharvest losses of 38.7 percent for tomatoes, 32.2 percent for mangoes, 31.8 percent for bananas and from 37 to 67 percent depending on the *woreda* for potatoes. The studies, and the pilots conducted, encouraged experts and officials in the sector to start paying attention to postharvest losses as part of the agricultural development programme (see Section 3.4.3).

Finding 2: Postharvest losses of perishable fruits and vegetables are major challenges faced by producers. Due to a lack of appropriate storage facilities and an inability to process the produce, losses are very high. Hence, the project intervention was highly relevant with a view to reducing postharvest losses in important crops (potato, tomato, banana and mango) and addressing the problems faced by beneficiaries in this regard.

36. As the project worked on horticultural crops, including vegetables and fruits, which are perishable and require appropriate care during harvesting, storage and transportation, its interventions were deemed highly relevant. Interviews with the key informants at different levels confirmed that the focus on postharvest interventions was significant, due to i) the sizeable knowledge and skills gaps of the producers and ii) the limited handling capabilities of producers when it came to storage and transportation facilities. In addition, traditional techniques of harvesting fruits and vegetables were causing physical damage to the produce. The fruits and vegetables were stored in open fields, exposed to the sun, until transported to the market, causing a deterioration in quality. The methods of transporting the produce were also inappropriate, exposing them to damage. The project, therefore, tackled these critical issues of producers, traders and transporters.

Finding 3: The four value chains are highly relevant to the beneficiaries and the Ethiopian economy, both in terms of production, food security, nutrition and income. The project provided evidence of how low-level technologies and techniques for postharvest handling and processing could help reduce postharvest losses and boost food security, nutrition and income.

37. The four value chains (two fruit and two vegetable) are high-value horticultural crops, produced for income generation and consumption (nutrition security). Key informants confirmed that high postharvest fruit and vegetable losses in the target *woredas* greatly impacted the food and nutrition security of those communities. An ever-increasing population and alarming rise in food demand call for greater food production and productivity, as well as the prevention of food loss. The sectoral study showed high postharvest losses due to a lack of preservation techniques, so the project interventions were key to cutting postharvest losses and making more food available for consumption.
38. The project also responded to a widespread lack of awareness of the benefits of diversified food consumption. Awareness-raising and training on food processing enabled the beneficiaries to diversify their diet by including fruits and vegetables in their meals. Producer interviews confirmed broadened knowledge of recipes using fruits and vegetables.
39. Because of the short time it takes for certain produce, such as papayas, to mature, regional governments are encouraging the use of available irrigable land to produce fruits and vegetables, to enable farmers to earn income more quickly. Interviews showed that the project was implemented in those *woredas* with the greatest potential for horticultural production and where the relevance of postharvest loss reduction was high.
40. Although the four value-chain commodities chosen were appropriate in terms of economic importance and postharvest loss-related problems, some key informants were critical of specific piloting activities, for example, that mango-related activities did not cover major mango production areas, such as Benishangul-Gumuz and west Oromia. The context of these areas differs from where the pilot schemes were carried out.

3.2 Was the project coherent with other projects on fruit and vegetable production and food loss implemented by FAO or other partners in the same areas?

Finding 4: There was good coherence between the project and three other related projects on postharvest handling practices implemented by FAO.

41. FAO implemented three other projects on postharvest losses in the province, namely, food-loss reduction through improved postharvest handling practices of grain crops (GCP/ETH/084/SWI), food-loss reduction through improved postharvest handling practices of grain crops II (GCP/ETH/099/SWI) and the Ethiopia Postharvest Loss Alliance for Nutrition (E-PLAN) project of the Global Alliance for Improved Nutrition (GAIN) Ethiopia. The consistency between the GCP/ETH/088/GER project and the three other projects was realized through experience sharing by FAO Ethiopia project management teams.

Finding 5: There was no collaboration with projects outside FAO, other than to share experiences through the National Platform for Postharvest Management. The project funded the platform, which led to greater coherence of postharvest management projects. Platform participants learned from the forum and capitalized on that knowledge.

42. The National Platform for Postharvest Management was established at Jimma University years prior to the project, but had not been legally registered. With FAO's support (through GCP/ETH/088/GER), the platform was registered under the umbrella of the Ministry of Agriculture. Its registration enables it to formally liaise with other agencies and to raise funds to accomplish its duties, conduct meetings, hold exhibitions, etc. The forum held two annual meetings during the project period, with the assistance of FAO, where platform members, including non-governmental organizations, research institutions, universities, international organizations and government agencies working on postharvest management, presented and discussed their plans and achievements. The platform also organizes exhibitions and conferences at which postharvest management technologies, practices and study results are presented to policymakers and development actors. The platform is chaired by the Ministry of Agriculture, though a coordination office has not been established as yet.
43. Platform members interviewed confirmed that they benefited from the knowledge shared at the forum, which had informed the implementation of their own projects. By supporting the platform, the project enabled the dissemination of knowledge on postharvest handling technologies and practices to a wider group of stakeholders. The discussions and exhibitions prompted both the public and policymakers to pay attention to sectoral issues. FAO may need to lend further assistance to create a Postharvest Management Platform Secretariat at the Ministry of Agriculture to allow the platform to function sustainably.
44. GCP/ETH/088/GER is unique in the sense that it is the only project that has focused fully on postharvest loss reduction in fruits and vegetables. Projects implemented by other agencies, such as the Sasakawa Africa Association and Save the Children, include the postharvest handling of fruits and vegetables as a component of integrated projects that include other crops, such as cereals. Some projects implemented by the International Potato Center and the Irish Aid food security project, for instance, introduced diffused light storage (DLS) to support seed-potato systems with a view to ensuring food security in Tigray and SNNPR.

3.3 Have activities implemented by the project contributed to achieving the main project outputs?

45. This section describes the activities implemented and assesses the results achieved under each project output.
46. Table 3 presents a summary of outputs planned versus outputs achieved. The project achieved 89 percent of the outcome-level target "farmers adopt good practices of fruits and vegetables postharvest handling". While the indicators for Outputs 1, 2 and 4 were also achieved, more limited resultants were reported for outputs 3 and 5, as discussed below.

Table 3. Summary of outputs planned and achieved by the project

Results level	Description	Unit	End target		Achievement		Comments on end-line data
			Initial target	Revised target	Achieved quantity	% achieved	
Outcome	Farmers adopting good postharvest handling practices for fruits and vegetables	No.	4 000	3 000	2 670	89	3 000 farmers reached and 2 670 used the practices
Output 1	Studies on value chain and consumption of fruits and vegetables in six <i>woredas</i>	No.	5	5	5	100	
	Capacity needs-assessment in six <i>woredas</i>	No.	1	1	1	100	
Output 2	No. of good-practice options evaluated	No.	5	5	6	120	
	No. of farmers and processors adopting good practices	No.	4 000	3 000	2 670	89	3 000 farmers reached and 2 670 used the practices; no evidence to confirm adoption of processing practices
Output 3	No. of processing units established and registered	No.	40	40	12	30	Not yet functional
	Materials and processing equipment and facilities distributed to cooperatives	No. of sets			41		
	Equipment distributed to farmer training centres and <i>woreda</i> agricultural offices	No.			3		
Output 4	Increased capacity by training:						
	• Farmers		250	250	800		
	• Experts				267		
	• Food-processing youth cooperative members				200		
	Increased capacity through exchange visits:						
	• Farmers				421		
	• Experts				40		
• Officials				9			
Output 5	No. of cooperatives established and registered		30	30	21	70	Not yet functional
	No. of cooperative members		4 000	4 000	1 200	30	
	No. of female members		1 600	1 600	325	20	
	No. of farmers linked to cooperatives supplying fresh produce				1 470		Supply not yet realized

Source: Project Team .

3.3.1 Output 1: Assessment of postharvest losses and value chain of four key fruit and vegetable crops

Finding 6: The project realised all the foreseen studies, including “food loss analysis: causes and solutions” for four value chains (banana, mango, potato and tomato), one study on household fruits and vegetables consumption and one on capacity-development needs with regard to postharvest losses along the supply chain. These studies help to plug a key information gap, providing evidence of the size and significance of post-harvest losses, which were previously undocumented. The project made efforts to disseminate these results and raise awareness.

47. The project produced four detailed studies on different value chains, assessing the extent and causes of postharvest losses in the tomato, potato, mango and banana value chains. One study assessed capacity-development needs at different levels of the supply chain (for both public- and private-sector institutions and actors). Another assessed the extent of fruit and vegetable consumption at household level.
48. The assessments found significant postharvest losses for the crops in question, poor dietary diversity and malnutrition in project target areas. The study validation workshops helped to disseminate the findings of the studies, creating awareness of the seriousness of the problem of postharvest losses in horticulture. This greatly contributed to the institutionalization of postharvest management in the agriculture sector (see section 3.4.3 for more).

3.3.2 Output 2: Compilation, evaluation, dissemination and adoption of good practice options for reducing food losses

Finding 7: The project introduced improved technologies and practices, such as mango harvesting tools, sheds for in-field banana and tomato storage, crates for transportation, DLS and mudbrick dark-storage facilities for potatoes, and postharvest handling techniques. These techniques have been widely disseminated, with capacity-development and awareness-raising exercises conducted in the target areas and beyond.

49. The project identified, documented and promoted a number of postharvest loss reduction, value-adding and processing technologies and practices in target areas, such as:
 - i. cutting banana handles prior to transportation and transporting packed bananas in plastic crates, rather than as a whole bunch;
 - ii. a dark storage facility constructed from mudbrick to increase storage life for ware potatoes and DLS for seed potatoes, and the introduction of different potato recipes; and
 - iii. a cost-effective dry processing technique involving charcoal evaporation for mangoes and tomatoes, as well as training for unemployed rural young people; the practices have not yet been applied, however, as processing cooperatives are not yet operational (see section 3.3.3).
50. Best practices on the handling and value addition of tomato, potato, banana and mango crops were disseminated beyond the project areas.
51. To raise awareness, farmers, extension workers and government officials took part in exchange visits (both locally and abroad) and in field days. The experience gained from exposure visits enhanced the adoption of technologies and practices to reduce postharvest losses in the targeted fruits and vegetables. The visits made and experience gained are listed in Table 4.

Table 4. Exposure visits and experience gained

Organization	Experience gained
Jeldu <i>woreda</i>	Production of quality potatoes and seed-potato business
Holeta Agricultural Research Centre, Potato Research Division	Potato postharvest handling and research on value addition
Ethiopian Agricultural Works Corporation Et-Fruit	Quality determination, price-setting and storage operations for bananas
Senselet food-processing enterprise	Processing and packing of potato chips
Ethio Vegfru PLC	Production, harvesting and value addition of globally competitive and European-standard beans, tomatoes, onions and other crops
Merti agro-industry	Harvesting and processing of tomatoes
Africa Juice agro-industry	Production, harvesting and processing of passion fruit
Melkassa Agricultural Research Centre, horticultural and agricultural research divisions	Tomato, banana and mango postharvest handling research, development of cost-effective processing and value-adding technologies

Source: Project document.

52. **Potato:** Potato-seed storage facilities were introduced, demonstrated and handed over to six producing and marketing cooperatives (five of which were newly established and one existing) in the Sinan, Arsi Negele and Ezia *woredas*. Beneficiaries interviewed confirmed having adopted DLS for seed-potato storage and mudbrick storage for ware potatoes. They also received training in potato processing and awareness-raising on potato consumption.
53. **Tomato:** In Dugda *woreda*, before the project, both ripened and green tomato cherries were picked together. Awareness-raising was conducted on the timely harvesting of tomatoes, storage in sheds and sorting practices. In addition, plastic crates were introduced, replacing the sacks and wooden and bamboo crates that previously heated produce and scratched fruit skin, leading to a rapid deterioration in product quality.
54. **Banana:** The major causes of postharvest banana losses in Arba Minch Zuria *woreda* include the harvesting of immature bunches, poor harvesting techniques, the transport of fruit in bunches, poor collection methods and the absence of value addition at producer level. To reduce mechanical damage to the fruit, the project promoted the cutting of banana hands in the *kebeles* before transportation and the use of plastic crates to transport them. It provided crates, banana-cutting knives and bunch-carrying saddles for banana producers and marketing cooperatives.
55. **Mango:** In Bahir Dar Zuria *woreda*, the major challenges of mango postharvest handling included the harvesting of mature and immature fruits together, limited value addition (such as the washing of fruit prior to sale), the use of poor harvesting and packaging technologies, and a lack of product storage sheds. The project promoted and demonstrated a package of working techniques and technologies that reduced postharvest losses. The technique of picking the fruit based on a maturity chart was demonstrated and promoted to facilitate the identification of mature and immature fruit. Fruit picking was made difficult by the height of the mango trees, with farmers often using unstable ladders to climb the trees or beating the fruit with a stick. The project introduced mango-picking poles that can be operated while standing on the ground.

3.3.3 Output 3: Improved access to processing and other value-adding technologies

Finding 8: Fruit and vegetable processing centres were constructed, and equipment was supplied for use by processing cooperatives. However, these are not yet operational due to delays in the construction of processing sheds and the installation of equipment.

56. Twelve fruit and vegetable processing cooperatives were established and provided with appropriate processing technologies (such as fruit jam, paste and juice-making machines and

potato flour-making technologies) and packaging materials (technologies such as paste filling and canning machines, glass jars, plastic foils and other items). They also received practical training. The cooperatives were registered in accordance with cooperative establishment guidelines, while the government provided them with land to set up the processing unit, except in Bahir Dar Zuria *woreda*, where securing land for a processing unit remained unresolved at the time of evaluation. The project provided the cooperatives with construction materials to help build the processing sheds.

57. The outcomes of the processing cooperatives could not be realized, however, because of delays to construction and equipment installation in all *woredas*. The internal finishing work was not completed on schedule and the fixtures for waste disposal were not installed. Implementation was partly hindered by COVID-19, partly by long procurement procedures and partly by delays in the approval of revisions to the project activity budget.

3.3.4 Output 4: Increased capacity for postharvest handling, processing, marketing and other value-adding activities

Finding 9: Capacity-development activities on postharvest handling and value addition, including processing and marketing, were conducted for government personnel, farmers, cooperative members and other stakeholders, consisting of training, awareness-raising workshops and the development of manuals. Stakeholder awareness was raised on topics including the causes, extent and mitigation of postharvest losses and the management and strengthening of cooperatives.

58. The project provided training on postharvest handling and value addition, reaching 800 farmers, 267 experts and 200 food-processing youth groups. Nine officials, 40 experts and 400 farmers participated in exchange visits and field days. It supported the preparation of eight marketing and 12 processing business plans and trained the cooperatives organized to process fruits and vegetables on technical aspects.
59. The awareness-raising exercises trickled down to farmers, including many who were not beneficiaries. Moreover, development agents in Arsi Negele *woreda* have been using the manuals (both in the local language and English) to train farmers under the government extension scheme, by integrating FAO training components into periodic awareness-raising sessions. Women made up the majority of participants trained on a weekly basis, especially in cooking new recipes and food processing.

Table 5. Number of documents produced and disseminated

Type of document	No. of documents	Remark
Tailor-made training poster	4	1 each for potato, tomato, banana and mango
Fruit and vegetable postharvest supply-chain assessment	4	1 each for potato, tomato, banana and mango
Mango and tomato processing unit set-up plan	1	
Mango and tomato processing unit business plan	1	
Potato and banana-processing units set-up business plans	1	
Capacity development needs for supply-chain actors	1	
Household fruit and vegetable consumption survey	1	
Postharvest handling of fruit and vegetable manual	1	
Sweet potato and potato seed production manual	1	
Bulletin on the postharvest management of fruits and vegetables	2	Issued twice
Brief leaflet	5	1 each for potato, tomato, banana, mango and the project

Source: Project Team .

3.3.5 Output 5: Establishment and strengthening of groups, associations and cooperatives with a focus on rural women and youth

Finding 10: Twenty-four cooperatives (12 focused on fruit and vegetable production and marketing and 12 on processing) were established, supported and registered. The training provided helped to increase motivation. However, the processing cooperatives are not yet functional and refresher training will be needed once they will become operational.

60. The cooperatives were trained in business-plan preparation and cooperative strengthening packages (cooperative establishment guide, business preparation, market linkages, storage management, bookkeeping and other skills). Experts from the Hawassa University nutrition department also provided capacity-development training on nutrition to members of the processing cooperatives, focusing on banana as the main fruit, but also mango and other fruits produced in the Arba Minch area. The training and exposure visits provided to the agro-processing cooperatives spurred great motivation in the selected *woredas*, though actual processing activities have not yet started.
61. Interviewees appreciated the training and practical sessions. However, they have not undertaken any processing activities due to delays in the completion of the processing centres, reportedly down to tardy equipment supply and installation of machinery, electric power, water and waste-disposal facilities. In addition, at the time of the evaluation, acquiring land for the processing centre in Bahir Dar Zuria remained a challenge. It is, therefore, possible to conclude that the cooperatives have not yet achieved the desired value-added targets for the chosen commodities. The knowledge gained has faded somewhat and will require additional refresher training to process the products.
62. Processing cooperatives were established by involving male and female jobless youths. Efforts were made to improve the participation of women. In the Arba Minch Zuria *woreda*, the banana-processing cooperative in the *kebele* where the data were collected had 12 members (ten young women and two young men), while in the Dugda and Arsi Negele *woredas*, four tomato and potato processing cooperatives were formed, consisting of 16 women and four men. Women's participation, therefore, averaged 80–83 percent.
63. Potato production and marketing cooperatives were linked with an agribusiness that makes chips. To enhance cooperative capacity, continuous monitoring and follow-up were conducted. As the cooperatives have not started to process any of the products for which they were trained, due to delays in the construction of the processing centres and the installation of equipment, they have not yet capitalized on this connection. Cooperative members are desperate to engage in the processing and marketing of their produce.

3.4 To what extent has the project contributed to its overarching outcome and final goal?

64. This section presents the project's contributions to its overarching outcome – "reduced postharvest losses through improved postharvest handling and processing technologies and equipment" – and its higher-level end goal of "improved food security and increased consumption of fruits and vegetables for the resource-poor rural population in Ethiopia". It also presents some interesting systemic policy and institutional changes.

3.4.1 Contribution to the overarching project outcome

65. Achievement of the overall project outcome and final goal was defined as the sum of the five outputs. However, as seen, at the time of the evaluation, some of the outputs had not yet been realized. A distinction can be made between: i) the pilot postharvest loss reduction, for which the evaluation can affirm that results were achieved, leading to increased income and food security for the farmers involved and ii) the organization of cooperatives to process fruits and vegetables, the results of which will be seen once they will become fully operational. The results described in this section on postharvest loss reduction and income improvements, therefore, only relate to the pilot postharvest loss reduction component.

Finding 11: Postharvest losses in target fruits and vegetables have been significantly reduced thanks to the intervention.

66. Reducing the postharvest losses of targeted horticultural crops was the project's primary objective. The reduction in losses is a cumulative effect of awareness-raising and capacity-development activities, resulting in the adoption of postharvest technologies and practices. Responses of the key informants suggest that this objective was achieved in the pilot intervention areas and has strong prospects for wider impact if the project is scaled up and out.
67. The capacity-development training on postharvest handling provided at different levels, especially to farmers and cooperative members, brought about positive change in attitudes and practices, filling knowledge gaps at household and community levels. Key informants said that they had not known about such technologies and harvesting techniques prior to the project.
68. **Potato:** The potato producers in the project area used to sell potatoes immediately after harvest at lower prices in order to minimize the damage caused when storing them using locally available materials. The factors that helped to reduce postharvest losses were capacity-development through training on postharvest handling and the use of proper harvesting, shed and storage facilities. Participants said that DLS technology had helped them to keep the tubers for more than five months, reducing postharvest losses and giving them a better chance of food security and higher income. In addition, farmers also confirmed that conserving potato seeds solved the problem of seed shortages in slack times and enabled them to sell their seeds at a higher price.
69. **Tomato:** Awareness-raising interventions on proper harvesting, sorting and storing tomatoes in sheds prior to transportation resulted in better quality tomatoes, as farmers could engage in timely harvesting and used the sheds to protect the fresh tomatoes against the sun. Key informants said the use of plastic crates significantly reduced postharvest losses. The project's awareness-raising activities in the Dugda *woreda*, for example, improved farmer know-how on what can damage the quality of tomatoes and cause postharvest losses. The use of sheds and sorting techniques, as well as care in packing and transporting tomatoes, also played an important role in reducing losses. At household level, too, project beneficiaries said that using cooling systems made of locally available materials (cool sand) helped to keep tomatoes for a longer period prior to sale.
70. **Banana:** The provision of crates for the proper handling and transport of bananas was cited as a critically important intervention that reduced postharvest banana loss. The project brought about a change in farmers' attitudes after they observed the extent of the improvement in banana quality after using sheds to keep the fruit out of the sun prior to sale. This resulted in greater bargaining power and higher market values for their produce. In Arba Minch Zuria *woreda*, the project supported the construction of sheds with cement floors. The sheds were constructed using

locally available materials and farmers were encouraged to keep their produce in the sheds, rather than on the ground, which could damage them.

Case study: Impact of potato storage techniques

Belaynesh Mekonnen is married and has five children. She is one of the potato-storage beneficiaries in Sinan woreda. She participated in training on ware potato-store construction and practices to store potatoes and reduce losses. Based on this training and exposure visits, she constructed her own ware potato storage from mudbrick. Consequently, she could store her potatoes for 4–5 months rather than the previous 2–3 months. She earned ETB 1.5 (USD 0.04) more per kg due to price changes over time (the potato price increased from ETB 5.5 (USD 0.13 per kg) to ETB 7 (USD 0.17 per kg). She can feed her family for the whole year now rather than just eight months, as was the case before the project. Interview with Belaynesh Mekonnen, November 2020.

71. **Mango:** Prior to the project, farmers had harvested mangoes by hitting the fruit to make them fall to the ground, leaving around 18 percent of the fruit damaged at the point of harvest. The project showed farmers how the use of special poles for harvesting could also reduce the risk of scratches on the fruit. Also, before the intervention, there was no sorting of mangoes based on size, quality or maturity, resulting in low overall prices. Interviewees confirmed that the new technologies and practices resulted in a significant reduction in postharvest losses. Project beneficiaries were able to sell mangoes at higher prices because of their improved quality. In addition, introducing mango harvesting technology and creating awareness simplified mango harvesting methods, saving labour and lives. Key informants said that six people had died and two were injured in Bahir Dar Zuria *woreda* before the project, having fallen from mango trees while trying to pick fruit from the tips of branches.

3.4.2 Contribution to the final project goal

Finding 12: The rise in quality and quantity of produce brought about by the project enhanced the food security of producers. Improved storage facilities also enabled farmers to choose an appropriate time to sell, when prices were high, thus increasing their income.

72. The evaluation found that farmers' bargaining power increased with the rise in quality and ability to store, enabling them to sell their products at higher prices and reducing postharvest losses. While an end-line study is not available to quantify the increase in income, evidence collected from interviews with beneficiaries and key informants during this evaluation support this finding.
73. **Potato:** Potato producers used to sell potatoes immediately after harvest, partly due to the immediate need for money, but mostly because they could not store them for longer periods, as they are perishable. However, potato prices are at their lowest level at harvest time. DLS technology resulted in a greater chance of higher prices and, therefore, income. In Arsi Negele, interviewees reported that ware potato storage and later sales resulted in a gain of ETB 4–6 (USD 0.10–0.14) per kg. Dark storage facilities constructed from mudbrick in the *woreda* of Sinan in the Amhara region were said to have increased the shelf-life of ware potatoes from about two months to four or five months, making potatoes available for consumption for a longer period. This extended storage period also enabled farmers to sell their produce at higher prices during slack periods, resulting in increased income.
74. **Tomato:** In Dugda *woreda*, project beneficiaries said that the project's capacity building through training and awareness-raising, the use of sheds for tomato storage and the use of plastic crates for transportation reduced postharvest losses and maintained product quality. This resulted in greater bargaining power and higher prices, increasing the income earned from product sales.

Market brokers refused to use the crates. Interviewees believed that this was because standardized crates prevented them from cheating farmers on weight. The farmers were able to sell their products to other buyers, however, and thus boost their income.

75. **Banana:** Training in banana handling and the construction of sheds for storage changed farmers' attitudes towards product quality and they started to keep freshly harvested bananas in sheds. The use of crates for transporting bananas also resulted in better quality. Consequently, beneficiary cooperatives reported good bargaining power, better prices and increased income.
76. For example, better banana handling and transport in crates, as well as the overall knowledge gained on product-quality management and handling from harvest to sales, reduced losses significantly and resulted in a price increase of around ETB 20 (USD 0.48) per kg for the Lante Banana Cooperative, which has banana shops in Hawassa City. The Cooperative management expressed its appreciation for the impact of the project on its banana marketing.
77. **Mango:** Improved methods of harvesting and transporting mangoes in crates generated higher selling prices as the quality of produce improved (there was no physical damage, fruit were sorted and transported by crate).

Finding 13: The project contributed directly to greater diversity and availability of food for household consumption over longer periods. This was a direct result of the reduction in postharvest losses and increased knowledge of food processing. No evidence was found that demonstrated an increase in dietary diversity.

78. As seen, the project affected food security in various ways. It had a direct impact through the reduction of postharvest losses and the longer shelf-life of produce which meant more food was available for household consumption for a longer period. In addition, the improvements in quantity and quality also led to an increase in household income and therefore an increased capacity to buy food on the market.
79. The project also aimed to enhance horticultural consumption through greater awareness-raising on nutritive value. Both men and women interviewees said that the training and demonstration of potato processing enabled them to prepare different types of food from potato and to reduce wastage. While beneficiaries made more diverse use of potatoes in their cooking, however, there was no clear evidence that this knowledge translated into greater dietary diversity.
80. As the young people organized to participate in fruit and vegetable processing could not earn any income from this activity and the processing centres were not yet functional, no changes in their food security or nutrition were observed.

3.4.3 Contribution to policy and institutional change

Finding 14: While not a stated goal, the project contributed to institutional capacity and systems building by filling gaps in the country's agricultural policy and development strategy.

81. The project conducted baseline value-chain studies of potato, tomato, banana and mango farming. The studies established concrete postharvest loss figures all along the value chain, from production to the end market in Addis Ababa. Information generated by these studies played a decisive role in promoting horticulture to official subsector levels led by a state minister, increasing the number of personnel for postharvest management (from zero to three at the Ministry of Agriculture) and creating a number of government-funded positions in certain regional bureaux of agriculture and *woredas*.

82. A Ministry of Agriculture interviewee said that the government intended to increase the production and productivity of horticultural products, including fruits, vegetables and roots, but was not paying attention to postharvest losses. The baseline studies showed very high postharvest losses, the reduction of which, coupled with quality assurance before and after harvest, could contribute to food security, increased income and exports. The studies encouraged institutional reform within the Ministry of Agriculture, with postharvest handling now given greater emphases. This presents a good opportunity for the use of the project's approach, technologies and practices on a wider scale, sustaining the results obtained.
83. According to a key informant at the Ministry of Agriculture, *"the project is new in kind to specifically address postharvest losses in horticulture crops. It revealed the high level of postharvest losses in potato, tomato, mango and banana at different nodes of the value chain and contributed convincingly to the priority given to postharvest handling in the agricultural sector transformation agenda"*. Further institutionalization and institutional capacity development are necessary.

3.5 To what extent are project results sustainable?

84. This section assesses the sustainability of project results from an institutional, technical, economic and environmental perspective.

Finding 15. Institutional sustainability: Postharvest management is becoming one of the major pillars of the country's agricultural extension strategy.

85. The study conducted for this project, indicating that food security and higher income for farmers could not be attained unless postharvest losses were minimized, was instrumental in bringing about the inclusion of postharvest management in Ethiopia's agricultural extension strategy. The Ministry of Agriculture has also prepared a ten-year horticultural development strategy that includes postharvest handling. Moreover, a national horticulture development roadmap is being developed, which will cite quality assurance as key to commercialization and export.
86. The horticulture sector has started to benefit from institutional reform in the agricultural sector. As part of the new emphasis placed on horticultural development, the sector is now overseen by a state minister, while experts have been assigned to fill postharvest management positions at the Ministry of Agriculture and regional bureaux of agriculture. If this continues, there is no doubt that postharvest management practices will be further institutionalized at all levels and become sustainable.
87. The project's awareness-raising sessions also trickled down from participating farmers to non-participant farmers in project areas. Moreover, development agents are still using the training manuals to train farmers under the regular extension system by integrating FAO training components into their periodic awareness-raising exercises.

Finding 16. Technical sustainability: The postharvest management technologies and practices introduced are technically appropriate and suited to production and use in the intervention areas.

88. Most of the technologies promoted, such as DLS, mudbrick, sheds and mango harvesting tools, can be locally manufactured and modified. These technologies are also easily managed by the beneficiaries. The promoted postharvest handling practices are highly adaptable to prevailing conditions and farming systems. It was also found that good technologies and practices had been adopted by farmers who were not directly targeted by the project. However, the supply of some materials, such as crates, was limited. The processing machinery and spare parts may not be as easily produced at local level, due to their complexity and the lack of local capacity.

89. Additional efforts are needed to ensure the sustainability of fruit and vegetable processing. Training on the technical aspects of processing was given some time ago and this has not been translated into skills. Some youths have already called for refresher training. Moreover, the operation and maintenance of machinery and utilities require further technical skills development.
90. Although 12 marketing cooperatives were registered to receive support from this project, no marketing activities were observed, except for the cooperatives organized to promote mangoes and bananas. Despite the current increase in farmer income, as more farmers produce horticultural products, the need for market linkages to buyers will increase. Establishing market ties with individual smallholder farmers is unrealistic, hence the need to strengthen marketing cooperatives. However, marketing has been a major challenge for horticultural products in the project areas. Lack of appropriate transport facilities, storage, management skills and market linkages are key problems cited. Capacity development in marketing and business management remain major areas where producers and processors need support. Interviewees displayed a lack of adequate training in business management. If the processing of fruits and vegetables is launched, business management, marketing and financial management will become crucial, so should be provided. Without strong management and technical capacity, the cooperatives cannot function sustainably.

Finding 17. Economic sustainability: The postharvest management technologies and practices introduced are financially affordable at scale and sustainably used.

91. According to interviewees, the materials used for fruit and vegetable storage are often locally available, affordable and modifiable by farmers and local artisans. Improved product quality has also resulted in better product prices, indicating high potential for financial sustainability.
92. The beneficiary cooperatives have mobilized some money to use as working capital when they start functioning. In Bahir Dar Zuria *woreda*, the cooperatives mobilized savings of ETB 200 000 (around USD 4 785), while in Sinan *woreda*, the cooperatives saved ETB 100 000 (about USD 2 392) as working capital, which is to be used for operational expenses when the business is launched. Some of the services/inputs that need investment can be accessed through rural savings and loan organizations, which provide loans at affordable interest rates. However, the levels of working capital required or operating costs involved have not been adequately estimated for each of the processing cooperatives, so the cooperatives do not know exactly how much they need in order to embark on a successful processing business. Some cooperative members said they were told to run complementary businesses to diversify their income and ensure the sustainability of the processing businesses. However, these complementary businesses were not identified and their feasibility was not studied.
93. The youth cooperatives for fruit and vegetable processing have not yet started operating. Many participants complained about the delay. Some of the young people were registered with day-labour associations and left to join the agribusiness cooperatives to make a better living. Many are now leaving the cooperatives, as they have lost hope and need to find alternative ways of earning a living. For example, of the 25 members of one banana processing and marketing cooperative in Arba Minch Zuria, five (20 percent) have left. Twenty-four of the 30 (80 percent) have left the Getnet Wubrist and Friends Vegetable Processing Cooperative in Sinan *woreda*. The situation is similar in all the intervention areas.
94. The initiatives linking cooperative members trained in processing with suppliers of vegetables is a good step in sustaining project initiatives and should bear fruit when the processing facilities are completed and functioning. However, as the processing has not yet started, it was impossible to ascertain the precise effect of these market connections.

Finding 18. Environmental sustainability: Postharvest loss-preventing technologies and practices, such as sheds, DLS, mudbricks and crates, cause no environmental damage.

95. Most of the technologies and practices introduced by the project involve reusable and recyclable objects and will have minimal environmental impact. The technologies use clean energy sources, such as electricity, solar energy and low-carbon fuels. However, the team was unable to assess the positive or negative impacts of the agro-processing interventions of the project. The evaluation team believes an environmental impact study is needed to make sure that proper disposal of solid and liquid waste management is included in the implementation of the horticulture processing activities.

3.6 To what extent was the project implemented efficiently?

Finding 19: Project activities were implemented in partnership with government institutions from federal to *kebele* level. The arrangement ensured ownership and sustainability and could contribute to the potential upscaling of project results. While it was efficient for the most part, the inclusion of the agricultural offices of administrative zones made no significant contribution to project outputs.

96. Project management arrangements followed FAO modalities. FAO Ethiopia acted as project manager, while the partners at regional, administrative zone, *woreda* and *kebele* levels had different roles in the implementation of the activities. Implementers benefited from capacity development and experience sharing and the arrangement was found to be practical. However, key informants noted that while the inclusion of administrative zones in the implementation arrangement added another level to project financial transfers, they had no technical role in project implementation. According to them, implementation would have been more efficient without the involvement of the administrative zones.
97. At federal level, FAO seconded a project manager as project focal point and coordinator, stationed in the Ministry of Agriculture, unlike other FAO projects implemented in partnership with the Ministry. This enabled the focal point to increase their involvement in the implementation of project activities and to closely manage the project by building strong connections within the Ministry, resulting in better joint implementation of project activities.
98. Implementation was carried out based on approved project documents, comprising lists of project activities at output level. The steering committee chaired by the Ministry of Agriculture was responsible for approving the activity plan presented by FAO and overseeing implementation. Steering-committee meetings were conducted on three occasions during the project. In a few cases, it revised the original plan. For example, it decided to establish 12 strong cooperatives with the capacity to meet the demand of the target areas, rather than 30 smaller cooperatives. The number of target farmers was also reduced from 4 000 to 3 000 and the number of farmers producing fruits and vegetables was adjusted in the target *kebeles*. This suggests over-estimation during the project design phase.
99. FAO Ethiopia has field offices in the Oromia, Amhara and SNNPR regions. These offices worked closely with the focal points assigned by the regional bureaux of agriculture. As in the Ministry of Agriculture, the FAO regional field offices are in the same buildings as the agricultural bureaux, enabling close and immediate information sharing and quick decisions. FAO field-office coordinators and experts provided technical support to the *woreda*-level focal points, the most direct implementers of project activities. This arrangement enabled the government institutions to take ownership of the projects.

100. The efficiency of some activities, such as studies and procurement, was dependent on FAO rules and procedures. Though the implementation arrangements were appreciated, key informants said FAO needed to improve its procurement efficiency to avoid delays.
101. In Oromia region, the Bureau of Agriculture implemented the project through its horticulture and extension department, in close cooperation with the FAO field office. The initial letter of agreement was signed with the Oromia Irrigation Development Authority (OIDA), home to horticultural development before it was restructured and moved to the Bureau of Agriculture. In the initial phase, the transfer of funds from OIDA to the Bureau of Agriculture proved challenging, affecting implementation efficiency, though things speeded up later on, offsetting the delay.

Finding 20: Financial transfers were based on letters of agreement between FAO and the implementing offices. This generally worked well, except for the last instalment, which was based on a reimbursement. The implementing partners found themselves short of resources to implement activities and had to mobilize resources elsewhere so they could apply for repayment.

102. There were delays in disbursing funds, as the approval of budget changes and additional activities took longer than expected. With regard to financial performance, FAO's core personnel at regional level are responsible for facilitating financial flows, with funds transferred based on letters of agreement with the FAO Country Office. Financial revisions are undertaken twice a year, according to budget lines and corresponding project activities. At the Ministry of Agriculture's request, there were some new activities that were not included in the project document, which had been incorporated through budget revisions. The evaluation found that such revisions led to delays due to the time needed for their approvals.
103. In most cases, 30 percent of the funding was released upon signing, with partners required to present financial justification for the next instalment of 50 percent. The remaining 20 percent was payable after the final project implementation report was delivered. The partners reported challenges in meeting this last obligation due to a lack of budget for implementing the remaining activities prior to reimbursement. They attempted to find other sources of funds to complete the outstanding project activities. At the time of evaluation, all letters of agreement were closed following the satisfactory completion of the activities, as planned.
104. The process of transferring funds to implementers at *woreda* level seems excessively long, as the funding passes from FAO to the region, then to the administrative zone and/or *woreda*. There were also delays and a lack of project ownership from government financial personnel, as they were busy with other transactions and lacked motivation to prioritize this project. On this, serious concerns were raised in *woredas* in the SNNPR region, though the concerns were widespread.

Finding 21: The cost-sharing arrangement adopted by the project was generally effective as an approach, but the real cost for communities and implementing partners were not adequately estimated in the planning phase.

105. To use resources efficiently, project activities were conducted using a community cost-sharing mechanism and target beneficiaries were mobilised for shared contributions in kind, such as local materials for constructing DLS and sheds. The *woreda* administrations were also responsible for providing the land, materials and utilities, such as water, electricity and sewerage, necessary to establish the agro-processing units.
106. While the cost-sharing arrangement was necessary to ensure ownership and sustainability, the value of the contribution of the community and *woreda* offices (such as the cost of land provided by *woreda* administrations) were not estimated in monetary terms during project planning. It was

difficult for the partners to meet such costs during implementation. The *woredas* also had to plug gaps that arose from the under-budgeting of certain activities (such as labour costs in excess of the budget, as was the case in Arba Minch Zuria *woreda*).

3.7 Were gender-equality considerations reflected in project design and implementation?

Finding 22: The project targeted men, women and girls and young farmers. It did not aim to change social gender structures and dynamics, however, as the intervention was not underpinned by gender analysis. The assessment showed gender-mainstreaming weaknesses in project design, which could be linked to a lack of gender-dedicated personnel in the Country Office.

107. The project was designed in a gender-neutral way, with no attempts made to alter existing social gender structures in the target community. The project document did not give details of any expected achievements in terms of gender equality and empowerment, though the number of target beneficiaries was disaggregated by sex.
108. Despite the clearance of gender-related formalities during preparation, review and approval, per FAO's requirements, the project documents did not take gender-equality concerns sufficiently into account. This is in part due to the fact that the FAO Country Office lacked gender-dedicated personnel. The assessment recently conducted by the Country Office showed a lack of capacity on gender and recommended the appointment of a gender focal point.
109. No specific gender analysis was conducted prior to the planning and implementation of activities to identify gender gaps or imbalances in access and control of resources and income, so as to properly identify interventions that would correct those inequalities. Gender analysis would have enabled the planning and implementation of capacity-development activities to promote women's empowerment in terms of economic improvement, decision-making, confidence, self-esteem, capacity for leadership and many other areas.
110. Nor did the various studies conducted under the project include gender aspects. The only exception was the processing units survey, which considered women's domestic role in processing food at household level to decide whom to involve in the processing cooperatives.
111. During implementation, the project promoted the inclusion of young women and girls as beneficiaries in the processing cooperatives. According to interviewees, their inclusion varied from place to place. For example, about 80 percent of cooperative members in the Dugda and Arsi Negele *woredas* of Oromia region and the Arba Minch Zuria *woreda* of the SNNPR are women or girls, while membership in Amhara region is very much male dominated. In Bahir Dar Zuria *woreda*, the beneficiary cooperative for the postharvest management and processing of mango belongs to a mango producers' cooperative, where the members are mostly male. The cooperatives plan to employ jobless youth when the processing units are up and running, but the gender balance of the young people to be employed was not known at the time of evaluation.
112. Women and girls play a significant role in agricultural production in general and in horticultural production, in particular, especially in harvesting. Female interviewees said they had participated in the capacity-enhancement trainings provided to farmers to improve postharvest management practices. The project also included women in training on how to use a mix of food crops (dietary feeding) and encouraged women to attend awareness-raising and recipe sessions.
113. In contrast, the target beneficiaries of DLS (for potato) and sheds (for tomato and banana) were selected based on their access to land and irrigation for horticultural production, and gender was

not a criterion in their selection. As land ownership is largely in the hands of heads of household, which are predominantly men, the producer cooperative members targeted by the project were dominated by men.

3.8 What capacity-development results did the project achieve?

Finding 23: The project invested in developing capacity at individual and organizational level. It adopted effective and sustainable approaches to capacity development, targeting producers. It also contributed to the creation of an enabling environment to reduce postharvest losses by supporting the Ethiopian Society of Postharvest Management and by gathering evidence on the importance of postharvest management.

114. At both the individual and organizational level, the project trained experts, farmers and processors on postharvest technologies and practices, food processing, marketing and management. It provided cooperatives with materials and equipment. It raised awareness by organizing workshops to share knowledge generated by different studies and exposure visits.
115. A training-of-trainers approach was used to cascade capacity-development activities on different levels. The process allowed attendees to deepen their knowledge as they passed on their training. As part of the training-of-trainers process, the Ministry of Agriculture took responsibility for facilitating and providing training at regional, administrative zone and *woreda* level, using its technical personnel to support the project. Various training sessions were conducted at regional and *woreda* level, where agronomists and project focal points were trained based on capacity needs assessments. The experts trained in these sessions then trained direct project beneficiaries.
116. Workshops were used as a forum for disseminating study results. The findings of the baseline studies were shared in a validation workshop, which boosted the attention paid to the postharvest management of horticulture at federal and regional level. Exposure visits abroad by officials also added to their awareness of technologies and practices used to reduce postharvest losses. Thus, the project's various interventions contributed to the creation of an enabling environment for postharvest loss reduction in the Ministry of Agriculture and this has gradually spread to the regions.

Finding 24: While postharvest losses happen all along the value chain, FAO's capacity-development efforts with regard to postharvest loss reduction focused mainly on producers and did not target other actors in the chain.

117. The project's capacity-development study confirmed the need to introduce better practices and technologies for postharvest handling, processing and value addition to reduce postharvest losses. The findings of the six *woreda*-based studies served as a baseline for measuring postharvest losses, household consumption of fruits and vegetables and capacity gaps in the target areas and helped in the design of necessary interventions.
118. The project's capacity-development activities focused on investment in sheds, DLS and postharvest handling by producers – activities with the potential to significantly reduce postharvest losses and maintain quality. However, the studies conducted by the project showed losses at farm level, in storage, during transport and in traders' warehouses. Therefore, unless other activities are implemented to strengthen the capacities of the other actors involved, losses will continue all along the value chain, right down to the consumer.

4. Conclusions and recommendations

4.1 Conclusions

Conclusion 1. By tackling postharvest losses, the project addressed one of the major challenges faced by producers. Farmers have adopted postharvest management practices and technologies introduced by the project that have helped to reduce losses and increase food security by boosting income and making more produce available for household consumption over longer periods. This was possible due to a significant effort to raise awareness of the scale of postharvest losses, coupled with training in postharvest management practices and techniques, capacity development and the provision of technology to farmers. The results will be sustainable because of the economic gains the farmers are seeing and the adaptability of practices and technologies to the intervention areas.

Conclusion 2. The interventions served as a good pilot for the institutionalization of postharvest management in Ethiopia's agricultural extension system. As a result, postharvest management features heavily in the country's horticultural development strategy. Institutional reform in the agricultural sector to raise the status of the horticulture sub-sector is the best illustration of project sustainability. However, scaling up and expanding these technologies and practices will require greater effort and support, as the sub-sector is young and lacks capacity. The efforts under way in this regard should be supported, in particular, by the mainstreaming of postharvest management in the extension system, the development of guidelines and the provision of capacity-building training on a wider scale. A concerted effort by stakeholders, including the Ministry of Agriculture, the regional bureaux of agriculture and other agencies, is required. Extension efforts should also cover other value-chain actors, such as brokers, who have been found to resist the use of new equipment, such as tomato crates.

Conclusion 3. The pilot interventions on processing and value addition for vegetables and fruits were not sufficiently advanced to demonstrate impact and sustainability. The planned processing centres are not completed or operational, with equipment yet to be installed. The young people trained in processing for these centres have been waiting for activities to start. They are unemployed, so desperate to earn a livelihood. Due to the delays, some members of the cooperatives have started to leave in search of work elsewhere. This undermines sustainability.

Conclusion 4. It was assumed that fruit and vegetable producers would benefit from supplying their produce to the processing centres. However, the centres have not been completed and not all types of horticultural produce can be processed by them. This suggests that problems with vegetable marketing will persist. While 12 marketing cooperatives were registered to receive support from the project, the only marketing activities observed were in the mango and banana cooperatives. Marketing has been a major challenge for horticultural produce. The requirements of marketing cooperatives differ from those of the processing cooperatives, so tailored intervention is needed. A shortage of working capital, inappropriate transport facilities, a lack of proper storage, a dearth of management skills and market linkages are all key areas that need to be addressed.

Conclusion 5. The project's training approach was effective and covered a large number of beneficiaries and stakeholders in the extension sector. However, the effectiveness of capacity development for cooperatives will depend on the profitability of the processing businesses. No feasibility study was conducted for the cooperatives' processing businesses, which should have been done before procuring the processing equipment.

Conclusion 6. The planning and implementation of this project did not address social gender imbalances, merely focusing on the inclusion of beneficiaries based on gender and age. There was no gender analysis to identify the gender gaps, inequities of access or control of resources or income, to identify interventions that could lessen gender inequality. The capacity-development component did not consider the importance of promoting women's economic empowerment, decision-making, confidence and self-

esteem or leadership capacity, for example. This could also be attributed to a lack of gender-dedicated personnel within FAO Ethiopia. Due to this lack of gender analysis, however, the project was unable to include gender-responsive indicators and gender-specific activities that could alter the gender power balance and promote gender leadership. The producers' cooperatives, for instance, were male dominated due to a lack of effort to include women members.

A gap in addressing gender issues by FAO Ethiopia was also emphasised in the Evaluation of FAO's country programme in Ethiopia (FAO, 2020). The Evaluation recommended that the Country Office define a strategy on how to mainstream gender within its projects and programmes to bring about greater change in the lives of men, women, girls and boys. It suggested that the Office build on the recommendations of FAO's country gender assessment for Ethiopia (FAO, 2019) to better institutionalize gender in the country programme and the Office itself.

Conclusion 7. The findings of this assessment revealed that the overall outcome and end goal of the project were only partially achieved, as the cooperatives organized for processing fruits and vegetables were not functional. The completion of the processing centres was delayed, partly due to prolonged administrative processes for acquiring land, but also (and crucially) due to the long approval process for budgetary revisions. Moreover, the limitations of certain implementation arrangements affected project efficiency, for example:

- i. Overestimating government capacity to implement the project. The third and final payment in the letter of agreement stated that 20 percent of the budget would be refunded to the implementer after the project activities had been completed. However, the *woreda* partners found this challenge because of their resource limitations. This means the arrangement is likely to exclude partners with low financing capacity.
- ii. Including administrative zones in project implementation arrangements added extra administrative steps without adding value in terms of project results.
- iii. Long procurement procedures also contributed to delays in the implementation process.

4.2 Recommendations

The evaluation team makes the following recommendations based on the above conclusions.

Recommendation 1. FAO should work to ensure that technologies and practices are scaled up. It should also support key actions, such as the mainstreaming of postharvest management in Ethiopia's extension system, the development of postharvest handling guidelines and the provision of capacity-building training on a broader scale.

Recommendation 2. To ensure that the processing units become operational, FAO should ensure that the following activities are accomplished as soon as possible:

- i. When completing construction work on the processing units, it is important to pay attention to the type of processing involved and to put appropriate facilities in place for liquid and solid-waste management, in line with the environmental protection policy. If certification of the processed product is desired, environmental safety becomes a key criterion. The administration has not yet secured land for the processing centre in Bahir Dar Zuria. Critical decisions must be taken by the administration, as the machinery for the centre is still in storage.
- ii. Securing and installing water and electricity supplies may take longer. Involving the relevant authorities in the finishing process may help to speed things up.
- iii. To ensure efficiency and meet required standards, the installation of water and electricity supplies and waste-disposal systems should be aligned with the installation of the machinery and equipment.
- iv. Once all the above are achieved, refresher training will need to be organized for the cooperatives on processing and business management (finance, human resources, inventory

management and marketing). It is also vital to secure the operational capital needed to run the business.

- v. Capacity-development activities will need to be organized for those agencies supporting the processing cooperatives.

Recommendation 3. FAO Ethiopia should provide support for conducting proper business studies for the processing cooperatives on the feasibility of intended businesses, to determine the type of product processed, the market for the product, marketing strategy, pricing policy, raw-material supply (by day, week, month and year), source of raw materials, procurement policy, inventory management, etc. It should also conduct cash flow analyses to compare the cash income of business operations, as well as the cash required to procure materials for processing, salaries, wages and utilities and to service outstanding debts.

Recommendation 4. FAO Ethiopia should work hard to support the marketing cooperatives, also by developing capacity and management skills, providing appropriate storage and transport facilities and promoting market linkages.

Recommendation 5. In future projects, FAO Ethiopia should conduct a gender analysis to set gender objectives and strategies, identify needs, plan activities and develop gender-sensitive indicators to monitor results. As recommended by the Evaluation of FAO's country programme in Ethiopia, gender capacity in the Country Office should be strengthened to ensure that gender is properly mainstreamed in future activities. Gender awareness training should be provided to FAO personnel, as well as to key implementing partners.

Recommendation 6. Implementing these recommendations will require the consolidation of project results to date. FAO should mobilize resources for a second phase of the project, focusing on the *woredas* of the first phase and scaling up results to add further *woredas* where the production potential is higher (for example, mango production in the western part of the country, in west Oromia and Benishangul-Gumuz). The second phase is needed not only to consolidate activities in the current project *woredas* and enable the implementation of the evaluation recommendations, but also to allow the replication of successful project activities elsewhere.

Recommendation 7. FAO should review the letter of agreement with regard to the final payment schedule, which states that 20 percent of the budget will be refunded after project activities are accomplished, so as to adopt a more flexible and inclusive arrangement that considers the financing capacity of partners. Attempts should also be made to improve the procurement process and financial flows, including speedy approval of budgetary revisions.

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Appendix 1. People interviewed

List of key informants

Last name	First name	Organization	Position
Abay	Teshager	FAO Ethiopia Office	Project manager
Abebaw	Kidist	Sinan woreda	Vegetable crop expert and project focal point
Alemu	Shumye	FAO Amhara field office	Amhara field-office coordinator
Asaminew	Dereje	FAO Hawassa field office	Field-office coordinator
Beyene	Mamo	Oromia regional Bureau of Agriculture	Director of the Crop Development Directorate and alternate focal point
Beyera	Desta	FAO Oromia field office	Field-office coordinator
Desalegn	Abebech	SNNPR Bureau of Agriculture	Horticultural expert and project focal point
Emana	Firomsa	Arsi Negele woreda Office of Agriculture	Development agent
Emiru	Lakachew	Amhara regional Bureau of Agriculture	Horticulture crop expert and project focal point
Gossaye	Chali	Dugda woreda Office of Agriculture	Focal point and now Deputy Head of the Dugda woreda Office of Agriculture
Haji	Kemal	Dugda woreda Office of Agriculture	Horticultural team leader and project focal point
Jateno	Workicho	FAO Ethiopia Office	Assistant representative
Mohammed	Ali	Ethiopian Postharvest Management Society	President
Mulat	Yitateku	Bahir Dar Zuria woreda	Development agent
Negash	Abdela	Ministry of Agriculture of Ethiopia	Director of the Horticultural Technology Transfer Directorate, alternate project focal point
Nikus	Olani	FAO Oromia field office	Oromia field-office agronomist
Shiferaw	Meseret	Ministry of Agriculture of Ethiopia	Root & tuber crops team leader and project focal point
Temam	Ahmad	Arsi Negele woreda Office of Agriculture	Focal point
Tesfaye	Mekonen	Arba Minch Zuria woreda Office of Agriculture	Postharvest expert and project focal point
Teshome	Firew	Arba Minch Zuria woreda Office of Agriculture	Development agent
Tiruneh	Yibeltal	FAO Ethiopia Office	Crop team leader
Yenewa	Alene	Bahir Dar Zuria woreda	Horticulture team leader and project focal point

List of beneficiaries contacted for data collection

Region	Woreda	Gender	Value chain
Amhara	Bahir Dar Zuria	Male	Mango
		Female	Mango
		Female	Mango
		Male	Mango
		Male	Mango
	Sinan	Male	Potato
		Female	Potato
SNNPR	Arba Minch Zuria	Male	Banana
		Male	Banana
		Female	Banana
		Female	Banana
Oromia	Dugda	Male	Tomato
		Male	Tomato
		Male	Tomato
		Female	Tomato
		Female	Tomato
Oromia	Arsi Negele	Female	Potato
		Female	Potato
		Female	Potato
		Male	Potato

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