

Thematic Evaluation Series

**Evaluation of FAO's contributions to
Sustainable Development Goal 2 - "End
hunger, achieve food security and improved
nutrition and promote sustainable
agriculture"**

Support to value chain development

Abstract

This review forms part of the overarching evaluation of the Food and Agriculture Organization (FAO) contribution to Sustainable Development Goal 2 (SDG 2), as requested by the FAO Programme Committee at its 125th session. Although FAO's support for value-chain development is wide ranging, the focus of the review is on FAO's experience of roots and tubers value-chain development in Africa from 2015 to 2019, in particular, the development of the cassava value chain in Malawi.

The study found that FAO's value-chain development work is most successful when it takes into account and addresses the vast range of complex issues involved in value-chain development, some of which are non-technical. For example, peoples' perception, attitudes and behaviors about food derivatives and new product development may need to be factored in when scaling up pilot interventions to ensure their success. Additionally, many of FAO's value-chain development actions have been successful, but challenges remain with regard to the transformative upscaling necessary to ensure that rural smallholders can sustainably and equitably participate in the dynamics of the transition from subsistence to commercial agriculture. Among others, the study recommends that FAO consult with as many local actors as possible prior to designing, developing and implementing its value-chain initiatives to gain a comprehensive overview of issues and context.

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Abbreviations and acronyms

ACP	African, Caribbean and Pacific group of states
ASEAN	Association of Southeast Asian Nations
CAVA	Cassava Adding Value in Africa
FAO	Food and Agriculture Organization of the United Nations
GHG	Greenhouse gas
GIZ	Gesellschaft für Internationale Zusammenarbeit
NENA	Near East and North Africa
NGO	Non-governmental organization
OED	Office of Evaluation (FAO)
SDG	Sustainable Development Goal
SIDS	Small island developing states

1. Introduction

1.1 Purpose

1. This review forms part of the overarching evaluation of the Food and Agriculture Organization of the United Nations (FAO) contribution to Sustainable Development Goal 2 (SDG 2), as requested by the FAO Programme Committee at its 125th session. Part of the evaluation process involves reviewing typical FAO products and services. This report reviews FAO's support for value-chain development with a view to:
 - i. identifying and documenting good practices that have the potential to advance FAO's work in support of SDG 2 and may warrant upscaling;
 - ii. identifying areas for improvement and potential gaps that need to be filled in terms of supporting value-chain development;
 - iii. assessing the extent to which FAO, through on value-chain development, is collaborating with partners in support of SDG 2 and finding opportunities to strengthen FAO's partnerships; and
 - iv. understanding FAO's positioning and its comparative strengths and weaknesses with regard to SDG 2 at country and regional level.

1.2 Scope

2. FAO's support for value-chain development is wide ranging, as this review will discuss. However, for the purposes of this study, and due to constraints on interviews arising from measures to curtail the COVID-19 pandemic, the focus is on FAO's experience of roots and tubers value-chain development in Africa from 2015 to 2019 (FAO, n.d.), in particular, the development of the cassava value chain in Malawi.

1.3 Methodology

3. The evaluation methodology combined interviews with FAO personnel and third-party stakeholders (mostly by phone, Skype or Zoom due to COVID-19 restrictions), document reviews and desk or internet research into FAO activities, projects, programmes, products and services delivered during the review period. Attendance at live webinars and a review of recorded podcasts yielded additional information on recent developments and issues, mainly from FAO, other United Nations agencies and national government and agency personnel.
4. FAO-sponsored YouTube videos were viewed to gain information on and insights into remote site locations and the first-hand (translated) perspectives of some of the end beneficiaries and community members, who would otherwise be difficult to reach. The bibliography lists the documents consulted during the review process, while a list of interviewees can be found in Appendix 1.
5. The evaluation team undertook a 360-degree analysis by getting contributions from diverse stakeholders and partners involved in project design, development and implementation. Although FAO's primary clients are the governments of its Members – typically ministries of agriculture – the evaluation team felt it was important to solicit the views and insights of other stakeholders wherever possible – for example, value-chain participants, state actors, non-state actors and end beneficiaries. These third parties are instrumental to FAO's scaled-up, holistic and integrated One United Nations approach to national development.

2. Background

2.1 History of FAO's support for value-chain development

6. Support for value-chain development is a broad area and an important aspect of FAO's service and product offering, as it potentially contributes to several SDG 2 goals and targets:
 - i. SDG target 2.3 – to double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers;
 - ii. SDG target 2.4 – to ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production and help maintain ecosystems; and
 - iii. SDG target 2.a – to increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology, etc.
7. There are several areas of focus within value-chain development, spanning numerous technical and non-technical support services. FAO's key services seek primarily to provide:
 - i. access to markets and trade development;
 - ii. digital agriculture and innovation;
 - iii. financial services for value-chain development;
 - iv. agribusiness development;
 - v. climate-smart food systems;
 - vi. reduction of food waste and losses;
 - vii. development of efficient, effective and inclusive value chains;
 - viii. off-grid power supply systems and agricultural mechanization;
 - ix. capacity building for producer organizations; and
 - x. risk management for value-chain crises.
8. These products and services can simultaneously help to attain other SDGs, for example, by:
 - i. reducing inequalities and the marginalization of rural communities (SDG 10);
 - ii. attracting investment to the agricultural and food sectors, upstream and downstream (SDG 9);
 - iii. facilitating increased incomes to all players in the rural economy, providing decent work and economic growth (SDG 8);
 - iv. contributing to the sustainable management of natural resources (SDG 12); and
 - v. decreasing resource and environmental pressures and greenhouse gas (GHG) emissions (SDGs 6, 12, 13 and 15).

Appendix 2 illustrates some specific examples of the principal components of FAO's value-chain development work, categorized by 2030 Agenda focus area (columns) and type of FAO offering (rows). It is a rough-and-ready practical conceptual framework, in which select FAO value-chain interventions have

been placed according to their main areas of focus, along with the associated timelines to provide a snapshot of the history of these FAO actions.

2.2 Evolution of FAO's work on value-chain development

9. The evolving focus of FAO's value-chain development work has been influenced by global trends and Member priorities that affect agricultural and food production. These include drivers such as climate change, technological developments, urbanization, trading trends and opportunities.
10. The focus of FAO's support has basically moved from increasing staple crop production and international trade in "cash crops" to viewing the situation from an integrated perspective involving inputs, production, processing, distribution, marketing, sales and trade. This food-systems approach operates within the value-chain construct of converting raw agricultural produce and crops into food products ready for human consumption. A more holistic paradigm is also being incorporated – the social, economic and environmental aspects of food production and consumption in local contexts, especially those of developing countries.
11. FAO's work on value-chain development is critical because it brings the technical know-how and expertise to mend the "broken link" in the value chain between agriculture production (principally low value and rural based) and food provision and consumption (mainly urban and of higher value). The transformation of agricultural produce into food is what enables largely rural, subsistence-farming, poor communities to engage with commercial markets in growing urban populations and, thus, participate in wealth creation, albeit on disadvantageous terms. The interregional trade of locally grown crops and food derivatives will also be greatly enhanced, creating tremendous opportunities for acting at scale across the Africa Continental Free Trade Market.
12. The evolution of FAO's value-chain work has created a repository of services related to food systems that can make a direct contribution to the attainment of SDG target 2.3 – to double income and productivity – in a multi-pronged approach, including:
 - i. increasing the prices earned by the farmers (farm gate prices);
 - ii. reducing the number of actors in the supply chain – more direct selling by growers to end consumers;
 - iii. increasing and differentiating the use of farm produce – quality and marketing;
 - iv. farmers adding value to raw produce (through cooperatives, for example) by processing into intermediate or final food products in the rural setting;
 - v. reducing production costs through input efficiencies, the better use of information and so on; and
 - vi. greater productivity by reducing crop losses and food waste along the value chain.
13. In recent years, FAO's focus has moved from the traditional global cereal crops (maize, wheat, rice and soybean) to include other healthy food crops (fruits and vegetables) and the local, "indigenous" crops that are the dietary mainstay of people living in developing, tropical countries. These include roots and tubers, such as potatoes, cassava, yams and sweet potatoes, which hold great promise with regard to regional trade in Africa and Asia, as well as globally.
14. This document encapsulates the changing trend, reviewing the market-access developments for roots and tubers in Africa (specifically, cassava in Malawi). FAO's value-chain development work tackles constraints on smallholder value-chain access by facilitating cassava raw crop conversion

into intermediate products (such as cassava wet cakes and high-quality cassava flour) and final products (baked goods). The details of this particular case study are summarized in the Box in Section 2.3.

15. The cassava initiative included the acquisition of conversion equipment, knowledge dissemination and technical training, access to finance from local institutions, the establishment of linkages between value-chain players, and the establishment and capacity building of institutions, such as farmers' cooperatives, processors' associations and the Root and Tuber Crops Development Trust.
16. FAO's most recent focus (2020) in this area includes the conceptual framework for a functioning Smart Village (the Niger pilot, for instance), which utilizes mobile telecommunications, satellite-based services, artificial intelligence and other technologies to implement digital agricultural solutions. FAO is working together with the International Telecommunications Union in this newly emerging area, as well as with other United Nations organizations, such as the World Health Organization and the United Nations Educational, Scientific and Cultural Organization.
17. The transformation of the value chain is a multi-faceted challenge and FAO's work in this regard will continue to evolve. The Smart Village initiative should integrate well and act as a building block in upscaling of FAO's Hand-in-Hand Initiative.

2.3 Different forms of implementation

18. FAO's support for value-chain development has taken many forms:
 - i. policy formulation and implementation;
 - ii. climate-smart agriculture;
 - iii. value addition;
 - iv. digital agriculture;
 - v. food systems; and
 - vi. demonstration of new of value-chain operating models.

Access to markets and value-chain development – African roots and tubers project

19. The Africa Continental Free Trade Market presents great opportunities for intraregional trade in many products, such as traditional root and tuber crops, and FAO has an extensive track record in developing such value chains. FAO's experience with cassava growers in Malawi provides insights into how rural smallholders can be assisted with access to local markets and participate in and benefit from the value chain. This particular case involved a large, local, private-sector company and a local banking institution, with mutual benefits.

Case study 1: FAO support for cassava value-chain development in Malawi

FAO's African roots and tubers project, implemented from 2015 to 2019, is a successful example of the Organization's value-chain development work. The multifaceted project sought to increase and intensify sustainable market-led crop production; strengthen farmer cooperatives; improve access to climate change risk-management tools and finance; and develop business models along the value chain in which farmers (and enterprises) played a key role. Throughout the project, FAO, in collaboration with the European Union and the African, Caribbean and Pacific (ACP) group of states, supported the development of the cassava and potato value chains in seven African countries – Benin, Cameroon, Côte d'Ivoire, Ghana, Malawi, Rwanda and Uganda.

In Malawi, where cassava was the targeted crop, the changes between 2013–2014 and 2016–2017 were considerable; cassava output increased to 5.1 million Mt from 4.8 million Mt; area coverage increased 15.7 percent to 232 000 hectares from 200 000 hectares; and productivity increased to 25 Mt from 15 Mt per hectare. The number of cassava farmers increased to 252 000 from 120 000 and the uptake of improved varieties nearly doubled – to 18 000 from fewer than 10 000 farmers. The success of the intervention contributed directly to the achievement of SDGs 2.3 and 2.4 (FAO, 2015a).

FAO's partners and stakeholders in the project included: Germany's Gesellschaft für Internationale Zusammenarbeit (GIZ), Farm Concern International (United Kingdom of Great Britain and Northern Ireland), Irish Aid, the National Cassava Processors Association, Universal Industries, Lilongwe University of Agriculture and Natural Resources, the University of Malawi (Bunder College), the Department of Crops and the Department of Agricultural Research Services (Ministry of Agriculture), the Malawi National Meteorological Agency, the International Institute of Tropical Agriculture, the National Resources Institute (United Kingdom of Great Britain and Northern Ireland) and the World Food Programme. Several local farmer cooperatives were established and supported, including the Dzaone Producer Cooperative, the Mathiya Processing Group Cooperative and the Tiyanjane Processing Cooperative.

Smallholder farmers in the cassava value chain had been marginalized, so the objective was to secure greater access for them to participate in the value chain and evolve from subsistence to agribusinesses. Some of the changes involved grouping them together to create economies of scale as cooperatives, associations or other collectives, then making logistical arrangements to gather their produce and feed it into the value chain. Giving farmers the ability to competitively convert their raw agricultural produce into marketable food derivatives involved new equipment and knowhow, which in turn called for finance to buy the necessary assets.

Despite positive results in terms of creating market linkages and intensifying sustainable production, however, FAO realized that building capacity and facilitating relationships might not be enough to enable farmers to move beyond subsistence farming. It recognized the need to unlock access to credit, savings and insurance, as well as customized climate risk management tools to cope with climate variability affecting production and prices. Access to finance was said to be so challenging that upstream supply-chain players were offering farmers unconventional financial support so they could grow more cassava. It was said that prior to the intervention, local banks were not interested in lending to cassava farmers, but thanks to FAO support for farmers in developing business plans and interacting with banks, finance was secured for small farmers to buy cassava pressing machines for the manufacture of wet cakes.

The development of any value chain is a complex, interdependent and long-term process requiring the timely sequencing of interventions and engagement of diverse stakeholder – growers, cooperatives, middlemen, traders, food processors, wholesalers, retailers, end consumers, financiers, logistics actors, quality assurers, market agents and public-sector agencies. Notably, the FAO initiative built on a prior initiative called CAVA (Cassava Adding Value in Africa), supported by the Bill and Melinda Gates Foundation. The project also established the African Root and Tuber Crops Development Trust to coordinate and sustain the transformation effort. The Trust has served as a good focal point for different parties, including ministry personnel, to meet and continue their value-chain development work since the project ended.

The process of value-chain development in Malawi is ongoing. In 2019, with cassava second only to maize as the country's leading staple crop, the government developed the National Cassava Strategy (2019–2022) with FAO's support. While hard data are not available on FAO's direct contribution to Malawi's SDG goals, interviewees estimated average farmer income to have increased to USD 1.5 from USD 1 per day, on average, over the project lifecycle.

Source: FAO (n.d.).

2.4 Partners involved in implementation

Access to markets and value-chain development – African roots and tubers project

20. During the project lifetime, from 2015 to 2019, there were many partners involved in various capacities, which helped to contribute to its success. As mentioned, in the early days, the project built on previous initiatives. Some of the principal partners in the FAO-led implementation were:
21. International funding agencies:
 - i. Irish Aid (Ireland); and
 - ii. Gesellschaft für Internationale Zusammenarbeit (GIZ) (Germany).
22. Local associations:
 - i. National Cassava Processors Association; and
 - ii. Root and Tuber Crops Development Trust.
23. Grower/processor associations and collectives:
 - iii. Dzaone Producer Cooperative;
 - iv. Mathiya Processing Group Cooperative; and
 - v. Tiyanjane Processing Cooperative.
24. Private sector:
 - i. Universal Industries (Malawi private-sector company);
 - ii. Tehilah Bakery and Value Addition Centre (Malawi private sector company); and
 - iii. Bill and Melinda Gates Foundation (United States of America).
25. Research institutions:
 - i. Lilongwe University of Agriculture and Natural Resources;
 - ii. University of Malawi (Bunder College); and
 - iii. National Resources Institute (United Kingdom of Great Britain and Northern Ireland).
26. Non-governmental organizations (NGOs):
 - i. International Institute of Tropical Agriculture (Nigeria); and
 - ii. Farm Concern International (Kenya).
27. Public sector – central government:
 - i. Malawi Ministry of Agriculture:
 - Department of Crops;
 - Department of Agricultural Research Services; and
 - Seed Services Unit.
 - ii. National Department of Climate Change & Meteorological Services:
 - Malawi National Meteorological Agency.

28. International development agencies:
- i. World Food Programme; and
 - ii. Partnership Agreement between the African, Caribbean and Pacific Group of States and the European Community.

3. Effectiveness and relevance to SDG 2

3.1 Indications of relevant & potential achievements related to SDG 2

29. FAO's support for value-chain development addresses several SDG targets, primarily 2.3, 2.4, 2.a and 2.b. However, it also fundamentally works towards the attainment of SDG target 2.1 and SDG target 2.2:

SDG target 2.1

By 2030, end hunger and ensure access by all people, particularly the poor, and people in vulnerable situations, including infants, to safe, nutritious, and sufficient food all year round.

SDG target 2.2

By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women, and older persons.

30. By way of example, FAO's roots and tubers intervention in Malawi helped rural farmers to increase their cassava production and to convert it into food products. The rural production of root and tuber crops in Africa plays an important role in the food supply and livelihoods of poor communities, providing vital food and nutrition and keeping hunger and malnutrition at bay. Cassava, specifically, is a hardy crop, resilient to the effects of drought and cultivable on marginal lands.
31. The development of value chains in which rural communities can participate will also serve to increase incomes for small-scale producers.

SDG target 2.3

By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment.

32. The project's farmer field school activities provided an integrated package of farming solutions aimed at minimizing losses and improving food quality and safety, resulting in higher productivity and better prices. Furthermore, consumer demand (a "pull factor") for indigenous roots and tubers encouraged the successful expansion of agribusinesses, boosting farmers' income.
33. Selling value-added intermediary products, such as wet cakes, processed from their home-grown cassava, also helped to increase rural farmers' income levels.

SDG target 2.4

By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.

34. The broader use of cassava serves to ensure a degree of resilience in agricultural practices, due to the inherently hardy nature of the crop. FAO's work on value-chain development assisted in broadening the scale and viability of rural community participation in local, sustainable food production systems.

SDG target 2.a

Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries.

35. FAO enabled the upgrade of rural farmers' economic activity by acquiring processing machines to convert the raw produce (cassava roots) to semi-finished products (wet cakes) through financing provided by local banks. This agricultural value-chain financing, secured with FAO's assistance, was a breakthrough in piloting value added processing in a rural setting with appropriate technology (FAO, n.d.). Local banks were encouraged to lend money to farmers and processors to buy tangible assets (equipment costing up to USD 5 000), against which their loans will be more recoverable.

3.2 Other specific SDG targets addressed

36. In addition to the SDG 2 targets mentioned, FAO's work to develop value chains also contributes to other important SDG goals – both directly and indirectly:
 - i. reducing inequalities and the marginalization of rural communities (SDG 10);
 - ii. contributing to the sustainable management of natural resources (SDG 12);
 - iii. attracting investment to the agricultural and food sectors – upstream and downstream (SDG 9);
 - iv. decreasing resource and environmental pressures and greenhouse gas (GHG) emissions (SDGs 6, 12 and 13).

SDG target 3.4

By 2030, reduce by one third premature mortality from noncommunicable diseases through prevention and treatment and promote mental health and well-being.

37. The value-chain development process involves the conversion of raw agricultural produce into food for human consumption and, as such, makes a contribution to good health and wellbeing (SDG 3). Currently, a lot of processed food (refined cereals, staple grains, etc.) is imported into developing countries (particularly small island developing states, or SIDS), crowding out local economic activity and displacing the livelihoods of rural farmers supplying produce to the domestic market. These processed foods – and associated lifestyle changes – are contributing to an epidemic of obesity and non-communicable diseases among the most affected Member populations.
38. FAO's work on value-chain development supports the supply, in greater commercial quantities, of home-grown produce and its processing into fresh food derivatives for urban (and rural) populations. This supports the greater likelihood of nutritious and healthy diets and encourages a more sustainable and secure food source for these countries.
39. FAO's intervention in Malawi prompted an increase in the production of raw cassava by smallholder farmers and facilitated its conversion into intermediate and end food products, such as cassava wet cakes and cassava starch/flour. The project also engaged with local private entities (Universal Industries and Tehilah Bakery) to foster the development and marketing of new healthy food products derived from local roots and tubers.

SDG target 10.1

By 2030, progressively achieve and sustain income growth of the bottom 40 percent of the population at a rate higher than the national average.

SDG target 10.2

By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status. FAO facilitates the integration of the rural economy and its stakeholders, such as smallholder farmers, their families and communities, into the commercial ecosystem by fostering of agribusiness models.

40. In the case of the Malawi cassava growers, FAO created a “pull factor” to boost production levels from subsistence levels to surplus amounts, which they could then process into intermediate food items and/or sell on to third-party processors. The inclusion of typically marginalized groups (rural poor, indigenous peoples and smallholder families) in the value chain gives them an opportunity to participate in income growth anchored in their existing rural livelihoods.
41. SDG target 12.3
42. By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.

SDG target 12.a

Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production.

43. The losses and waste of roots and tubers globally is estimated at 25 percent of produce harvested – and cassava is no exception (FAO, 2020k). After reaping a crop, the first value-adding step is typically to extend shelf life by processing, such as drying, cooling, curing, salting, freezing or pickling. Value-chain development is, therefore, fundamental to meeting the goals of SDG target 12.3 specifically and SDG 12 more generally, by reducing waste from spoiled crops in tropical post-harvest environments.
44. In Malawi, the cassava crop was processed into wet cakes in the rural communities by farmers or processing associations established and supported by FAO. The Organization also assisted them with procuring the necessary conversion equipment for these activities. The project brought about a change in working practices, whereby cassava was harvested in the afternoon rather than at the start of the day, as had been done traditionally. This enabled the farmers to complete their processing activities without having to contend with the heat of the midday sun. Although project data were not available, interviewees confirmed fewer crop losses and a rise income.
45. Additional benefits accrued from the coordination of farmers’ harvesting times with processors’ input schedule, introducing “just-in-time” cassava harvesting. This was done by using digital communications technology to help reduce fresh, raw cassava losses and ensure good-quality inputs to (and, therefore, good-quality outputs from) the value-chain process.

SDG target 17.6

Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism.

SDG target 17.9

Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the sustainable development goals, including through North-South, South-South and triangular cooperation.

SDG target 17.16

Enhance the global partnership for sustainable development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology, and financial resources, to support the achievement of the sustainable development goals in all countries, in particular developing countries.

46. FAO's work on value-chain development facilitates the exchange of know-how, information, expertise and networking between tropical countries that grow and process root and tuber crops. Much appreciation was expressed during one stakeholder interview for the opportunity to visit Brazil to witness and learn from the advanced development of food value chains in that country. Indeed, one of FAO's strengths lies in its ability to marshal the experience of value-chain developments globally through South-South and triangular cooperation. This is a practical measure assisting Members in delivering on their SDG 17 goals.
47. The Malawi intervention saw the establishment and enrichment of numerous stakeholder partnerships with organizations including Irish Aid, GIZ, the Bill and Melinda Gates Foundation, Farm Concern International, the National Cassava Processors Association, Universal Industries, Lilongwe University of Agriculture and Natural Resources, the University of Malawi (Bunder College), and the Department of Crops and Department of Agricultural Research Services (Ministry of Agriculture).

3.3 Links to the key principles of the 2030 Agenda

3.3.1 Acting at scale: Influencing the national economy

Access to markets and value-chain development – African roots and tubers project

48. Cassava is second only to maize in its importance as a staple crop in Malawi (and most of Africa), so successful value-chain interventions present an opportunity to significantly influence the national economy. The growth in market demand for cassava across Africa is substantial and the challenge is to ensure that smallholder growers can participate in this growth with appropriate business models and supportive commercial ecosystems.
49. The roots and tubers project – which included a subcomponent on the cassava sector – was a good opportunity for FAO to act at scale. It convened and involved many diverse stakeholders along the entire value chain – private food production companies, research institutions, processor associations, finance institutions and government agencies – in addressing the multidimensional aspects of the required transformation.
50. FAO also engaged with a major local private-sector company – Universal Industries – which purchased the outputs (cassava wet cakes) from the small rural farmers and processors for use in the production of its food products. (This private company had previously experienced logistical challenges in collecting raw cassava to increase its production volumes, while maintaining product quality). FAO successfully initiated the process of engaging marginalized rural farmers into the local cassava value chain, although the further upscaling of these activities is not currently assured.
51. Value-chain development at scale should include:

- i. Ensuring adequate logistics and distribution networks. Among the issues still outstanding is low public perception of cassava-based food derivatives, which restricts its ability to command a higher price compared with other food items, such as maize. New recipe formulations and food-product development, together with educational campaigns to change consumer attitudes and behaviours were a lacking and necessary component of ensuring successful value-chain development actions. This was being addressed towards the end of the project, but takes time to show significant results.
- ii. End-market issues, such as consumer tastes, new recipe formulation and new product development. Interviewees noted that the government could do more to promote the use of cassava and its by-products by legislating to enforce more substitution of cassava flour for imported flour in existing, popular food products, through food import policies such as those adopted in Nigeria.
- iii. Issues such as trade, competition from other food substitutes and addressing concerns of incumbent commercial actors in the food market.

3.3.2 Holistic views and interconnectedness

Access to markets and value-chain development – African roots and tubers project

52. The intervention secured good participation from Malawi's Ministry of Agriculture, particularly from the Department of Crops, Department of Agricultural Research Services and the Seed Services Unit, as well as the National Department of Climate Change and Meteorological Services. However, greater benefit and impact would be had from the involvement of other government ministries in subsequent value-chain development activities.
53. For example, one stakeholder lamented the absence of the Ministries of Trade and Industry, which would have helped catalyse the bigger changes required for the successful value-chain development of the cassava crop. Both ministries are important to attempt to progress the cassava crop from subsistence to commercial status, which necessitates the application of standards to processed food derivatives. The optimal route to the incorporation of more cassava into the Malawi food market/value chain is through the partial substitution of imported (wheat) flour with locally made cassava flour in popular food items. This calls for policies and actions on imports (and prospective exports) and import substitution, as well as product quality assurance and standards, and will involve supporting actions from both ministries.
54. Furthermore, the progression of subsistence farmers to commercial farming activity requires actions to inculcate an entrepreneurial ethos and to organize farmers into collectives, such as cooperatives, in addition to business and management training. These actions were partly addressed by the FAO initiative, but will require contributions from other government ministries (such as labour, youth and commerce) with the requisite budgetary responsibilities.
55. The holistic complexity of value-chain development was also in this initiative. The shelf life of the vulnerable, freshly harvested cassava was extended somewhat by farmers processing it into wet cakes, but these are also perishable. Without affordable, local energy sources for wet-cake preservation (chillers or freezers) and a well-coordinated, timely collection and distribution system, the value-chain model will not be scalable. Future initiatives need to factor in these limitations and give wider consideration to viable, alternative processing methods or products – such as cassava flour, paste and animal feed – drawing on the experience of other countries that lead in cassava technology (such as Brazil and Thailand).

3.3.3 Social inclusion to “leave no one behind”: gender and social equity considerations

Access to markets and value-chain development – Africa roots and tuber initiative

56. FAO’s cassava value-chain intervention was specifically designed to benefit poor, rural, smallholder farmers, their families and local communities. It has elements that contribute to the objective of “leaving no one behind”, by enhancing the livelihoods of the rural poor – giving them the ability to earn more income and participate in the wealth creation afforded by converting raw produce to finished food products. FAO’s work in this regard, therefore, disproportionately assists and supports women and indigenous groups, who tend to be more widely represented and disadvantaged in these target communities.

3.4 Factors contributing to successful interventions

Access to markets and value-chain development – Africa roots and tuber initiative

57. Value-chain development is an inherently risky, complex and long-term transformational process that few institutions can successfully deliver. Incumbent actors in existing value chains need to be won over, the capabilities of new actors have to be nurtured, commercial ecosystems and appropriate business models must be developed and the market forces of demand and supply need to be kept in alignment over a significant period of time.

Existing market demand and opportunity

58. There is a growing local market for cassava-derived products, a “pull factor” driving demand for greater production of the source crop and catapulting it into a commercial activity from its original, primarily subsistence operations. As the country transitions, amid local migration, to a more concentrated urban population (who cannot grow their own food, for the most part) there is a need for the remaining rural communities to meet this growing demand from towns and cities. The challenge is how to establish the processing of agriculture produce into appropriate and longer-shelf-life food items and link town and country logistically. These market-based drivers of change ensure that the various stakeholders in the value chain (including private-sector companies) believe in the “joint growth opportunity”, so are willing to work together to ensure the success of FAO’s value-chain development initiatives.

Opportunities arising from market failure

59. As mentioned, Universal Products, the private company, was having challenges sourcing adequate cassava supply in the local market, constraining its growth and profitability. It was, therefore, motivated to become involved in the initiative from the outset, working with FAO and helping smallholder farmers to boost their cassava production, convert raw cassava to semi-processed foods and coordinate output for delivery to Universal’s final-stage food processing plant.
60. Equally, there was an unmet need for farmers to access finance, as they were essentially excluded from the conventional banking system. The situation was so dire that, according to one interviewee, certain actors upstream in the supply/value chain were willing to lend to farmers so that they could grow cassava crops to meet the input needed in downstream manufacturing processes. FAO’s reputation helped to bridge the investment divide between the financially unserved small farmers and uneducated bank loan officers through business-planning training.
61. The FAO intervention was successful, therefore, as it credibly met the interconnected needs of diverse players in the value chain – private-sector processors, unbanked farmers and uninformed local financial institutions.

FAO's convening and facilitating powers

62. Much has been written about FAO's role as an honest broker, but it should not to be understated as a key factor in the success of the Organization's work on value-chain development, which is extremely challenging to execute due to the complexity and magnitude of the transformation required across several domains of expertise.
63. FAO was able to almost seamlessly step in and build on prior and ongoing initiatives in Malawi. It managed to engage a large and broad cross section of diverse local and international players involved in value-chain development – at least 20 organizations (see the full list in Section 2.4). They represented the entire spectrum of value-chain participants: buyers, sellers, producers, processors, wholesalers, retailers, government officials, private-sector actors and financial institutions. Their interests, viewpoints and considerations were given a shared platform through FAO's intervention, which helped to ensure success.

Demonstrating real change in the field

64. The action facilitated the procurement of tangible physical assets – preliminary processing equipment for small rural farmers – to make intermediate food products (wet cakes) from harvested raw cassava. This was more than just a project involving technical expertise, training, knowledge-sharing and capacity-building actions, therefore, as useful as these are.
65. The purchased equipment allowed participants to process produce on a demonstration scale to show the possibilities of successful transformation. Farmer or new small and medium-sized enterprise processing to make wet cakes was a new, value-added process in the rural setting. It spawned new rural economic activity and encouraged more farmers to join cooperatives to participate in the value chain.

4. How FAO's value-chain development work affects its positioning

66. Overall, FAO's support for value-chain development is fundamental to the Organization's positioning globally, as it creates the essential link between agricultural production and food consumption in a way that no other international organization can, especially with regard to rural smallholders and fisherfolk in developing countries.
67. Value-chain development and associated food systems are fundamental to achieving several SDG targets: reducing food loss and waste (SDG target 12.3); developing capacity for sustainable consumption and production (SDG target 12.a); increasing farmer productivity and rural incomes (SDG target 2.3); integrating disadvantaged marginal communities into the economy (SDG target 10.1 and SDG target 10.2); and ensuring sustainable food production systems adapted to the effects of climate change (SDG target 2.4).

FAO as initiator, convenor and facilitator

68. The development of value chains is an important offering in FAO's portfolio, as an initiator of paradigm or radical change in the development process. Typically, such actions are stymied by market failure, with a Catch-22 scenario ensuring a market is not developed because there is no (surplus) product and no (surplus) product being produced because there is no market (demand). To develop the value chain involves synchronizing supply and demand, as the oversupply of fresh produce will result in a glut and a market price crash, while undersupply can shift demand to substitutes. Breaking this logjam requires an initiator who can convene and steer the diverse parties and pilot demonstrations to effect change in a managed way.
69. Equally, to ensure the greater participation and equitable treatment of excluded, marginalized groups (such as smallholder farmers) in existing value-chain dynamics requires the facilitation of a trusted, neutral, third party.
70. In both cases, FAO is the global candidate uniquely positioned to achieve these goals.

Re-engineering value chains

71. Value-chain development is a core area of FAO's strategic positioning, creating the principal link between agriculture and food, which for too long have been seen and treated as different domains. Historically, rural smallholder farmers have been largely excluded from the downstream food processing, value-adding domain, which tends to occur in urban settings and account for a greater share of income potential and wealth creation.
72. Through its value-chain development work, FAO is facilitating a much-needed transformation of the agriculture–food value chain, enabling farmers and their families to participate in and profit from a more holistic value-chain model, to the benefit of the rural economy and community development.
73. In the case of the roots and tubers (cassava) intervention in Malawi, farmers were assisted in processing their cassava harvest into wet cakes and flour for sale to a larger (urban) processor, which then turned the produce into food items, which it then sold to the market.

Bridging the void – smallholder access to finance

74. As primary intermediary, FAO helped farmers successfully apply for conventional bank finance to procure equipment. This required a deepening of understanding between the two parties. Banks are risk averse, so lending to agriculture, a highly risky endeavour, goes against the grain; they would rather lend to consumers to buy tangible, recoverable assets, such as cars, than to farmers against vulnerable, perishable crops exposed to the vagaries of climate change and unpredictable weather. The banks however were encouraged by an FAO initiative to lend to rural farmers (for the first time) against the wet cake making equipment (a tangible and recoverable asset) on reasonable terms. The banks helped farmers develop business plans and provided entrepreneurial specialists to guide them through the process. FAO's educational and brokering role is, therefore, crucial to scaling up rural production levels.

South–South and triangular cooperation – opening doors and minds

75. FAO also facilitates value-chain transformation, bringing knowledge, know-how and experience from around the world to innovate or catalyse changes needed in local agricultural and food sectors.
76. One Malawian stakeholder interviewed underscored the significant benefits of a visit to Brazil to see the products and processes in the country's advanced, commercialized cassava sector. This gave them a vision of the possibilities and future of cassava in Malawi. Equally, Thailand has much to share with other countries when it comes to cassava (tapioca) value-chain development, as probably the most advanced developing country in these sectors.
77. FAO is a recognized facilitator of South–South cooperation – matching country demand and supply, securing resources for delivery, ensuring the quality of the exchange and raising the visibility of results (FAO, 2015b). There is a well-defined process through an established South–South Cooperation Gateway framework, with access to trust funds for the financing of approved actions. FAO could capitalize on this role by positioning its support for value-chain development accordingly and serving as a South–South and triangular cooperation coordinator.

5. Lessons, challenges and limitations

5.1 Potential challenges and ideas for upscaling, replicating and adapting at scale

78. The four-year value-chain development project in Malawi successfully piloted many dimensions of value-chain development, including:
- i. organizing rural farmers into cooperatives to pool their outputs and create economies of scale;
 - ii. improving crop yields by introducing new plant varieties;
 - iii. facilitating farmers' access to finance to acquire processing machinery;
 - iv. teaching farmers to add value by converting raw, harvested cassava into intermediary goods;
 - v. establishing links in the value chain between farmers, preliminary processors and end food processors – specifically, a private-sector company, Universal Industries; and
 - vi. building the capacity of local associations to foster value-chain collaborations.
79. The multi-faceted aspect of value-chain development is captured in this project: agricultural production, food processing, logistics, financing, marketing, selling, product development and quality control. The participation of a large, local, private food manufacturing and distribution company – United Industries — provided a ready market for any expanded cassava production by smallholder farmers. However, overdependence on this one private sector entity may result in commercial imbalances once FAO's direct involvement in the initiative ends.
80. The links between this value-chain development project and preceding and ongoing projects — by the Bill and Melinda Gates Foundation and GIZ projects – have proved beneficial to all parties, including smallholder beneficiaries. This collaboration could be used as a model example of FAO working with the Bill and Melinda Gates Foundation and GIZ to replicate value-chain development elsewhere. Each party played to its strengths, with the Bill and Melinda Gates Foundation promoting and supporting entrepreneurial development and a private-sector ethos and the GIZ providing invaluable continuity in the capacity building of the National Cassava Processors Association and related cooperatives.
81. The involvement of a local food technologist, a then employee of Universal Industries, was also a fillip for FAO's project. The food technologist, who operates her own bakery and innovation centre, had a vested interest in the project's success, as her livelihood depended on it. At the time of the project, the technologist also served as vice-chair of the Root and Tuber Crops Development Trust and has since been promoted to chair. The involvement of people with "skin in the game" helps projects to succeed.
82. The Malawi Government should adopt the lessons of the Nigerian Government and implement more robust policy on compulsory substitution levels (cassava flour for imported wheat flour), as this would drive a quicker transition and growth in the local, value-added cassava market.
83. FAO's value-chain development work is most successful when it takes into account and addresses the vast range of complex issues involved in value-chain development, some of which are non-technical. For example, peoples' perception, attitudes and behaviours about food derivatives and

new product development may need to be factored in when scaling up pilot interventions to ensure their success.

84. Lastly, interviewees expressed their appreciation for the exposure they gained to more developed value-chain operations in other countries (such as Brazil), which educated them in the diverse, scaled-up uses of root crops such as cassava (food items, animal feed products, beer production, commercial inputs and so on). These insights highlighted the need for a fuller consideration of farmer business models and the wider commercial ecosystem in conjunction with the more technical aspects of value-chain development for successful transformation at scale.

5.2 Use of innovation and digital technologies

85. The innovations brought about by FAO's work on value-chain development included:
- i. the acquisition and use of raw cassava crop-conversion equipment for small farmers to make intermediate food items;
 - ii. the coordination and synchronization of farmers' and processors' activities with those of private-sector buyers through digital mobile communications to approximate a just-in-time collection system;
 - iii. changes in working hours to start harvesting cassava round 4 p.m. (rather than at 5 a.m.) to reduce crop loss/waste due to high ambient temperatures; and
 - iv. the creation of new cassava product recipes and food formulations to facilitate optimal substitution levels of cassava flour for imported wheat flour in existing products.

5.3 Applicability to address shocks and stresses

86. Certain aspects of FAO's support for value-chain development are a response to climate change, which is disrupting farmers' ability to increase or retain productivity levels. New crop varieties and advanced propagation techniques, such as tissue culture, are being used to respond to changing patterns of rainfall, variations in average temperatures and incidences of pests, for example. As the environment and ecosystems change, there is a need to pre-emptively plant and pro-actively plan a response to new scenarios. In the Malawi cassava project, new quality cassava inputs and seed stock were introduced to increase yields in such contexts.
87. Value-chain development can boost resilience by converting (processing) perishable crops into other formats (dried, salted, chilled, frozen or sugared, for instance) or intermediary derivatives with a longer shelf life. The roots and tubers initiative facilitated the introduction of crop processing equipment to convert the fresh, raw cassava into wet cassava cakes, an intermediary product, prior to further processing into high-quality cassava flour or starch for making baked goods.
88. Cassava is a hardy crop — resilient to drought – and can be grown on marginal quality lands. It is, therefore, an ideal crop to grow in the context of climate change. The challenge is to introduce the appropriate commercial ecosystem (business models and socioeconomic framework) to ensure value addition and a supply chain from field (rural) to fork (urban).
89. FAO's work on food systems is progressing this transformation, bolstering food security and resilience of supply. However, there is a widespread need for off-grid rural power sources to provide cost-effective, reliable, and accessible energy to facilitate further value-chain development (crop storage and processing post-harvest) in rural communities. This would

significantly enhance the shelf life of harvested crops and downstream food derivatives and products, reduce crop losses and food waste, minimize GHG emissions and provide additional resilience and food security.

90. Advancements in modern renewable power generation have made off-grid, rural power systems much more affordable and accessible. Ready-made solutions need to be designed, developed and implemented, accompanied by the necessary financial investments, commercial ecosystems, rural community and farmer business models, as a next logical step in the continued success of the FAO's work to promote value-chain development.

6. Recommendations

91. FAO's support for value-chain development is an important service offering that can make a substantial contribution to Members' achievement of several SDG goals, particularly SDG 2. It has evolved over the years into a comprehensive and holistic toolbox of solutions to increasingly complex and integrated issues.
92. FAO is uniquely placed with regard to value-chain development, as it can provide the know-how and expertise to bridge the value-chain gap between agricultural production (principally low value and rural) and food provision and consumption (mainly urban and of higher value). This transformational process of turning agricultural produce into food is what enables mainly rural, subsistence-based, poor communities to engage with the commercial markets of the growing urban populations and participate in the corresponding wealth creation (value addition).
93. Many of FAO's value-chain development actions have been successful, but challenges remain with regard to the transformative upscaling necessary to ensure that rural smallholders can sustainably and equitably participate in the dynamics of the transition from subsistence to commercial agriculture. These recommendations are based on a rapid review of a large programmatic area and should be taken as suggestions for programme development:

Recommendation 1. FAO should consult with as many local actors as possible prior to designing, developing and implementing its value-chain initiatives to gain a comprehensive overview of issues and context. FAO's project-clearing mechanism should be adapted to incorporate this customization.

Recommendation 2. Ensure appropriate baseline and end-of-project data are agreed, defined and collected, and that they relate to the SDG targets being addressed by a given value-chain development action, so that all stakeholders understand the relationship between the initiative and the goals and become more educated about the SDGs in general.

Recommendation 3. Ensure that a well-resourced and managed sectoral value-chain forum (such as the Root and Tuber Crops Development Trust) is established to facilitate better communication between and the participation of all value-chain stakeholders (existing and new) on a sustainable basis.

Recommendation 4. Strengthen relationships with global private-sector foundations (such as the Bill and Melinda Gates Foundation) and other entities with shared values and a common ethos with a view to engaging in joint actions on value-chain development, to strengthen the commercial viability of smallholders and their collective associations (cooperatives, etc.).

Recommendation 5. As part of its South–South and triangular cooperation role, FAO could establish a specialized value-chain development offering, organized by agricultural/food sector, to facilitate the sharing of knowledge and experience from countries that have already transformed their value chains with Members seeking to develop theirs.

Recommendation 6. Expand FAO's technical value-chain development personnel pool to include people skilled in other areas – such as market dynamics, change management, sectoral transformation, commercial ecosystems and business modelling – so that the team thinks and operates more holistically.

Recommendation 7. Address the missing value-chain link arising from the urban–rural divide in the availability of electricity, technology, information and internet connectivity. Solutions are now viable, with demonstration models providing off-grid access to renewable power supplies. This will hopefully form part of the emerging FAO Smart Village model that is being developed and piloted.

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Appendix 1. People interviewed

Last name	First name	Organization/Division	Position
Kaitano	Vincent	FAO	National project consultant
Kateta	Sekani	GIZ	Malawi Programme Officer
Kelly	Siobhan	FAO	SP4
Liang	Wei	FAO	CIO IT Division
Malapela	Themhani	FAO	Country consultant
Neven	David	FAO	Senior Economist
Pankuku	Jean	Root & Tuber Crops Development Trust	Vice-Chair
Pera	Massimo	FAO	SP4
Rolle	Rosa	FAO	Food loss & waste specialist

Appendix 2. Support for value-chain development – sample FAO initiatives

	ECONOMIC VALUE ADD (Production, Processing, Markets, Trade)	TARGET COMMUNITIES (Smallholders, Youth, Women etc)	ENVIRONMENTAL (Including Climate Change)
POLICY DEVELOPMENT			
Marginalised Peoples	Developing gender-sensitive value chains – A guiding framework. (FAO 2016) Rural youth employment and Agri-food systems in Rwanda (Kenya) - A rapid context analysis (FAO/SIDA 2020)		Climate Risk Management for the roots & tubers sector in Africa (FAO 2020)
General Guidance	The OECD-FAO Guidance for Responsible Agricultural Supply Chains – How it can help to achieve the Sustainable Development Goals (OECD/FAO 2020)		
TECHNICAL SUPPORT			
Capacity Building (Institutional)	Improving the Capacity of Farmers to Market a consistent supply of safe quality food – Samoa (FAO 2019) Strengthening National Capacities of Producer Organisations in the NENA Region - (FAO 2020)		
	Development Support to Commercial Aquaculture in Inhambane Province (Mozambique)		
	TECA – Technologies & Practices for Small Agricultural Producers (E-platform)		
INVESTMENT/FINANCING			
Private Sector / International Funds	Sustainable Agricultural Mechanisation for Africa (SAMA)	Strengthening financial services for roots and tubers value chain development in Africa (Rome, FAO 2020)	
RESEARCH & REPORTS			
Reports and briefings	FAO in the Philippines – Delivering for impact (2019)		
Conference Outputs	Food Loss & Waste Management linked to the Food Loss Analysis Methodology	Building resilience of small-scale fisheries to ensure food security and nutrition in the Pacific	
	Report by the FAO OED of the Synthesis of Past Evaluations in the Near East and North Africa (2020)		
	Report by the FAO OED of the Regional Synthesis of Lessons Learned – Asia & Pacific (2020)		
	OECD-FAO Roundtable on Responsible Agricultural Supply Chains (2019)		
National	Digital Agriculture & Innovations		
	Value Chain Analysis – Sweet Potatoes in Lanao Del Sur, Philippines (internally displaced farmers – conflict zone)		
Regional	Reducing Food Loss and Waste and Developing Value Chains in Egypt & Tunisia (FAO 2019)		
	Development of Effective and Inclusive Food Value Chains in ASEAN Member States		
	Development of efficient and inclusive rice value chains in selected African countries		
	Boosting Agribusiness Development in Northern Belize		

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