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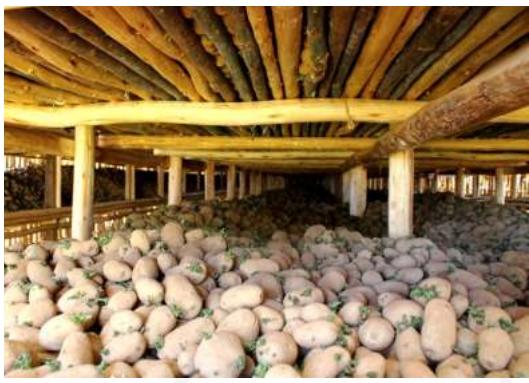
MINISTRY OF AGRICULTURE

The National Potato and Sweetpotato Development Strategy

2024-2030





"Unleashing the potential of potato and sweetpotato for food and nutrition security, job creation, income generation and national economy of Ethiopia"


Federal Democratic Republic of Ethiopia

Ministry of Agriculture

Addis Ababa
Ethiopia

May 2024

" beyond production "

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Foreword

Ethiopian agriculture continues to be the driving force for the country's economy as the main sector by improving food and nutrition security, creating employment opportunities, producing raw materials for agro-industries, and source of foreign currency earnings. Supported with favorable policies and strategies, there has been a steady increase in the production of grain and horticultural crops in the past couple of decades. While grains continue to dominate the Ethiopian food system, efforts are under way to promote the production and utilization of horticultural crops including root and tuber crops. Given the potential of root and tuber crops, Ethiopia should appreciate and strategically promote these crops to achieve food and nutrition security and beyond, through a more diversified and sustainable food system that benefits the producers and the country at large.

Potato and sweetpotato are among the most important root and tuber crops grown and consumed in Ethiopia, contributing to the food and nutrition security of millions of people. The two crops are rich in micronutrients, minerals, and vitamins that boost the immune system, support normal growth and development and thereby reduce micronutrient malnutrition. Orange-fleshed sweetpotato (OFSP) has already been recognized as a low-cost alternative source to combat vitamin A deficiency among vulnerable groups, whereas the purple-fleshed varieties are rich in anthocyanin, which gives them antioxidant and anticancer characteristics.

Potato and sweetpotato outperform major food grains in terms of yield per unit area, time, and input. They also create more on-farm and off-farm jobs than other crops and provide income to farm households and other value chain actors. Recently emerging agro-processing enterprises and food service providers rely on these crops as raw materials. Presently, agro-processing companies use more than 18,000 tons of fresh potato tubers per year to make chips, with a 40% growth per year, adding momentum to the country's import substitution and export promotion program. As industrialization expands and agro-industrial parks are established, the demand for these crops as raw materials is expected to rise steadily. Aside from these, potato and sweetpotato could be used to make snacks, glucose, beverages, adhesives, and other products, creating additional jobs and contributing to the national economic growth.

There is also a perceived need to promote the development of crops that are resilient to the changing climate and shocks. Potato is naturally water efficient, producing more calories per liter of water than most other crops (up to seven times more efficient in water use than cereals), and it is a short-cycled crop that allows crop intensification to meet rising food demands caused by a rapidly growing population. Equally significant, sweetpotato is one of the most prolific and robust crops, performing well in a wide range of climatic conditions and agroecological zones, tolerant to marginal growth conditions, and requiring fewer inputs and labor than other crops such as cereals.

The two crops currently contribute USD 762.2 million (USD 562.5 million for potato and USD 199.7 million for sweetpotato) to the total national income. Nevertheless, these commodities have long been regarded as non-strategic and subsistence crops, with very little public investment in enhancing and promoting the sub-sectors, preventing the country from realizing their full potential.

Despite the favorable ground laid out in the National Horticulture Policy, Horticulture Development Roadmap, and Horticulture Strategy, there is currently no national development strategy to provide clear direction and propel the development of potato and sweetpotato in Ethiopia. The commendable achievements made thus far are the results of the limited and uncoordinated efforts of public, international organizations, and private enterprises. To improve the sub-sector's overall performance, there are numerous opportunities that can be unlocked to maximize the potential of the two crops for improved food and nutrition security, income generation, and job creation.

Given the potential contribution of the two commodities, the Ministry of Agriculture (MoA) has decided that research, development and businesses related to the two crops should be guided by a national strategy for the coming seven years period (2024-2030). The national potato and sweetpotato development strategy (NPSPDS) comprises of eight strategic objectives with well-articulated actions that are targeted to give the desired results. Following a thorough situation analysis, eight strategic issues have been identified and interventions to exploit the potential of the two crops over the next seven years proposed. The eight strategic issues identified that require concerted efforts of stakeholders are i) institutional, legal, and regulatory framework; ii) technology generation and delivery; iii) production and productivity enhancement; iv) postharvest management, processing, value addition, and marketing; v) nutrition and utilization; vi) resource mobilization; vii) cross cutting issues, and viii) coordination and collaboration among value chain actors.

The NPSPDS will give overall guidance for the establishment of a resilient, thriving, commercially oriented, and inclusive potato and sweetpotato industry that contributes considerably to national development. Furthermore, it will enhance the realization of the overall national development goals through the seven years period (2024 – 2030). Through proper coordination and effective collaboration of public, development partners, the private sector, and the general public, I assure you that this well-crafted strategy will take the Ethiopian potato and sweetpotato sub-sector to the next level and significantly contributes to the overall national development.

Meles Mekonen, PhD

State Minister
Agriculture and Horticulture Development Sector

Acknowledgment

The Horticulture Development Department of the Federal Ministry of Agriculture owes its utmost gratitude to several entities that contributed to the development of the National Potato and Sweetpotato Development Strategy. The preparation of this national strategy was financially supported by the National Policies and Strategies Initiative of One CG through the International Potato Center (CIP), Vita, SNV, and Stichting Wageningen Research Ethiopia (SWRE) of Wageningen University & Research (WUR) and the department would like to record its sincere appreciation for CIP, which provided technical support and guidance during the development of the strategy.

Moreover, the department also duly acknowledges the technical committee drawn from the Ministry of Agriculture (MoA), the Ethiopian Institute of Agricultural Research (EIAR), and the Irish Potato Research and Development Association (IPRaDA). Their exceptional technical expertise has been pivotal in shaping this strategy and the preparation of this strategy would have not been possible without their invaluable contribution, active engagement, and perseverance.

Institutions and individuals including farmers' cooperatives, potato and sweetpotato seed multipliers, processing industries, market actors, government bureaus, private input suppliers, non-government organizations, and other stakeholders that generously spared their precious time for consultation meetings and provided useful information needed for the development of this strategy are duly acknowledged.

Once again, I am delighted to express that the strategy, which has been diligently prepared by the involvement of several stakeholders and experts of high caliber will be rolled out to materialize the intended benefits.

Abdella Negash

LEO for Horticulture Development
Ministry of Agriculture

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Abbreviations and Acronyms

APA	African Potato Association
ATI	Agricultural Transformation Institute
CGIAR	Consultative Group for International Agricultural Research
CIP	International Potato Center
COMESA	Common Market for Eastern and Southern Africa
CSA	Central Statistical Agency
EAA	Ethiopian Agricultural Authority
ECC	Ethiopian Customs Commission
EFDA	Ethiopian Food and Drug Authority
EHSS	Ethiopian Horticultural Science Society
EIAR	Ethiopian Institute of Agricultural Research
ESPHM	Ethiopian Society of Post-Harvest Management
ESS	Ethiopian Statistical Service
FAO	Food and Agriculture Organization
FGD	Focus Group Discussions
GDP	Gross Domestic Product
Gos	Government Organizations
HECA	Hope for Ethiopia Consumers Association
HLIs	Higher learning Institutions
ICT	Information Communication Technology
IES	Institute of Ethiopian Standards
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
IPRaDA	Irish Potato Research and Development Association
MEL	Monitoring, Evaluation and Learning
MinT	Ministry of Innovation and Technology
MoA	Ministry of Agriculture
MoE	Ministry of Education
MoLSD	Ministry of Labor and Skill Development
MoTL	Ministry of Transport and Logistics
MoTRI	Ministry of Trade and Regional Integration
NARES	National Agricultural Research and Extension System
NBE	National Bank of Ethiopia
NGO	Non-Governmental Organization
OFSP	Orange-fleshed Sweetpotato
PPP	Public-Private Partnership
RARI	Regional Agricultural Research Institute
RboA	Regional Bureaus of Agriculture
RboE	Regional Bureaus of Education
RDMC	Root Dry Matter Content
RTC	Research and Technology Center
WRI	World Resources Institute

Executive Summary

The National Potato and Sweetpotato Development Strategy (NPSPDS) is a comprehensive plan that aligns the efforts of various stakeholders at both national and regional levels to address challenges and leverage opportunities for holistic development. Prepared by a technical committee with active stakeholder engagement, the strategy has an overall objective of amplifying the contribution of potato and sweetpotato to realize a sustainable, resilient and nutritious food system; job creation; agro-industry development; export promotion, which ensures inclusive and equitable benefit to all value chain actors. It is a timely response to pressing issues such as climate change, rapid population growth, malnutrition, and limited agricultural diversification and intensification practiced in the cereal dominated farming system of the country. The strategy encourages Ethiopia to employ all possible adaptation and mitigation measures to manage these challenges, meet the increasing food and nutrition demand, combat malnutrition, and foster diversified and intensified agricultural practices.

Potato and sweetpotato in Ethiopia offer multiple benefits, directly supporting the food and nutrition security of about 36 million rural population and indirectly, benefits multiple actors including aggregators, transporters, wholesalers, retailers, processors, and consumers. They are rich in energy, minerals, and vitamins. Specialized sweetpotato varieties have been developed for different conditions and nutritional needs, including orange-fleshed sweetpotato for Vitamin A and purple-fleshed ones for antioxidants. These crops contribute USD 762.2 million to the total national income and USD 18.28 million from export earnings. In addition, over 21 million people are directly employed in the production and subsequent value chain activities of the two crops.

These resilient crops adapt to various environments and help to combat challenges from population growth, rapid urbanization, and climate change. They significantly contribute to Ethiopia’s agricultural development pillars: food and nutrition security, income and job creation, export promotion, and import substitution. Potatoes are prominent in Ethiopia’s highlands, while sweetpotato are common in mid- and lowland areas, showing their complementary roles in different agro-ecological areas. Over the decades, both crops have shown significant growth, improving food security and economic stability. Potato cultivation has increased from 30,000 hectares in the mid-1970s to more than half a million hectares in 2022, with productivity having risen from 8 to over 13.3 tons per hectare during the same period. Similarly, the area cultivated with sweetpotato has reached 100,000 ha and the productivity has increased from 8.5 to over 21.3 tons per hectare in 2023, still below their potential. However, the productivity of both crops is far from their attainable yield.

The low productivity is associated with the inadequate supply of quality seed of preferred varieties that are high-yielding, disease-resistant, and suitable for specific purposes,

suboptimal crop management practices, unacceptably huge postharvest losses, poorly structured and functioning markets, and weak structural setup among, other challenges.

Therefore, this strategy intends to overcome these challenges and enhance the role of potatoes and sweetpotato in Ethiopia's sustainable food system, agro-industrialization, and economy at large. To this end, research, development, and regulatory interventions are proposed under the following eight strategic areas: i) strengthening institutional, legal, and regulatory frameworks, ii) technology generation and delivery, iii) enhancing production and productivity, iv) improving postharvest management and market development, v) promoting nutrition and utilization, vi) mobilizing and increasing resources, vii) cross cutting issues, and viii) ensuring coordination and collaboration among value chain actors.

A very well-articulated implementation framework is pivotal to successfully roll out the strategy. The strategy's implementation framework depicts key stakeholders from public, private, non-governmental, and international organizations, with the Ministry of Agriculture playing the coordination role. The strategy emphasizes active stakeholder engagement, adaptive management, and regular updates. An external team will conduct mid-term and final evaluations. Based on the outcomes of the regular monitoring and scheduled evaluation, the strategy is amenable to further fine-tuning and revisions. The seven-year strategy aims to increase incomes of value chain actors, improve food and nutrition security, create jobs, and boost exports, transforming the sub-sector and impacting the broader economy by 2030.

Within the strategy, focus is rendered to increasing potato production from the current 6.0 to 11.2 million tons (by 2030), and that of sweetpotato from the current 2.13 to 4.68 million tons, by increasing the area under cultivation, integrating these crops into existing regular and flagship programs as a means of diversification, and accelerating the adoption of improved technologies and practices to intensify production. It plans to reduce postharvest losses from 42% to 21% with the help of the private sector, development partners, and the government, improving the quantity, quality, and availability of these products in domestic and export markets. In addition, it also envisages increasing the per capita per year consumption of potato from the current 7.7 (FAOSTAT, 2021) to 15.4 kilograms by 2030, and that of sweetpotato from 7 to 14 kilograms during the same period.

Moreover, jobs will be created, particularly for women and youth, across potato and sweetpotato value chains, supporting the livelihoods of about 21.67 million people. The strategy further intends to increase the supply of potatoes to processing industries from the current 18,000 tons to 150,000 tons per annum and meet the potential demand for sweetpotato puree. The strategy also aspires to ensure fair income distribution among value chain actors, increasing income for growers from the current USD 2,332 to 2,932 per hectare for potato and from USD 2,948 to 3,538 per hectare for sweetpotato through improved productivity, reduced post-harvest loss and improved market linkage.

The strategy will help to diversify Ethiopia's exports by increasing potato exports from the current 60,000 tons (ECC, 2022) to 120,000 tons and that of sweetpotato from 327 tons to 4,000 tons by 2030. This could double earnings from potato and sweetpotato to USD 36.2 and 2.0 million, respectively. The contribution of these crops to the total national income could rise to USD 1.68 billion in 2030.

In summary, if the proposed interventions are implemented through coordinated efforts of the value chain actors, the strategy will have far-reaching benefits, encompassing food and nutrition security, economic development, poverty alleviation, agricultural diversification, technology transfer, environmental sustainability, and knowledge development. By focusing on the specific needs and challenges of the sub-sector, Ethiopia can exploit its potential for growth, productivity, and socioeconomic advancement.

1. Introduction

Agriculture and the Ethiopian Economy: Ethiopia's agriculture sector is a cornerstone of the country's economy, employing and feeding millions of people. Ethiopia has developed a national agenda aiming at providing food and nutrition security, creating job opportunities, delivering raw materials to its agro-industries in a sustainable way, and increasing foreign currency earnings through export promotion and/or import substitution.

Capitalizing on its congenial climate, soil, and human resource capital to sustainably produce diverse crops including cereals, legumes, oils, fruits, vegetables, and root and tubers, coffee, tea and spices agriculture will continue to serve as the wheel and axle of the Ethiopian economy. In 2021, it contributed to 32.4% of the national GDP following the service sector (40%) while the rest (28.6%) was from the manufacturing sector (NBE, 2022). It contributes significantly to household incomes, particularly for small-scale farmers. Income generated from agricultural activities helps improve living standards, support education and healthcare, and enhance overall well-being. By diversifying income sources through crop production and commercialization, farmers can reduce their vulnerability to economic shocks and improve their livelihoods. Ethiopia's agricultural products have export potential, generating foreign exchange and bolstering the country's economy. Coffee, oilseeds, flowers, fruits, and vegetables are among the key export commodities. Earnings from agricultural exports contribute to trade balance, promote economic growth, and support investments in infrastructure and social services. According to the NBE (2022), the ten-year average share of agriculture to the total export earnings was 70%.

Agriculture is the largest sector of the Ethiopian economy, employing 64% of the workforce (FAO, 2023). It provides livelihoods for millions of Ethiopians, particularly in rural areas. Being labor intensive by nature, agricultural and horticultural activities create a wide range of employment opportunities, from farm laborers to agribusiness professionals, contributing to poverty reduction and economic stability.

Along their respective value chains, potato and sweetpotato create employment opportunities and generate income for millions of people. From cultivation and harvesting to processing, packaging, and distribution, these crops support a range of economic activities and provide livelihoods for farmers, workers, and entrepreneurs involved in the industry. Beyond their food and nutritional significance, potato and sweetpotato play a significant role in the employment of over seven million households in rural and marginalized areas creating special economic opportunities for women and youth societal groups.

Overview of potato and sweetpotato production in Ethiopia: In an era of frequent and unexpected climate and environmental changes, potato and sweetpotato have emerged as resilient and adaptable to different growing conditions and environmental challenges. The

elasticity of these crops in withstanding shocks and stress is attributable to their water-use efficiency, adapted to marginal production areas, early maturity, and tolerant to soil acidity, a characteristic shared by only a few other crops. Both crops can tolerate a wide range of climatic conditions and grow in diverse agro-ecologies, from cool highlands to mid and lowlands where temperatures are higher. They can even be cultivated successfully in regions with harsh climates and challenging growing conditions. Moreover, these crops have a relatively good tolerance to drought conditions. They can survive and produce reasonable yields even in areas with limited water availability. However, they still require sufficient moisture during critical growth stages for optimal production. Besides, both crops serve as soil and moisture conservation crops due to their ability to establish an early canopy cover. They are also resource-efficient crops that convert natural resources into caloric energy during the growing season. Potato also thrives well in higher cold highland areas, while sweetpotato can be grown in marginal lands with minimal inputs and endure harsh environmental conditions. Certain varieties of sweetpotato, in particular, have been bred for improved drought tolerance.

In terms of edaphic factors, they are adaptable to a wide range of soil types, as long as the soil is well-drained. They can grow in sandy soils, loamy soils, and even poor soils with low fertility. However, they prefer loose, well-aerated loam soils and thrive best in slightly acidic soils. Proper soil management practices, including soil preparation and nutrient management, can further enhance their resilience and productivity. Integration of early maturing varieties of both crops that can be harvested within three months adds to their noticeable role in circumventing the effects of recurrent drought. As a result of these features inherent to these crops, they are often preferred for emergency response programs following major crises such as drought and conflict.

Significance of potato and sweetpotato for food and nutrition security: Potato is the third most widely consumed staple crop globally, after rice and wheat. Likewise, sweetpotato is also an important staple crop, particularly in developing countries including Ethiopia. As staple foods, these two crops provide a reliable and affordable source of nutrition for millions of people worldwide, especially in regions where other crops may not thrive. In terms of caloric and nutrient content, potato and sweetpotato make significant contributions to food and nutrition security in Ethiopia, providing various nutrients and vital micronutrients such as vitamin A, Iron and Zinc. Both crops are rich in carbohydrates, making them an excellent source of calories for energy. Being low in calories, fat-free, and cholesterol-free, they also offer a healthy carbohydrate source that can be incorporated into various meals. Potato provides a good balance of amino acids with high protein bioavailability. Additionally, they are packed with essential nutrients, including dietary fiber, vitamins (such as vitamin C, vitamin B6, and vitamin A), minerals (such as potassium and manganese), as well as antioxidants and anti-cancer properties. These nutrients are vital for maintaining good health and preventing nutrient deficiencies. For example, the consumption of 125 g OFSP root just

can help meet the recommended daily allowance of vitamin A, addressing the issue of vitamin A deficiency, which is prevalent in many low-income countries including Ethiopia. Similarly, the biological availability of the protein in potatoes, though small in amount, is high only next to that of eggs, making potato a good weaning food for the poor.

Potato and sweetpotato are known for their high yields per unit area and time compared to many other crops. They have the potential to produce a significant amount of food per unit area of land, helping to maximize agricultural productivity and feed a growing global population. Their relatively short growing cycle also allows for multiple harvests in a year, further increasing their productivity.

The inclusion of potato and sweetpotato in diets helps diversify food sources and enhance food security. By incorporating these versatile crops into local food systems, communities in Ethiopia can mitigate the risks associated with relying heavily on a few staple crops. This diversification contributes to a more balanced and nutritious diet, reducing the vulnerability to nutrient deficiencies. In a nutshell, potato and sweetpotato are vital for national food and nutrition security due to their nutritional composition, adaptability, productivity, and potential to enhance dietary diversity. By promoting their cultivation and consumption, it is feasible to improve the availability of nutritious food, particularly in regions facing food insecurity and malnutrition challenges.

In alignment with the ***"Lemat Turufat",*** potato and sweetpotato can also be used as feed ingredients in the livestock industry. The by-products and unmarketable roots or tubers that are not suitable for human consumption can be utilized as animal feed, providing a source of energy and nutrients for livestock and poultry. This contributes to the sustainability of the agro-industry sector by minimizing waste and utilizing resources efficiently.

Contribution of potato and sweetpotato to livelihoods: Investing in agro-processing industries can enhance the value of agricultural products, generate employment, and boost exports. There are four integrated agro-industrial processing parks in Ethiopia, and more are planned for the years to come. Potato and sweetpotato are important raw materials for agro-industries due to their versatility, nutritional value, and market demand. The processing of these crops in the agro-industry sector contributes to economic growth, employment generation, and the production of a wide range of food products for consumers. They are used to produce a wide range of value-added products in the agro-industry sector. These include potato chips, french fries, mashed potatoes, dehydrated potato flakes, potato starch, sweetpotato flour, sweetpotato puree, and more. These processed products cater to diverse consumer preferences and provide various food options in the market.

Processing industries are potential sinks to locally produced raw materials to strengthen subsector development. The case in point is the experience of PEPSICO Food and Loli Chips agro-processing industries which are using over 8,000 to 9,000 tons of fresh potato tubers per

annum for the manufacturing of 2,200 tons of chips with an annual increase of 40% (personal communication). This provides an impetus to both the import substitution and export promotion agenda of the country. Chips are already being exported to Somaliland and Djibouti with future expansion to the Middle East. With the expansion of industrialization and the establishment of agro-industrial parks, there is an anticipated steady growth in the demand for these crops as a raw material. The agro-industry sector also relies on potato and sweetpotato as key ingredients in various food processing industries. These crops serve as essential components in the production of snacks, convenience foods, bakery products, baby food, and ready-to-eat meals. The high starch content in potatoes is particularly valuable for food processing applications, as it contributes to texture, binding, and thickening properties in many food products.

The utilization of potato and sweetpotato as raw materials in agro-industries generates economic opportunities along the value chain. The processing and manufacturing of potato and sweetpotato based products create employment in various sectors, including farming, transportation, processing plants, packaging, marketing, and distribution. This supports local economies, stimulates entrepreneurship, and contributes to the overall economic growth of the agro-industry sector.

Potato and sweetpotato are widely traded commodities in the global market. Ethiopia has been exploring the export potential of these commodities in recent years. The country's favorable agro-ecological conditions make it suitable for growing high-quality crops. By expanding export markets for these commodities, Ethiopia can generate foreign exchange earnings, boost agricultural exports, and contribute to its economic growth. The export market for potato and sweetpotato in Ethiopia has been relatively insignificant, but there is untapped potential for considerable growth. The East and Central African regions offer promising export markets that have yet to be fully exploited. Opportunities exist for exporting significant quantities of both raw and processed products of these two crops to various African, Asian, and other countries. Currently, Irish potato has been exported to neighboring countries such as Somalia, Sudan, and Djibouti during 2009-2011. Furthermore, Ethiopia successfully exported its potato to the Middle East countries like Yemen, the United Arab Emirates (UAE), Bahrain, Qatar, and Saudi Arabia in 2011/12, with an export volume of 55,102.73 tons valued at 14.98 million USD (Ali, 2012) which lately increased to 18.0 million USD in 2022 (Ethiopian Custom Commission, 2022). In addition, with growing urbanization demands for fresh and processed products are changing following the dynamics in lifestyle towards fast food. Hence, developing varieties that meet international standards is crucial to exploit existing and emerging markets.

Achievements in potato and sweetpotato research and development: In Ethiopia, research on root and tuber crops has achieved tremendous advances in variety development, seed system development, pest management, crop husbandry, and postharvest management over the last three decades. To date, more than 39 and 29 potato and sweetpotato varieties that

are disease-resistant/tolerant, adaptable, and high-yielding, respectively, have been released (EAA, 2022). Most potato varieties are suitable for medium and highland areas, while sweetpotato varieties are primarily adapted to medium and low altitudes with low rainfall, demanding limited or no external agro-inputs. Additionally, improved crop management practices, seed production technologies, postharvest management technologies, and socio-economic recommendations have been developed and promoted.

Similarly, tremendous results have been obtained through the sweetpotato breeding program in Ethiopia. Over 29 varieties, including six orange-fleshed sweetpotato (OFSPs), have been released and disseminated to farmers. However, the low root dry matter content (RDMC) of the old OFSP varieties had hindered their acceptance by farmers. Hence, a controlled crossing program was started in 2013 to improve the dry matter contents of the OFSP varieties and enhance their acceptance by consumers (Fekadu et al., 2018). Accordingly, two high-yielding varieties with high RDMC (> 30%), high β-carotene content (> 9.5 mg 100 g-1, on a dry weight basis), better resistance to sweetpotato virus disease, and the highest farmers' preferred taste were released and disseminated to over two million farmers in the south, eastern and northern parts of the country (Fekadu and Shiferaw, 2019). A recent study conducted on OFSP technology adoption in the former SNNPR revealed that OFSP adoption rate has reached about 53% among sweetpotato growers (unpublished data).

Implementing good agricultural practices, adopting modern storage, building capacity in handling techniques, market intelligence, linkages for a well-functioning value chain, and promoting appropriate postharvest handling and processing methods should also be considered as areas of future attention. Furthermore, investing in innovation research in value-added products beyond the existing types such as frozen fries, dehydrated potato flakes, OFSP puree and snacks can open up new market opportunities to help increase the profitability of these crops, and contribute to economic development.

Concerted efforts are being made in Ethiopia to enhance the productivity and sustainability of potato and sweetpotato production. Research institutions, government agencies, and development partners are collaborating to develop and disseminate improved technologies. They also promote good agricultural practices, provide training and extension services to farmers, improve access to quality seeds, and strengthen market linkages. These initiatives aim to enhance productivity and profitability, household food and nutrition security, income generation, and ultimately foster economic growth in the country by unlocking the full potential of potato and sweetpotato.

Major bottlenecks and opportunities of the potato and sweetpotato subsector: The Ethiopian potato and sweetpotato industry faces several challenges that can impact its growth and development. The major constraints include, among others, limited access to quality seeds, the prevalence of pests and diseases, lack of postharvest infrastructure, limited knowledge about post-harvest handling and processing, low per-capita consumption, limited

market information and access and underdeveloped value chains, climate change and environmental factors, insufficient investment in research, extension services, and weak stakeholder coordination and collaboration.

Furthermore, the slow diffusion of new technologies, the poor linkage between research and extension systems, and limited access quality (clean for EGS) to seed of the new varieties (high costs and limited availability), as the limited number of sites used for early-generation seed production and the meager quantities produced thereof are hindering rapid variety diffusion and adoption of technologies. Consequently, many farmers in Ethiopia continue to cultivate old potato and sweetpotato varieties. Moreover, some of the varieties have lost their resistance to major diseases and call for further improvement through research.

Therefore, addressing these challenges requires concerted efforts from various stakeholders, including government agencies, research institutions, academia, private sectors, and development partners. Strategies such as improving seed systems, strengthening pest and disease management, investing in post-harvest infrastructure, expanding market linkages, promoting climate-smart agriculture practices, and enhancing research and extension services can help overcome the challenges and foster the growth and competitiveness of the Ethiopian potato and sweetpotato industry.

To further promote the utilization of enhanced potato and sweetpotato technologies in Ethiopia, it is critical to strengthen collaboration and communication among research and extension system actors. Equally crucial is the need to deploy improved propagation techniques, such as tissue culture, aeroponics, stem cuttings, rooted apical cutting, and other mass seed production methods, to increase the availability, cleanliness, and true-to-type multiplication of recommended varieties. An efficient distribution system for high-quality seeds is essential for assuring the availability and accessibility of seeds to farmers in various production setups. An efficient distribution system for high-quality seeds is essential for assuring the availability and accessibility of seeds to farmers in various production setups.

The development and utilization of improved technologies for potato and sweetpotato in Ethiopia have shown promising results, but there is still room for improvement. By addressing the challenges related to rapid and mass production of seeds, availability, and accessibility to farmers across different agro-ecological zones, diffusion of new technologies, and strengthening collaboration between research and extension systems, Ethiopia can enhance the adoption and utilization of improved technologies to contribute to increased agricultural productivity ultimately improved livelihoods for farmers, and enhanced food security in the country.

Therefore, developing and implementing a national potato and sweetpotato development strategy for Ethiopia is essential to address food security, stimulate economic growth, enhance market competitiveness, promote climate resilience, foster research, and innovation, and improve policy coordination. Such a strategy can provide a roadmap for

sustainable and inclusive development of the potato and sweetpotato industry, benefiting farmers, rural communities, urban consumers, traders, processors and the overall economy of the country.

2. Situation Analysis of the Potato and Sweetpotato Sub-Sectors in Ethiopia

2.1 Assessment of strengths, weaknesses, opportunities, and threats (SWOT)

A SWOT analysis was carried out to identify and analyze the internal strengths and weaknesses of the potato and sweetpotato value chains, and the potential opportunities and threats that shape current and future performance of the sub sector. The outcomes of the analysis were used to define the objectives of the strategy and propose the interventions needed to address the key bottlenecks and unlock the potential to achieve the expected outcomes and desired targets set for 2030.

Strengths

Potato and sweetpotato play an important role in food and nutrition security, income generation and job creation for many farm households and other value chain actors. Both commodities have national research coordination units to oversee the design and implementation of research and outreach activities at a national level. Considerable efforts have been made through multiple actors (public institutions, NGOs, and the private sector, International Research Centers) to disseminate improved potato and sweetpotato production and utilization technologies in major growing regions and introduce the technologies to new geographic areas and agro-ecological zones. Strong collaboration maintained with international research centers in the areas of germplasm exchange and capacity building has resulted in the development of close to 60 improved varieties of the two crops in the past three decades. Besides, improved production packages that can increase the productivity of potato and sweetpotato were also developed and promoted among the end users. Potato and sweetpotato research and development projects implemented in the past have attempted to engage women and youth although more effort is needed to enhance their active participation, decision making and benefit sharing from the results of future interventions. Several seed producer's associations (cooperatives for potato and decentralized vine multipliers for sweetpotato) established through research and development projects have served as a source of quality planting materials for potato and sweetpotato growers across the country. Storage structures such as diffused light stores (DLS) constructed by various projects through cost-sharing arrangements with farmers have helped to keep seed potato for at least seven months, a significant proportion of which was sold to ware potato grower farmers across the country. Availability of strong national agricultural biotechnology research center, qualified core research and extension staff, seed multiplication facilities (tissue culture, aeroponics, screen houses, greenhouses, net houses.

Weaknesses

Limited investment and attention given by research and extension services has profoundly hindered the development of the root and tuber crops sub sector in Ethiopia. This is inferred by the limited budget allocation/support by government and donors for research and development of both crops. Government's commitment to improve access to healthy and diversified diets by the poor (as highlighted in the national policies and strategies) have not been fully translated to concrete plans and supported by budget allocation to promote the production and consumption of nutritious crops such as the orange-fleshed sweetpotato. Moreover, there is limited awareness and inadequate extension services to scale up proven potato and sweetpotato technologies. Collaboration, coordination, and linkage among the stakeholders are generally weak, limiting information exchange and market development across the value chain of the two crops. Farmers have limited access to inputs (quality seeds, fertilizers, fungicides, etc.) due to unavailability, untimely supply, high price, and poor quality of the production inputs. Despite the large number of varieties released by research institutions, varietal options that suit different agro-ecologies, production systems, market needs (e.g., processing, micro-nutrient rich, etc.) are still lacking. Innovative, affordable and efficient quality seed multiplication techniques have not been developed and promoted to meet the high demand for quality seeds of all classes. Apart from a few components (e.g., fertilizer), context / location specific agronomic management practices and technologies are either lacking or not widely adopted by farmers. Most farmers also have limited access to inexpensive and labor-saving farm machinery and implements to effectively undertake both production and post-harvest operations. Lack of standard protocols on packaging and transportation, poor post-harvest practices and lack of appropriate technologies often lead to a significant loss in yield and quality of roots and tubers. As most of the production takes place under rainfed conditions (lack of staggered production), limited irrigation facilities, fresh roots and tubers are not available in required quantities to consistently meet the year-round demands for fresh market and processing.

There are limited potato and sweetpotato based food products that appeal to consumers developed and popularized to increase consumption of the two nutritious crops. The market system, both for inputs and outputs, is generally inefficient, underdeveloped and severely manipulated due to the involvement of brokers who often expose farmers to various types of risks, limiting formal business profitability and growth. Information on adoption rates and impact of potato and sweetpotato technologies disseminated to date are scanty to gauge achievements and revisit strategies and approaches of research and outreach interventions. Awareness about and use of national standards for seeds and products of potato and sweetpotato among the value chain actors is generally limited. The statistics on roots and tuber crops farm management practices, production, consumption, post-harvest losses, trade volume, market price, and contribution to job creation are either underreported or incomplete making it difficult to have an accurate inputs supply, marketing and resource

mobilization plan needed to develop the sub sector. There are apparent limitations in the implementation of existing seed laws, policies, strategies, directives, and standards (seed, inputs) for vegetatively propagated crops including potato and sweetpotato. There is limited capacity for potato and sweetpotato seed inspection and certification both at federal and regional levels due to shortage of trained and experienced inspectors, limited laboratory, field facilities and logistics to adequately cover mandated regions and economically important crops. Ware and seed producers have limited access to financial services (credit, insurance) to invest in and expand their businesses. In general, lack of coordinated support services for these crops such as extension, credit, cooperative, ACC support, contract farming, marketing groups, and post-harvest value addition are among the major challenges deserve due attention.

Opportunities

Ethiopia has favorable climate and other enabling conditions needed to expand the production of potato and sweetpotato. There is an increasing demand for domestic consumption, processing and export of fresh and processed products of both crops. There is a growing interest from public institutions and NGOs to invest in potato and sweetpotato value chains due to the increasing contributions of the two crops to food and nutrition security, job creation along the value chain, income and building resilience to climate shocks. The growing interest from private seed growers to invest in quality seed multiplication and supply of the two crops will have a meaningful contribution to alleviating the shortage of quality seed currently faced by ware and seed producers alike. With increasing awareness about the benefits of quality seed, the demand for quality seed of improved varieties of both crops is growing among farmers and institutional buyers. The suitability of potato and sweetpotato for emergency response following natural and manmade crises, for promoting urban agriculture, and for multiple cropping system (inter cropping, double cropping, relay cropping etc.) makes them the right choices for intensified and diversified production systems and recovery efforts to restore livelihoods of affected communities. Existing collaboration among farmers, farmer groups, MoA and research institutions can serve as a foundation to further strengthen potato and sweetpotato seed businesses and commercial-oriented production of the two crops. Favorable agricultural and nutrition policies, strategies and flagship programs (FSRP, Seqota Declaration, etc.), alongside the presence of units at federal MoA and some regional BoA, are of significant importance to provide extension, regulatory, and other services needed to develop the root and tuber crops sub-sector. In addition, the existence of a wealth of experience in both ware and seed production among farmers, emerging agro-processing industries, availability of tissue culture facilities (though limited) to produce high-quality early-generation seeds, proximity to regional and international markets and contribution of potato and sweetpotato to foreign currency earning are also key opportunities that can drive the development of potato and sweetpotato value chains. Existing stakeholders' platforms such as IPRaDA, horticulture and post-harvest management

professional societies have considerable roles to play in linking science, development and business related to the two crops, fostering partnership, and information sharing among the value chain actors.

Threats

Among the threats that may adversely affect the development of potato and sweetpotato industry are expansion of cereal crops in traditionally potato and sweetpotato production belts, and climate change and variability induced drought, floods, and disease and pest epidemics such as bacterial wilt, degenerative viral disease and potato tuber moth that the country has been experiencing in recent years. Moreover, unavailability, high cost and poor quality of agricultural inputs, limited access to land for commercial seed and ware production and conflict could disrupt the production, distribution, and marketing systems of the two crops.

Based on the SWOT analysis, key entry points for the improvement of the sub-sector are identified (See sub-section 4).

2.2 Stakeholder analysis

The success of any strategic plan document depends among others on knowledge of the roles and responsibilities of all actors involved along the value chain and incorporation of the concerns of these stakeholders to issues of focus. For this purpose, a comprehensive and an open-ended questionnaire related to potato and sweetpotato were developed and focus group discussions (FGD) and key informant interview (KII) were made with pertinent stakeholders such as farmers, unions, primary cooperatives, agro-processing industries, NGOs, wholesalers and retailers, super markets, private seed potato producers, agro-chemical suppliers (fertilizer, chemicals etc.) and regional bureaus of agriculture. The summary of the stakeholders' analysis including their roles and responsibilities in the potato and sweetpotato value chains is indicated below in Table 1.

Table 1. List of stakeholders and their respective roles in potato and sweetpotato value chains

Stakeholder	Role and responsibilities
Ministry of Agriculture (MoA) and Regional Bureau of Agriculture (RBoA)	• Overall coordination of the implementation of the strategy, providing agricultural extension services and facilitating the forwarding of improved technologies, information, and knowledge from the research system to farmers. • Facilitate and monitor input supply, credit, training, regulatory policy, advisory services, technology introduction, release and dissemination • Participate in monitoring, evaluation, and learning • Facilitate the establishment, strengthening and operation of multi-Stakeholder Platforms on potato and sweetpotato • Create enabling condition for decentralized seed system in the country.

Stakeholder	Role and responsibilities
	• Promote highland-lowland integration in potato production where the former engages more in seed production and the later in ware potato production. • Facilitate contract farming • Giving guidance in the production to consumption continuum
Producers (small scale and commercial)	• Utilizing improved technologies, information, and knowledge in the production, utilization, and marketing of the crops • Participatory technology evaluation, provision of land and labor during technology testing
Federal and Regional Research Institutions	• Overall coordination and administration of the research system. • Generate technologies, information, and knowledge, and demonstrate and disseminate to farmers through an extension system. • Facilitate training, institutional learning and participate in MEL of the strategy; • Provide technical backstopping at various levels for experts • Provision of disease-free early generation seed. • Engage in testing and verification of new products from potato and sweet potato
Higher Learning Institutions (HLIs)	• Generate and disseminate technologies, information, and knowledge, awareness creation on production, utilization, and other values of the crops for national development. • Produced qualified human power • Engage in testing and verification of new products from potato and sweet potato • Provision of disease-free early generation seed (EGS).
Ethiopian Biodiversity Institute	• Conserve improved and local germplasm of the two crops • Share the germplasm of the two crops with the NARS
Ministry of Health (MoH) Ethiopian Public Health Institute	• Conduct nutritional analysis of potato and sweetpotato especially during and before the release of new varieties, and participate in collaborative research. • Train mothers, women, and other sections of the society on utilization of diversified diets and dissemination of nutrition education
Non-government organizations	• Support in providing facility and funds for extension, development, utilization, and marketing of potato and sweetpotato • Support development activities of the two commodities • Participate in training and extension activities • Promote pro-poor value chain development
International Research Institutes (IRI) and UN Organizations	• Provide funds for collaborative research projects, germplasm and information exchange, technology and knowledge transfer, technical and methodological backstopping, training, and participation in monitoring and evaluation.
Private companies (input suppliers and private seed producers)	• Technology introduction, technology multiplication, input supply, joint research, advisory service, and other services (such as agro-chemicals, machinery/equipment, transport) • New product development from potato and sweetpotato

Stakeholder	Role and responsibilities
Agro-processing and food industries	• Develop and market potato and sweetpotato food products • Purchase raw materials from the producers and support out-growers' schemes • Contribute resources to support research and development in potato and sweetpotato
Ethiopian Cooperatives Commission and Unions/cooperatives	• Link actors of the value chain of potato and sweetpotato crops among themselves and others to promote production, utilization, and marketing • Arrange credit and saving services. • Engage in service provision such as warehouse, mechanization, transportation, etc.
Ministry of Trade and Regional Integration (MoTRi)	• Information on market/export-oriented technologies • Create border market linkages
Ministry of Industry (MoI)	• Information on demand for technologies for agro-processing factories • Create an enabling environment for potato and sweetpotato processing industries
Ministry of Innovation and Technology (MinT)	• Promotion of research technology, development activities, and fund supply • Cultivate innovators in production, processing, marketing & utilization
Ethiopian Agriculture Authority (EAA)	• Ensures the quality and safety of primary agricultural products for both domestic and export consumption. • Engage in the development of relevant laws, policies, and directives on safety and quality. • Keep database of released and recommended technologies and inputs
Ministry of Education (MoE) & Regional BoEs	• Ensures that school feeding programs include P and SP for a healthy and diversified food. • Oversees that education is fair and equitable and addresses local commodities including P&SP in curricula.
Financial Institutions	• Provide credit, saving, and insurance services for technology purchase. • Support marketing of products through financial transaction • Execute their corporate social responsibilities
Traders (Collectors, wholesalers, Retailers)	• Involve in the marketing of products at different stages of the value chain and finally to consumers, and processing industries
Brokers/ Commission Agents	• Assist farmers with access to inputs. • Mobilize farm produce to consolidate at collection center and move to the destination markets (often wholesalers)
Ethiopian Conformity Assessment Enterprise (ECAE)	• Provides testing, certification, or inspection services for products/services

Stakeholder	Role and responsibilities
Institute of Ethiopian Standards (IES)	• Develop Ethiopian standards and establish a system that enables to check whether goods and services are in compliance with the required standard
Ministry of Transport & Logistics (MoTL)	• Ensures the efficient delivery of agricultural inputs and products. • Facilitate access to infrastructure and logistics like road, cold chain, cold track etc.
Ethiopian Statistical Service (ESS)	• Generating, analyzing, and disseminating reliable statistical data timely and appropriately to the users
IPRaDA, APA, EHSS, ESPHM	• Represent potato and sweetpotato producers, processors, and other industry stakeholders and they are critical in lobbying for the sector's interests. • Serve as hubs for knowledge exchange, networking, and collective action on problems such as market development, sustainability, and policy advocacy.
Ethiopian Food and Drug Authority (EFDA)	• To protect and promote public health by ensuring the safety, effectiveness, quality, and proper use of regulated products through licensing, inspection, registration, laboratory testing, post-marketing surveillance, community participation, and provision of up-to-date regulatory information.
Ethiopian Agricultural Transformation Institute (ATI)	• Include potato and sweetpotato in ACC program. • Integrate potato and sweetpotato in wheat and rice irrigated production initiatives. • Provide extension services using their digital platform (e.g., call center)
Integrated Agro-industrial Parks (IAIPs) and Rural Transformation Centers (RTCs)	• The IAIPs are connected with farms and communities through the Rural Transformation Centers (RTC) to source potato and sweetpotato from producers. • RTCs aggregate agricultural produce from producers within 100 Km of the IAIPs
Consumers and Local Communities	• They determine the types of potato and sweetpotato product to be produced, processed, and marketed. Their feedback influences research priorities and adoption of new varieties.

3. Strategic Direction for Potato and Sweetpotato Value Chains

3.1 Rationale for the Strategy

The potato and sweetpotato strategy development in Ethiopia is primarily driven by the need to address major challenges, including but not limited to climate change induced environmental and biotic stresses, rapid population growth and urbanization, widespread malnutrition and related health problems, and limited agricultural diversification and intensification in the cereal dominated farming system of the country. These factors have significant implications for crop production, productivity, and livelihoods in Ethiopia and the

world at large. Through intensifying and integrating potato and sweetpotato into the cereal-based cropping systems, Ethiopia aims to minimize the effects of climate change, meet the growing food demand driven by rapid population growth, combat malnutrition, and ensure sustainability through promoting diversified and intensified agricultural practices.

Climate: Rising temperatures, changing rainfall patterns, and increased frequency of extreme weather events pose significant challenges to crop production worldwide, including Ethiopia. These changes directly impact agricultural productivity, leading to food insecurity and economic losses. Predictions shows suitable areas for production of major cereals like Maize will shrink while suitable areas for the production of root and tuber will increase. The cultivation of resilient root and tuber crops are often considered as best adaptation strategies to the multiple climate change-induced agricultural production challenges often experienced in Ethiopia. Potato and sweetpotato exhibit resilience to climate change conditions, with shorter maturity periods that enable faster harvests and reduced vulnerability to droughts and erratic rainfall. The adaptability of sweetpotato to poor soils and moisture stress further enhances its suitability for marginal growing conditions. Moreover, these crops can serve as security crops during crop failures and bridge food deficit periods due to their shorter maturity period.

Rapid Population Growth and Urbanization: Ethiopia's high population growth rate places immense pressure on land resources and food availability. Ethiopia has been experiencing rapid population growth over the past few decades. According to According to FAOSTAT data, the population of Ethiopia was estimated to be around 120.3 million in 2021 (FAOSTAT, 2024). The country has one of the highest population growth rates in Africa, and it is projected to continue growing in the years to come. The country's population is projected to reach around 215 million by 2050 if the current growth rate persists (Aynalem, 2019). To meet the growing demand for food, growing crops with high yields per unit area offers a sound solution. To this effect, promoting the production of potato and sweetpotato will have an enormous contribution to ensure food security and reduce the reliance on massive food importation. The proportion of urban population in Ethiopia is projected to reach 42.4 million by 2037 (CSA, 2013). This situation leads to the transformation of agri-food systems landscape creating both challenges and opportunities, the challenges being high demand for cheap, energy and nutrient dense food while opportunities include dietary diversification, rising need for pre-prepared or processed and fast foods, and creation of off-farm employment opportunities, especially for women and youth.

Malnutrition: Chronic malnutrition and micronutrient deficiencies, particularly among children and vulnerable populations, have adverse effects on livelihoods and overall well-being of our society. To combat malnutrition, the cultivation and consumption of nutrient-rich crops is often considered as the most affordable and sustainable strategy compared to alternative approaches such as industrial fortification. Potato and sweetpotato are rich in vital nutrients such as vitamin A (SP), iron, and zinc (P), which play a crucial role in addressing

micronutrient deficiencies among children, pregnant and lactating women, and adolescent girls. By promoting these crops, Ethiopia can improve nutritional outcomes, especially among the most vulnerable groups, leading to better health and reduced prevalence of malnutrition.

Diversification and Intensification: Ethiopia's crop production system is predominantly cereal based with very poor rotation practice and crop diversification. Such mono-cropping practices predispose the soil to build up of aggressive pests that may result in serious crop failure. Besides, it also affects soil health and productivity. Incorporation of non-cereal crops as a break will help curb the buildup of aggressive pests of cereal monoculture. Besides, it helps to improve the soil health and diversify agricultural commodities. The cultivation of the two crops is a good option for intensification and diversification reducing reliance on a narrow range of crops under the present irrigated wheat and rice national level initiative.

Overall, potato and sweetpotato are ideal strategic crops for ensuring food and nutrition security in the face of changing climate, rapidly growing population and urbanization with changing life styles. They also offer opportunities for livelihood improvement, income generation and have the potential to generate foreign currency through the export of fresh and processed products. Moreover, potato and sweetpotato are important raw materials for emerging agro-processing industries for the production of flour, puree, starch, ethanol, adhesives, glue, and raw materials for paper, pharmaceutical, confectionary, cosmetics, canned sweetpotato, sweetpotato beer, sweetpotato beverage, etc.

Technological / innovation advancement: The advances and application of new technologies such as gene editing technologies, **cis-genes** in biotechnology and genetic engineering, which enhances the precise modification of genes for the development of varieties resistant to major disease, are emerging scientific advances for genetically difficult to manipulate crops such as potato. Likewise, apical rooted cutting (ARC) is a relatively new seed propagation technique that revolutionized mass multiplication of quality potato seed derived from disease cleaned tissue culture plantlets. The recent move towards the development of hybrid potato varieties also helps to reducing the production cost, seed transportation, spread of seed-borne diseases, and reliance on fungicide usage. By collecting and using data on plant growth, Artificial Intelligence (AI) can help researchers identify/develop best-performing varieties that are tolerant to biotic and abiotic stresses and meet needs of farmers and other market actors. The use of digital tools that can reduce crop loss, increase yields, improve cost effectiveness in production, reduce post-harvest losses, facilitate extension services and market linkage will have tangible roles in improving the contribution of the two crops to food and nutrition security and economic growth. The application or use of these technologies and innovations are expected to enhance potato and sweetpotato technology generation and delivery capacity at reduced costs and time and quality to the satisfaction of the value chain actors.

Therefore, this national potato and sweetpotato strategy is developed with clear objectives, goals, outcomes and impacts that are aligned with the envisioned mission and vision. The

existing situations were analyzed to identify strategic issues and possible interventions, each with key deliverables.

3.2 Strategic approach

The development of this national strategy followed a comprehensive and inclusive process that engaged key stakeholders and encompassed various dimensions of the value chains of both crops.

A thorough situation analysis was carried out to examine the current state of potato and sweetpotato value chains (production, processing, marketing, and consumption) and thereby identify the strengths, weaknesses, opportunities, and threats (SWOT analysis) in the sub sector. Moreover, existing policy and regulatory frameworks were analyzed to identify limitations or gaps that may hinder the development of roots and tuber crops in Ethiopia. The review also considered assessment of current and future trends in demand and supply for the two crops, and other emerging issues that need to be considered when designing the interventions that will be implemented during the proposed seven years period. Stakeholders including government agencies, research institutions, farmers, processors, traders, industry associations, NGOs, and international partners were engaged through consultation meetings, key informant interview and focused group discussions.

The vision, mission and objectives of the national strategy were defined considering the approach taken towards setting and achieving the desired future growth of the subsector. Efforts were made to develop specific, measurable, achievable, relevant, and time-bound (SMART) objectives that align with the vision. The objectives were crafted with a view to transforming the two crops from subsistence production to a more commercial (market oriented) production and increased contribution to the resilience of the national food system. Eight strategic issues have been identified for interventions in the next seven years to enhance the contribution of potato and sweetpotato to food and nutrition security, job creation, import substitution, export promotion, and development of agro-processing industries.

Key stakeholders in the potato and sweetpotato sub-sectors have been identified to foster effective institutional arrangements, collaboration, and coordination for the implementation of the strategy. The roles and responsibilities of each stakeholder have also been elaborated.

A robust monitoring, evaluation and learning system to track the progress and impact of the strategy is designed with appropriate performance indicators and targets to measure the achievement of the objectives and outcomes. The implementation of the strategy will be periodically reviewed, and feedback received from the stakeholders will be considered to make the necessary adjustments.

3.3 Vision

A resilient, vibrant, commercially oriented, and inclusive potato and sweetpotato industry that significantly contributes to the overall livelihood improvement of the society and national development at large.

3.4 Mission

To drive the sustainable development of the potato and sweetpotato sub-sector harnessing the full potential of these crops in improving food security, enhancing nutrition, creating employment opportunity and improving incomes of the value chain actors. Through enhanced investment in agricultural research, extension, capacity building, market development and partnerships, the strategy aims to create a resilient and inclusive potato and sweetpotato value chain that contributes to poverty reduction, environmental sustainability and the overall well-being of the Ethiopian people.

3.5 Objectives of the strategy

The potato and sweetpotato strategy provides an overall direction and context for the interventions to amplify the contribution of the two crops to the realization of a sustainable and resilient food system, agro-industrialization, and national economy which ensures inclusive and equitable benefits to all value chain actors.

Specific objectives:

- Increase the national production of potato by 87% and double that of sweetpotato to meet local demand and the export market through intensifying and diversifying production and promoting the adoption of improved varieties, better agronomic practices, and access to inputs such as seeds, fertilizers, pesticides, farm implements / machineries and irrigation facilities.
- Strengthen the capacity of institutions engaged in research, regulatory and extension services to generate and deliver technologies, ensure the qualities of inputs, enforce and create awareness about the existing laws, regulations, and directives applicable to potato and sweetpotato agri-food systems.
- Reduce the post-harvest loss of potato and sweetpotato by half through wider adoption of improved post-harvest handling practices and technologies along the value chain.
- Promote value addition activities such as processing, preservation, and product development to increase the nutrition qualities, shelf life, options for rural and urban consumers and create additional income-generating opportunities along the potato and sweetpotato value chains.
- Create efficient and innovative marketing and information delivery systems along potato and sweetpotato value chains.
- Create seamless coordination, monitoring, evaluation and learning, and information sharing platforms.

3.6 Scope of the strategy

The seven-year (2024-2030) strategy aligns not only with regional (Malabo Declaration, COMESA, IGAD), and global policies (SDG's), plans, and programs, but also developed considering the unique challenges and opportunities connected to potato and sweetpotato production, utilization, and market development in Ethiopia. It considers the country's overall agricultural development ambitions, as well as the diverse agro-ecological zones, production systems, and the demands and priorities of the value chain actors. The strategy also leverages the value chain concept to build strong and efficient potato and sweetpotato value chains from farm to fork.

The strategy prioritizes increasing production and productivity of potato and sweetpotato through increased access to improved inputs, extension services, credit services, establishing an innovative seed system and up-to-date crop production information delivery digital platforms. The potato and sweetpotato research focus on the development and promotion of adaptive, climate resilient, nutritious, and market preferred varieties with accompanying agronomic practices tailored to local conditions and production systems. Postharvest losses will be reduced through developing, adapting and promoting optimal potato and sweetpotato storage and processing technologies, and value-added products such as chips, flour, and snacks. The strategy also pays attention to establishing structured marketing systems, linkages, market information delivery systems, boosting market-oriented production, and exploring domestic and international market prospects. As an impetus to nutrition and food security, the strategy has streamlined interventions that promote the consumption of these crops as part of broad and diversified diets. Finally, as one of the key drivers of the Ethiopian food system, the strategy is designed to advocate for supportive policies and institutions that create an enabling environment for the development of potato and sweetpotato value chains.

Successful implementation of the strategy is sought through the active involvement of farmers, farmer organizations, government institutions, private sector actors, and civil society organizations in the planning, implementation, and monitoring processes.

3.7 Potential impacts of the strategy

The interventions proposed for implementation in the next seven years are designed to transform the sub-sector from multiple viewpoints. The strengths and opportunities identified from the scenario analysis will be consolidated to further improve the operational efficiencies of implementing institutions. Furthermore, well-thought-out solutions are identified to transform challenges into opportunities. The following are the key impacts that are expected by 2030.

Through cultivating additional land, integration of the two crops in to the cereal-based intensification and diversification regular and flagship programs, introducing clustered and commercialized production approaches, and wider adoption and use of improved technologies, the current total production of 6.0 (potato) and 2.13 (sweetpotato) million tons

will increase to 11.2 and 4.68 million tons for potato and sweetpotato, respectively. The current area under potato (478,670 ha) and sweetpotato (100,009 ha) (CSA, 2022; MoA, unpublished) will respectively increase to 675,000 and 200,018 ha through expanding their cultivation to new areas, production systems and integrating into the cereal-based systems as double and rotation crops. The productivity of the two commodities is expected to increase from the current 13.3 t/ha to 16.6 t/ha for potato and from 21.3 t/ha to 23.4 t/ha for sweetpotato driven by wider adoption and use of improved inputs, and reduced post-harvest losses.

To achieve these targets, a total of 20 new varieties that meet different market needs and purposes (fresh, processed, and biofortified) will be developed and disseminated for wider adoption among subsistence and commercial oriented farmers. Among these new varieties, three, two, and six are processing types (at least one hybrid), bio-fortified and fresh table potato varieties, respectively. The remaining are four orange-fleshed (at least one export type), two purple-fleshed, and three white-fleshed sweetpotato varieties. To boost the production and supply of quality planting materials, the number of private commercial potato and sweetpotato seed multipliers will increase from the current eight (4 potato and 4 sweetpotato) to sixteen by 2030. Some of these private seed multipliers will shift from QDS to multiplying and marketing certified seeds. Furthermore, the number of farmers' seed grower cooperatives (currently about 40) will increase to 110 (80 for potato and 30 for sweetpotato) through providing various supports including training, starter seed, market linkage, and technical backstopping.

To timely and efficiently deliver the outputs of research and innovations to users, the existing packages will be revised, and new recommendations incorporated for promotion through the national agriculture and health extension systems. The revised and new packages will be constituted of production and post-harvest handling practices, potato and sweetpotato based food products and utilization practices, and seed multiplication and conservation technologies (e.g., apical rooted cutting for potato and Triple S for sweetpotato).

Post-harvest losses as high as 42% have been reported for potato and sweetpotato (FAO, 2019), which is unacceptably high in a country where millions of people remain food insecure. With the active participation of the private sector, development partners, and the government, at least four appropriate postharvest technologies of potato and sweetpotato will be promoted that can reduce the current level of postharvest losses by half (from 42% to 21%), substantially improving the quantity, quality and year-round availability of potato and sweetpotato products in the market through implementing appropriate cultural practices, disease and pest management practices, introducing improved storage, packaging, and transportation technologies and practices.

The strategy will also strongly leverage job creation for women and youth by creating opportunities at different segments of the respective value chains. Currently, the livelihoods

of about 21.67 million people (14.18 in potato and 7.49 in sweetpotato respectively directly depends on the production and subsequent value chain activities (CSA, 2022). Through developing the existing value chain activities and creating new business opportunities, the number of people employed by the interventions targeting potato and sweetpotato will increase by an estimated from 10 to 20%. This will be an impetus to the ongoing effort of the Ethiopian government to reduce the unemployment rate in the country.

In alignment with the national agenda of industrialization, the new paradigm shift in potato and sweetpotato will enhance the availability of raw materials for the processing industries. It is expected that the current meager supply of potato to the processing industries (18,000 tons per year) will be heightened to 150,000 tons through extensive production and supply of varieties specifically suitable for processing. To date, there is no industrial level processing of sweetpotato roots. Nevertheless, to respond to the emerging demands for puree from small and medium enterprises (injera makers, bakeries, etc.), an estimated 50,000 tons of fresh roots will be annually delivered to meet the demands of puree processing businesses.

The potato and sweetpotato sub-sector will grow through equitable distribution of margins to the different value chain actors. It is therefore anticipated that the household income per hectare for potato and sweetpotato growers will increase from the current USD 2,332 to USD 2,932 per ha for potato and from the current USD 2,024 to USD 3,538 per ha for sweetpotato.

The national foreign exchange earnings have been levied on a few commodities such as coffee, oilseeds, and pulses. Therefore, as strategic diversification of commodities to the export basket, the volume of fresh potato tubers exported to the foreign markets will increase from the current sixty thousand tons to 120 thousand tons per annum by 2030. Similarly, with improved availability of export market-preferred varieties, the export of fresh sweetpotato roots will be boosted from the current 327 tons (ESS, 2022) to four thousand tons through tapping the potential available markets in Africa, Europe and the Middle East.

The contribution of root and tuber crops to the national foreign currency earnings is often under-recognized. However, through the effective implementation of the interventions proposed in this strategy, the current contribution of USD 18.1 million (ECC, 2022) per annum for potato can easily be doubled (36.2 million USD) and that of sweetpotato can substantially increase from the current USD 0.18 million to USD 2.0 million by 2030. The current total national income of potato and sweetpotato is estimated at USD 562.5 million and USD 199.7 million, respectively and expected to increase to USD 1.19 billion and 495.2 million, respectively by 2030.

4. Strategic Issues

The root and tuber sub-sector are confronted with various policies, institutional, technical and technological challenges that warrant systemic and coordinated interventions to unlock

their potential contributions to food and nutrition security, adaptation to climate change, livelihood improvement and to the wider economic growth of the country. Several opportunities exist that accelerate the development of the sub sector including the increasing demand for fresh and processed products of the two crops both for domestic and regional markets. The eight strategic issues identified warranting the concerted efforts of the value chain actors are: i) the institutional, legal, and regulatory framework, ii) technology generation and delivery, iii) production and productivity enhancement, iv) postharvest management, processing, value addition and marketing) v) nutrition and utilization, vi) resource mobilization vii) cross cutting issues such as gender, climate change, social inclusion, biodiversity conservation and job creation, and iix) coordination and collaboration among value chain actors. To address the key challenges and the opportunities identified under each of the eight strategic issues, the strategy aims to implement targeted interventions over the next seven years (2024-2030) that leverage the contribution of potato and sweetpotato to food and nutrition security, job creation, household income, and the national economy at large. Gathering of reliable data on the two crops from production to consumption continuum will help a lot to promote the two crops.

4.1 Institutional, legal, and regulatory framework

The institutional, legal, and regulatory framework plays a crucial role in supporting the development and growth of the potato and sweetpotato industry. However, several bottlenecks and weaknesses have been identified particularly in the implementation of the existing policies and regulatory frameworks. These include the lack of dedicated units with qualified and experienced staff at regional Bureaus of Agriculture (BoA) to lead the development of roots and tuber crops, inconsistent institutional arrangements at federal and regional levels, and weak capacity and poor linkages among institutions involved in research, extension, regulatory and business activities.

The input and output marketing system of root and tuber crops is not well-developed and often distorted due to a weak regulatory system and inadequate law enforcement. This results in an unfair distribution of benefits among value chain actors. Additionally, regulatory authorities at both the federal and regional levels lack qualified staff and facilities to effectively inspect and certify seeds of roots and tubers, as well as validate the effectiveness of pesticides used against potato and sweetpotato pests and diseases. The weakness in quality control has contributed to the spread of potato bacterial wilt and reduced potato yields due to undetected latent viral and bacterial wilt infections in early-generation seed potatoes.

To address these challenges, strategic interventions have been proposed. These interventions include evidence-based advocacy and lobbying to raise the importance and benefits of roots and tuber crops among policymakers and to secure budgetary and manpower support at regional and district levels. Strengthening linkages and enhancing the implementation

capacity of actors involved in the potato and sweetpotato value chains is also crucial. Formalizing and enforcing laws related to input and output marketing of these crops is necessary to ensure fair practices. Moreover, the development and/or implementation of quality standards for potato and sweetpotato inputs, such as seeds and pesticides, as well as fresh and processed products, is essential.

Creating awareness among key value chain actors about policies, strategies, legislations, and directives that regulate seed production, certification, quality assurance, and general seed business is vital. Inspectors should be trained in roots and tuber crops inspection standards for certification, and capacity building and institutionalization of latent virus testing in early-generation seed should be prioritized. If these interventions are implemented, it is expected that most regional states and federal authorities will have dedicated units, qualified and experienced staff, and the necessary facilities to provide extension services, quality control, and other regulatory services to roots and tuber crops.

Key Deliverables

- Dedicated units for root and tuber crops established at regional levels, key public institutions engaged in research, regulatory, extension, and marketing services of potato and sweetpotato equipped with the required facilities and manpower.
- Laws, regulations, directives, and protocols (tax holidays for potato seed producers; import tax lifting for equipment needed for potato seed multiplication, export tariffs on fresh potato exports, quota and import tax on imported fresh and processed potato products etc.) that support the functioning of the institutions revised, enacted, and implemented.
- New professional and industry associations and platforms established and existing ones strengthened.
- At least 80% of the players comply and issued with conformance certificate to standards and practices of potato and sweetpotato
- Four quality standards (two on fresh and two on processed products) revised or developed and 80% of potato and sweetpotato value chain actors complying to the standards.
- Ten functional laboratories established and/strengthened across seven regions for bacterial wilt testing (potato), virus indexing (both crops) and for quarantine for imported germplasm and for domestic movement of seed.

4.2 Technology generation and delivery

Research is vital in increasing the relevance of potato and sweetpotato for food security, nutrition, revenue generation, job creation, and the national economy at large. It aims to enhance crop varieties, seed availability, crop management practices, mechanization, postharvest management, utilization and nutrition, and market linkage. Key constraints identified include limited availability of potato and sweetpotato varieties suitable for different purposes/product development,, limited seed multiplication capacities, lack of bundled climate-smart production technologies, limited access to farm machinery suitable for potato and sweetpotato, poor post-harvest management practices, underdeveloped market

systems, and lack of evidence on the contributions of the two crops to food and nutrition security, employment opportunity, and the economy.

To address these constraints, a range of interventions are proposed. These includes, promoting the existing best performing varieties and associated technologies, developing and adapting improved potato and sweetpotato varieties that are climate-resilient, nutritious, tolerant to diseases and pests, and suitable for different processing purposes. These varieties should be suitable for different agro-ecologies and production systems. Additionally, affordable and efficient methods for seed multiplication and supply systems must be developed to ensure the availability of high-quality seeds of the two crops.

Climate-smart crop management technologies and practices should be developed and promoted, considering economic viability, environmental friendliness, and suitability for different production systems and agro-ecologies. Digital advisory tools need to be developed and promoted to provide farmers and stakeholders with information and recommendations to make informed decisions regarding potato and sweetpotato production and marketing. Development, adaptation, and promotion of affordable and context specific farm machinery and implements suitable for potato and sweetpotato production and harvesting are crucial to commercialize the two crops.

Postharvest practices and technologies need to be improved and promoted to minimize losses and enhance quality. Studies on market systems and value chain integration should be conducted to improve market efficiency and information flow. Evaluating the adoption and impact of the disseminated potato and sweetpotato technologies is essential to understand their effectiveness and identify areas for further improvement.

Promoting the development of diverse potato and sweetpotato-based food products that appeal to consumers and have enhanced nutritional quality is important. Furthermore, optimizing processing techniques to minimize nutrient loss and developing value-added products from potato and sweetpotato by-products should be prioritized. Conducting comprehensive studies to understand the importance of the crops to food and nutrition security, employment opportunity, and the economy at large is crucial to conduct evidence-based advocacy for more investment in research and development of root and tuber crops.

Key deliverables

- At least eleven potato and nine sweetpotato varieties that are climate resilient, nutritious, market preferred (both for fresh table and processing) developed and delivered.
- Percent of farmers receiving customized and market-oriented extension services will increase from the present 35% to 70% by 2030.
- Annual production of early-generation seed of potato increased to 10,000 tons and that of sweetpotato increased to 205 million cuttings by 2030 for further multiplication of certified and quality declared seeds.

- At least four innovative, affordable and efficient quality seed multiplication approaches and techniques developed and promoted.
- Four recommendations made and promoted for fertilizer, irrigation, crop protection and post-harvest management
- At least two digital advisory tools developed and promoted for informed decision making by potato and sweetpotato farmers and other value chain actors.
- At least four postharvest technologies developed and promoted for potato (packaging, and household level DLS) and sweetpotato (storage for fresh root, and packaging)
- At least two locally contextualized and affordable machinery and farm implement suitable for potato and sweetpotato developed, adapted and promoted.
- One comprehensive report and policy briefs on the contribution of potato and sweetpotato to food and nutrition security, employment opportunity, and the economy at large prepared and disseminated to relevant stakeholders.

4.3 Production and productivity enhancement

Potato and sweetpotato production and productivity have remained low due to poor management practices, limited access to production inputs such as quality seeds, fertilizers, and fungicides, reliance on rainfed production, a lack of affordable and appropriate technologies, weak extension and advisory services, insufficient access to financial services, including credit and insurance, and climate change.

Provided that the key challenges of potato and sweetpotato are strategically prioritized and addressed its feasible to boost the national production and productivity of the two crops and contribute to realization of the food and nutrition security, job creation, export promotion, import substitution, and development of agro-industries.

Accordingly, this strategy recommends essential strategic interventions which include enhancing access to quality seeds/planting materials, fertilizer and agro-chemicals through an innovative, robust and demand driven system. Alternative seed multiplication techniques and facilities, such as Triple S for sweetpotato, rooted apical cuttings for potato, and tissue culture plantlets, will be promoted to increase the supply of planting materials. In addition, creating favorable conditions and strengthening the capacity of community-based, private, and public sector is critical in production and supplying of quality seeds. Promoting the use of screen houses and greenhouses will improve the availability of early-generation seeds (EGS) of potato. Furthermore, establishing and strengthening existing tissue culture laboratories, as well as field facilities like screen houses, net houses, and irrigation systems would help to boost seed production. Regulatory law enforcement is required to enforce restrictions governing the supply, distribution, and proper application of fungicides. Farmers can benefit from awareness efforts that teach them how to utilize fungicides and other inputs effectively.

Promoting potato and sweetpotato to new areas will help to increase national production. Moreover, introduction of climate-smart technology packages in drought and crisis-affected areas will ensure the expansion of potato and sweetpotato production as an emergency

response strategy. Aside from increasing the amount of area available for potato and sweetpotato cultivation, encouraging the use of staggered production techniques improves the year-round availability of these crops.
Similarly, integrating potato and sweetpotato cultivation into irrigated wheat and rice production systems, as well as urban and peri-urban agriculture programs, can boost the production and consumption of these crops.

Encouraging the use of appropriate machinery for plowing, planting, and harvesting based on varied agro-ecologies and production scales is critical. Improving access to chemical fertilizers for different production systems, including the main rainy season (meher), the short rainy season (belg) and irrigated production system for both crops is very crucial. Enhancing the institutional capacity and promoting the effective implementation of pluralistic extension system as the vehicle to deliver appropriate technologies and practices for the production of potato and sweetpotato will be crucial.

Facilitating access to finance services for actors throughout the value chain is indicated as another strategic intervention to promote access to various industrial inputs and technologies.

Key deliverables

- Increased productivity from the current 13.3 t/ha to 16.6 t/ha for potato
- Increased productivity from the current 21.3 t/ha to 23.4 t/ha for sweetpotato
- The current production of potato (6 million tons) increased by 87% and that of sweetpotato (1.2 million tons) doubled by 2030
- Use of quality seeds of potato increased from the present 24,650 tons to 228,308 tons annually.
- Increased use of quality seed of sweetpotato by farmers from the present 2% to 20%.
- Percent of farmers that use full production package of potato and sweetpotato increased from the present 35% to 70% by 2030.
- At least 25% of experts, extension agents and farmers in major growing regions trained on improved potato and sweetpotato production and post-harvest handling technologies and practices

4.4 Postharvest management, processing, value addition and marketing

In order to improve postharvest management, processing, value addition, and marketing in the potato and sweetpotato value chain, several strategic interventions are proposed. Several constraints have been identified in this area, including poor post-harvest practices, limited availability of appropriate technologies, under-developed infrastructure for postharvest management and processing, weak capacity of value chain actors, inadequate implementation of quality standards and regulatory systems, limited diversification of products, and inefficient input and output market systems. These interventions aim to

address various constraints and enhance the efficiency and profitability of the value chain. To address these constraints, the following strategic interventions have been proposed:

Efficient postharvest management is crucial to maintain the quality of potato and sweetpotato products and reduce losses. To achieve this, the promotion of available post-harvest management technologies such as sorting, grading, packaging, and labeling are essential. These practices maintain product quality and ensure that the crops reach the market in optimal condition.

Investing in infrastructure for postharvest management is another vital intervention. The establishment of collection centers, market centers, cold storage facilities, and warehouse receipt centers facilitates efficient handling, storage, and distribution of potato and sweetpotato products. This infrastructure helps reduce postharvest losses and ensures that the crops are available throughout the year.

Value addition through processing activities adds value to potato and sweetpotato products, opening up new market opportunities. Investing in processing infrastructure, such as drying, puree making, and packaging facilities, enables the development of processed products and expands the range of offerings in the market. Building the capacity of value chain actors is crucial for effective postharvest management, processing, and value addition. Training programs and facilities should be provided for producers, traders, small-scale processors, and extension service providers. This strengthens their knowledge and skills, enabling them to adopt best practices, improve their production processes, and add value to their products.

Implementing quality control measures and grading systems ensures that potato and sweetpotato products meet the required standards. This intervention enhances consumer confidence and facilitates access to regional and international markets, where quality standards are often stringent. Packaging, labeling and branding play a significant role in attracting consumers and creating market differentiation. Enhancing the quality and design of packaging, as well as implementing effective labeling and branding strategies, can help promote potato and sweetpotato products and increase their market share. Diversifying the range of products that utilize potato and sweetpotato as ingredients is an important intervention for value addition. This expands market opportunities and encourages the development of innovative food products, such as snacks, baked goods, and processed foods, which incorporate these crops.

To facilitate market access, linkages between producers, processors, retailers, wholesalers, food service providers, and export markets should be established. This enables smooth transactions and trade within the value chain, ensuring that the products reach the intended markets efficiently. Promoting entrepreneurship and business development among value chain actors is crucial for the growth and sustainability of the potato and sweetpotato industry. Supporting the development of business skills and providing access to financial

services can foster the establishment of successful enterprises and stimulate economic growth. Digitizing the market information system provides real-time information on market trends, prices, and demand across the value chain. This empowers stakeholders to make informed decisions and enhances the overall efficiency of the market. Contract farming can be promoted to ensure a stable supply of raw materials, while enforcing regulations fosters fair and transparent transactions within the value chain. Identifying opportunities for exporting ware and seed potato and sweetpotato to international markets can expand market reach and increase export revenues. Effective regulation and management of input and output markets are essential to minimize the involvement of illegal traders and brokers, ensuring a fair and transparent trading environment. Building the capacity of farmers' organizations, such as cooperative unions, is important for their engagement in potato seed supply and strengthening their role in the value chain. This empowers farmers and facilitates collective action for improved production and market access.

By implementing these strategic interventions, the postharvest management, processing, value addition, and marketing aspects of the potato and sweetpotato value chain can be enhanced. This will contribute to reducing losses, maintaining product quality, expanding market opportunities, and ultimately improving the competitiveness and profitability of the potato and sweetpotato industry.

Key Deliverables

- Post-harvest losses of potato and sweetpotato reduced by half (from the current 42% to 21% by 2030)
- At least four postharvest technologies (two storage technologies, one potato harvester and one for puree processing) tested and promoted
- At least four types of environment friendly packaging materials for fresh product identified for wider promotion)
- Four aggregation centers established/strengthened for both export and agro-processing supply
- Ten (for each crop) processed and value-added products developed, promoted and commercialized.
- SME consisting of women and youth that are engaged in potato and sweetpotato processing and marketing increased by 25%
- At least one digital platform available to facilitate marketing of potato and sweetpotato fresh and processed products

4.5 Nutrition and utilization

The strategic development of potato and sweetpotato involves addressing the challenges related to nutrition and utilization. Our food system is more cereal based and limited in terms of dietary diversity. There is no nutrition education and many people assume that consumption of potato and sweetpotato are apt for low class people. Potato and sweetpotato are commonly used in boiled or stew forms and rarely used in various forms. This arises from

the limited knowledge of preparing diversified recipes from potato and sweetpotato. School meals have been started in several schools across the country and very few of them include potato and sweetpotato in their school meals menu except boiled and stewed potato that is seldom served to students.

Globally and nationally potato and sweetpotato are acknowledged for supporting the lives of millions of people as these commodities are wonderful sources of energy, vitamins, minerals, and anti-oxidants (particularly orange and purpled fleshed sweetpotato and potato). School age students require diversified nutritious diet to which potato and sweetpotato can contribute as cheap sources that are widely available in every corner of the country.

Accordingly, to promote the consumption and utilization of fresh and processed products of potato and sweetpotato, various strategic interventions are proposed. Various recipes can be formulated from potato and sweetpotato in supplement with other food items, including those listed in the food-based dietary guidelines of Ethiopia. Demonstrating the different recipes that incorporate potato and sweetpotato can create awareness and encourage the utilization of these crops in diverse and nutritious meals. By introducing these recipes to individuals and communities, they can understand the nutritional benefits of potato and sweetpotato, leading to increased utilization. Another strategic intervention focuses on implementing social and behavioral change communication. This involves establishing healthy living clubs and utilizing complementary technologies such as healthy baby toolkits to promote utilization of orange-fleshed sweetpotato as infant and young children food. These initiatives play a crucial role in educating and encouraging individuals to incorporate potato and sweetpotato-based foods into their diets, thereby improving their nutrition. Furthermore, integrating potato and sweetpotato-based recipes in school feeding programs, refugee camps, internally displaced persons (IDPs) settlements, returnee communities, and health institutions is vital. This integration ensures that these nutritious crops become an integral part of the food systems of populations vulnerable to malnutrition, contributing to their improved nutrition and health.

Key Deliverables

- At least 10 new or enhanced recipes of potato and sweetpotato developed and adopted by consumers
- At least 100 schools included OFSP recipes in their school feeding menu
- At least 80 healthy living clubs established to promote the utilization of biofortified sweetpotato and potato products in selected regions
- Potato and sweetpotato production and utilization technologies promoted in at least 10 refugee and internally displaced people (IDP) camps
- Per capita consumption of potato and sweetpotato at national level doubled by 2030

4.6 Resource mobilization

Horticultural crops in general and root and tuber crops in particular, have not received sufficient attention and resources required for their research and development endeavors like other cereal crops. Also, there is no clear strategic documents and resources set for these two crops to contribute to the national development targets during the past long period. However, some level of interest is being observed from the government and development partners in support of potato and sweetpotato development-related initiatives including in emergency response projects to drought or conflict-affected communities, and internally displaced peoples although the reach is still not significant.

Given this background, resource mobilization for the implementation of the current national potato and sweetpotato strategy is vital. The financing of this strategy will directly or indirectly be a joint responsibility between the development partners, private sectors, CG centers, and international organizations through the government development and research institutions. Various intervention could be employed to mobilize funds and resources from government, national and international development partners, private companies, and farmers associations.

Advocating for the nutritional significance of potato and sweetpotato within the framework of nutrition-sensitive agriculture is an important step to solicit sufficient budget and resources needed for the successful implementation of the proposed interventions. Furthermore, establishing a grant program dedicated specifically to potato and sweetpotato research and development is another plausible option. This approach aims to attract funding from various sources, fostering innovation and advancements in potato and sweetpotato value chain development. Making use of available innovative competitive opportunities that provide funding for agricultural projects, including those focused on potato and sweetpotato, is also recommended. Such competitions can serve as platforms to secure additional resources and funding for the development of the root and tuber crops sub-sector. Building on the experiences of food and brewery industries in Ethiopia, the public and private companies engaged in potato and sweetpotato businesses can be encouraged to set aside corporate social responsibility funds to carry out potato and sweetpotato research and development activities.

By integrating potato and sweetpotato into emergency response programs, the nutritional benefits of these crops can be emphasized, attracting support from international development and humanitarian agencies. Ensuring that potato and sweetpotato projects align with the development priorities of the government, donors, and aid agencies is crucial for securing financial support. By aligning potato and sweetpotato activities with the priorities of key stakeholders, the likelihood of securing funding can be significantly increased. Lastly, developing joint collaborative research for development projects with CGIAR and other international centers and Universities could help to generate funding needed to strengthen

capacity of local institutions to implement research and outreach activities related to the two crops.

Key Deliverables

- Increased investment in potato and sweetpotato industry (seed multiplication, root/tuber production, processing)
- Budget allocation by federal and regional governments, donors and private companies to support potato and sweetpotato research and development increased
- At least four projects developed through the collaboration of NARES, CGIAR and other international organizations approved by donors and funds secured by NARES partners.

4.7 Cross cutting issues

The key bottlenecks identified along the value chain of the two crops are limited involvement of women and youth in technology generation, capacity building, and seed production activities. In addition, contribution of potato and sweetpotato to job creation for different gender groups is not well documented. The attention given for the conservation of the germplasm of the crops has been inadequate on the account of the misperception that Ethiopia is neither a country of origin nor center of diversity of the two crops. The recent focus of national and international research institutes to develop and disseminate mainly the biofortified sweetpotato varieties may in the long-term negatively impact conservation and use of improved and local varieties with white and cream flesh which have various agronomic and socio-cultural merits to the farmers.

Addressing cross cutting issues such as social inclusion, biodiversity conservation and job creation adds depth to the potato and sweetpotato national strategy to ensure economic, environmental and social sustainability. Sweetpotato is usually cultivated around home gardens where women's involvement in farming activities is high. Moreover, biofortified sweetpotato is one of the crops that have recently received attention from nutrition sensitive agriculture initiatives due to its role in combating malnutrition. Women are in the frontline in the preparation of potato and sweetpotato based food for household consumption. Men should also be engaged in awareness raising events related to nutrition and behavioral change education (healthy eating habits). Both potato and sweetpotato are creating job opportunities mainly engaging youth and women in root/tuber production, seed multiplication, aggregation and retailing of fresh produce, and roadside small business in urban areas. Engaging and deliberate targeting of these social groups in technology generation and dissemination hastens technology adoption and ensures fair share of benefits to these groups from development interventions. Although Ethiopia is neither a country of origin nor center of diversity of both crops, there is a need to pay attention to the conservation of local and improved germplasms that have been used and still cultivated by farmers for a long time.

Conducting gender-integrated value chain analysis is important to explore the social constraints and opportunities for socially marginalized groups, such as women, youth and people with disabilities and thereby design and implement gender responsive interventions along the value chains of the two crops. Projects and initiatives focusing on the two crops are expected to contribute to gender equitable control of productive assets and resources and improved capacity of women and young people to participate in decision making. Furthermore, research and development practitioners should encourage and support the participation of women and youth in technology generation and popularization and capacity building, to ensure decision making in selecting appropriate technologies, investment in and use of inputs and productive assets. Training and input supply need to be customized to women needs to further support their capacity and skills as managers of these important productive resources. Both women and youth should be supported to participate in potato and sweetpotato related businesses such as aggregation, wholesale and retail trade, small-scale processing, value addition, and marketing activities.

It remains crucial that the current attention and interest to develop and promote Vitamin-A rich nutritious OFSP and high yielding and market preferred potato varieties (including processing types) should not have a potential adverse impact on local sweetpotato and potato cultivars, which have unique attributes to the local agro-ecologies and socio-cultural uses. To avoid or minimize the risk of gradual extinction of the local cultivars preserved over the decades, appropriate germplasm conservation mechanisms need to be in place following national and international procedures.

Practitioners should also make sure that potato and sweetpotato production relies on the principles of agro-ecological farming that depend on sound use of external inputs (fertilizer, pesticide, machinery, etc.) and use of environmentally friendly methods such as climate smart and regenerative agriculture practices, resulting in both economically profitable and environmentally sound sustainable agriculture.

Evidence based advocacy needs to be carried out targeting policy makers and development partners using the findings generated from the study on the contribution of potato and sweetpotato to food and nutrition security, employment opportunity, and the economy at large. This will help demonstrate the sector's potential to create employment opportunities along the value chains and thereby contribute to reduced unemployment rates both in rural and urban areas.

Key Deliverables

- Number of youth and women participated in participatory technology generation and potato and sweetpotato seed multiplication increased by 10%.
- Number of women led SMEs engaged in in potato and sweetpotato processing increased by 50%
- Number of youth and women participated in potato and sweetpotato value chain increased by 10%

- Number of local and improved potato and sweetpotato cultivars collected and conserved at Ethiopian Biodiversity Institute and research centers increased by 50%.
- At least 7 PhD and 15 MSc (50% women) students completed their studies in various disciplines related to potato and sweetpotato

4.8 Coordination and collaboration among value chain actors

Among the main constraints identified from the situation analysis is the weak linkage and coordination among value chain actors due to the fragmented and inadequate efforts to develop the subsector. Weak linkage and communication platforms among the key value chain actors hindered the timely transfer of knowledge, technology and innovation, and sharing of reliable data (statistics) on potato production (especially for irrigated and belg season), farm management and utilization (e.g., use of inputs, consumption, post-harvest losses), trade volume, market price trends, and employment for proper policy attention and investment on the sub sector. Furthermore, the limited availability and use of ICT and digital media hinder knowledge and information sharing among value chain actors, which in turn affects their popularization and attention from various stakeholders.

To ensure effective coordination and collaboration among value chain actors in the potato and sweetpotato industry, the following strategic interventions are proposed. First, it is quite important that industrial and trade associations that bring together various actors in the value chain are established or strengthened. These organizations can serve as platforms for collaboration, information sharing, and joint decision-making. The second intervention is encouraging the development of geographic clusters where potato and sweetpotato cultivation is concentrated. Bringing farmers, processors, traders, and other actors in close proximity foster collaboration and cooperation leading to improved coordination along the value chain. Third, arranging regular conferences, seminars, and workshops which enhances sharing knowledge, experiences, and best practices among value chain actors. These events provide opportunities for networking, learning, and addressing emerging trends and challenges collectively. Create online platforms, such as forums and communication channels also facilitate information exchange and collaboration among value chain actors. These platforms enable easy access of information, encourage interaction, bridge geographical barriers, and popularizing agricultural and nutrition policies and strategies and ultimately their effective implementation. Fourth, encouraging partnerships between private companies, public institutions, and international research institutions. These partnerships can ensure development and implementation of collaborative research and development projects. Furthermore, improving coordination among different actors involved in potato and sweetpotato research and development; farmers, researchers, higher learning institutions, processors, and policymakers; arranging regular meetings, joint initiatives, and shared decision-making processes strengthen collaboration and ensure rapid research technologies dissemination and adoption, implementation of supportive regulations and policies along the value chain. Strengthening professional societies and industrial associations such as IPRaDA,

EHSS, and ESPHM serves as a vehicle to foster collaboration, facilitate information exchange, and share experiences, and best practices among stakeholders involved in the potato and sweetpotato subsector.

To address the challenge related to reliable data generation and management of both crops, the proposed strategies among others include strengthening the capacity of the Ethiopian Statistics Service (ESS). This enhances the ability to collect, analyze, and disseminate accurate and up-to-date data related to production area, farm management, consumption, post-harvest losses, trade volume, market prices, job creation, and value-added products of roots and tubers; systematically collect and report gender-disaggregated data at all levels of intervention to monitor the benefits shared among the different societal groups;

Finally, to address constraints related to limited ICT infrastructure and utilization, the proposed strategies include: enhancing the availability and use of ICT facilities within the potato and sweetpotato sector; and promoting awareness creation among stakeholders about the potential of ICT tools for data optimization, knowledge sharing, and effective communication in the development of potato and sweetpotato value chains.

Key Deliverables

- At least one industrial association established at the national level
- At least one regular conference, two seminars, and one workshop organized annually with different themes related to the two crops.
- Web-based platform that strength partnerships between private companies, public institutions, and international research institutions created.
- Strong platform created for annual consultative meeting with ESS to discuss on collection of reliable data on production volume, area under production (meher, belg, irrigated production, and residual moisture), number of farmers growing the two crops and utilization.
- Accurate and reliable statistical report on the production, yield, area (meher, belg, irrigated production, and residual moisture), number of growers of the two crops, utilization, etc. prepared and disseminated
- At least one Information Management System created to accommodate the relevant data on potato and sweetpotato

5. Implementation Roadmap

The national strategy for potato and sweetpotato will be implemented over a seven-year period (2024 - 2030). The strategy is divided into three distinct phases where during the first phase (2024), the strategy focuses on startup activities such as popularization of the strategy, resource mobilization and baseline data / information establishment. In the medium term (2025 - 2027), the focus will be on networking and coordination to operationalize the strategy and initiate policy dialogue with government and development partners to enhance attention for root and tuber crops. In the long-term (2028 - 2030), the MoA and partners will

commission an independent evaluation of the strategy to identify gaps and lessons learnt, and indicate future directions of potato and sweetpotato research and development. The detailed activities of the national strategy rollout plan are indicated in Table 2.

Table 2. Implementation plan of the national potato and sweetpotato strategy

Short-term (2024)	Medium-term (2025-2027)	Long-term (2028-2030)
Popularization of the strategy among stakeholders and wider public	Lobby and advocate for the establishment of root and tuber crops units at regional and district levels of BoA	Continue networking and coordination to operationalize the strategy
Resource mobilization	Resource mobilization	Resource mobilization
Preparation of detailed implementation plan and indicative budget to rollout the strategy	Conducted adoption study to track acceptance and utilization of disseminated potato and sweetpotato technologies	Commission independent evaluation of the strategy to assess the effectiveness, identify gaps and lessons learnt that can be used as inputs for the next ten-years strategy
Establish baseline information or data missing for some indicators	Study the contribution of potato and sweetpotato to national economy	Conduct biannual steering committee meetings
Strengthen networking and coordination to operationalize the strategy	Conduct inventory of available potato and sweetpotato technologies	Documentation of best practices to leverage future research and development works on potato and sweetpotato
Conduct stakeholders mapping	Conduct mid-term evaluation of the strategy	Develop ten years potato and sweetpotato strategy 2040
Foster linkage and share experience with national and international partners, professional societies and associations	Continued networking and coordination to operationalize the strategy	
Establish steering committee and conduct meeting to monitor the implementation of the proposed interventions	Initiate policy dialogue with government and development partners to enhance attention given to root and tuber crops	
	Create PPP engagement platform	
	Establish/strengthen potato and sweetpotato information and data sharing portal	
	Foster linkage and share experience with national and international partners, professional societies and associations	
	Conduct biannual steering committee meetings	
	Capacity building of implementing partners	
	Regular review of the strategy and adapting it to emerging issues and feed received from stakeholders	

Table 3. Strategic issues, expected outcomes and key performance indicators of the national potato and sweetpotato strategy.

Strategic Issues	Expected Result/Outcome	Key Performance Indicator (KPI)	Baseline	Target/Expected output	Responsibility/ (Lead* & collaborators)
1. Strengthen Institutional, Legal and Regulatory Framework	Root and tuber crops received attention as strategic food and nutrition security, industrial and export commodities	Number of regions/organizations with dedicated units for extension and regulatory services on root and tuber crops	1 Region only	7 Regions	MoA, RBoA, EAA, RARI, HLI, CG centers
			3 functional laboratories in two regions	10 functional laboratories across seven regions	
2. Research in the Potato and Sweetpotato Industry	Increased production, productivity, consumption of potato and sweetpotato by 30%	Number of technologies developed and adopted by end users (farmers, seed multipliers, processors, etc.)	4 processing type potato varieties	3 new processing potato varieties (at least one hybrid variety)	EIAR, RARI, HLI, CGCs, MoA, RBoA, Private companies, Cooperative Agency
			NA	2 new bio-fortified potato varieties	
			27 fresh table potato varieties	6 new table potato varieties	
			10 orange-fleshed sweetpotato varieties	4 new OFSP (at least one export type) and 2 purple fleshed varieties)	
			20 White fleshed sweetpotato varieties	3 new white fleshed sweetpotato varieties	
			NA	1 pre-harvest and 1 postharvest farm implement	
			NA	2 digital advisory tools for potato and/or sweetpotato	
			Two postharvest technologies for potato	At least 4 postharvest technologies for potato and sweetpotato developed and adopted	
3. Production and productivity enhancement	Potato and sweetpotato production doubled	Percent increase in area and production	**Potato**	**Potato**	MoA, RBoA, EIAR, RARI, HLI, CGCs, Private companies, DPs
			Area: 478,670 ha	675,000 ha	
			Production: 6.0 million tons	11.2 million tons	
			Yield: 13.3 t/ha	16.6 t/ha	
			Sweetpotato	**Sweetpotato**	
			Area: 100,009 ha	200,018 ha	

Strategic Issues	Expected Result/Outcome	Key Performance Indicator (KPI)	Baseline	Target/Expected output	Responsibility/ (Lead* & collaborators)
			Production: 2.13 million tons	4.68 million tons	
			Yield: 21.3 t/ha	23.4 t/ha	
		Number of seed producers involved in potato and sweetpotato (private, cooperatives)	Private 1 for potato and 2 for sweetpotato	Private 10 for potato and sweetpotato	
			Cooperatives 40 for potato	Cooperatives 80 for potato & 30 for sweetpotato	
		Number of production packages developed	4 packages (2 ware and 2 seed potato and sweetpotato)	12 packages (recipe and utilization for potato and sweetpotato (2), apical rooted cutting for P (1), Triple S technology for SP (1), update ware potato and sweetpotato production packages (4) and seed potato and sweetpotato production packages (4)	
4. Postharvest management, processing, value addition and marketing	Contribution of potato and sweetpotato to HH income and the national economy increased	Volume of raw materials processed and marketed, increased HH income, contributions to national economy	18,000 tons of tubers supplied to processing industries	150,000 tons of potato tubers supplied to processing industries;	MoTI / BoTI; Private processing companies; Retail and wholesale traders
			NA for sweetpotato	50,000 tons of OFSP roots supplied to puree processors	
			Net income of USD 2,332 per ha for potato and USD 2,948 for sweetpotato	Net income per ha increased to USD 2,932 for potato and USD 3,538 for sweetpotato	
			Total national income: USD 562.5 million from potato and USD 199.7 million from sweetpotato	Total value: USD 1.19 billion from potato and USD 495.2 million from sweetpotato	
		Number of food/agro-industries engaged in potato and	Two	Seven	

Strategic Issues	Expected Result/Outcome	Key Performance Indicator (KPI)	Baseline	Target/Expected output	Responsibility/ (Lead* & collaborators)
		sweetpotato processing			
		Number of market value chain actors (traders, processors, retailers, exporters, etc.)	NA	Number of market value chain actors directly engaged in potato and sweetpotato business increased by at least 25% by 2030	
		Value of fresh and processed potato and sweetpotato destined for the export market	USD 18.1 million (potato) and USD 0.18 million (sweetpotato)	USD 36.1 (potato) and USD 2.0 million (sweetpotato)	
5. Nutrition and utilization	Consumption of diverse, safe and nutritious potato and sweetpotato products increased	Number of potato and sweetpotato based recipes adopted by consumers	NA	At least 10 potato and 10 sweetpotato recipe will be adopted	MoH / BoH, MoA / BoA, CIP, NGOs, UN Agencies
		Rate of malnutrition (e.g., VAD) among vulnerable groups reduced	NA	At least 100 schools include potato and sweetpotato recipes in their feeding menu	
			Prevalence of VAD of 14% at preschool age, 10.9% school age, 3.4% women reproductive age	Prevalence of VAD among pre-school children in OFSP intervention areas reduced to 10%	
		Per capita consumption	Potato: 7.7kg Sweetpotato: 7kg	Potato: 15.4kg Sweetpotato: 14kg	
6. Resource mobilization for potato and sweetpotato R&D	Potato and sweetpotato research and development undertakings strengthened	Amount of funds invested by government, donors, private sectors, etc. in potato and sweetpotato research and development	NA	To be done when the detailed implementation plan is prepared	MoA, RBoAs, CGIAR, NGOs

Strategic Issues	Expected Result/Outcome	Key Performance Indicator (KPI)	Baseline	Target/Expected output	Responsibility/ (Lead* & collaborators)
7. Cross cutting (Gender, climate change, biodiversity conservation, capacity building, social inclusiveness and job creation)	Participation, decision making and benefit sharing for women and youth in potato and sweetpotato value chain increased	% of women, youth, disabled benefiting from potato and sweetpotato related opportunities	NA	Job creation increased by 20% for potato and 10% for sweetpotato	MoA, Cooperatives commission, MoLSD
	Professional from relevant institutions attended long-term training in various disciplines related to potato and sweetpotato	Number of people completing MSc and PhD studies	NA	7 PhD 15 MSc	MoA, EIAR, CG centers, Universities
8. Coordination and collaboration among value chain actors	Effective platforms that create enabling environment for advancing potato and sweetpotato industry through research, knowledge transfer, innovation, policy advocacy and sustainable development	Number of active member organizations and individuals of IPRaDA	7	100	MoA, RBoA, EIAR, RARI, IPRaDA, CGCs, Private companies
		Number of joint meetings held	NA	Steering committee meetings, twice a year	

6. Monitoring, Evaluation and Learning

This national potato and sweetpotato development strategy will be coordinated by the Federal Ministry of Agriculture (MoA) at the national level. The structure of the Bureaus of Agriculture at all levels including regional, zonal and district level will be part of the coordination, monitoring and evaluation process. An agreed common MEL framework will be used among various implementors to effectively monitor the implementation of the proposed interventions and track the expected deliverables of the strategy. The MoA will oversee the overall implementation through a steering committee designated at national level. The regional bureaus of agriculture will be responsible for monitoring the programs that fall within their regions for further reporting to the MoA. To effectively monitor the participation, decision making and benefit sharing among different groups, data collection and reporting should be disaggregated by gender and social groups. Stakeholders' meeting will be convened annually in the month of June to jointly evaluate progresses made against the plan during the budget year and share their intervention plans. Moreover, an annual report that highlights achievements made against the plan during the budget year will be prepared and shared to the wider public.

The monitoring and evaluation activities include routine data collection and analysis processes to inform decision making at all levels for the whole periods of the strategy. Information on potato and sweetpotato value chain activities will be periodically shared through different platforms such as MoA, EIAR and IPRaDA websites. A special app (similar to Viazi Soko app used in the Kenyan potato industry) will be developed and used to generate various datasets across the industry.

Key performance indicators developed for the eight strategic issues will be aligned with implementing institutions' programs and projects. The indicators listed in the implementation matrix will form the basis of monitoring and evaluation. The MEL team of the key implementing institutions will be responsible for developing the ME framework, conduct regular monitoring, data collection, analysis and share reports. The team also regularly updates databases, and provides feedback and advices on areas of improvement. Best practices and lessons learnt from the implementation of research and development projects and programs will be documented and shared among stakeholders at appropriate local, regional and federal levels. A mid-term and final evaluation of the strategy will be conducted 2027 and 2030, respectively, to assess the effectiveness of the strategy, identify gaps and inputs for the next strategy development.

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