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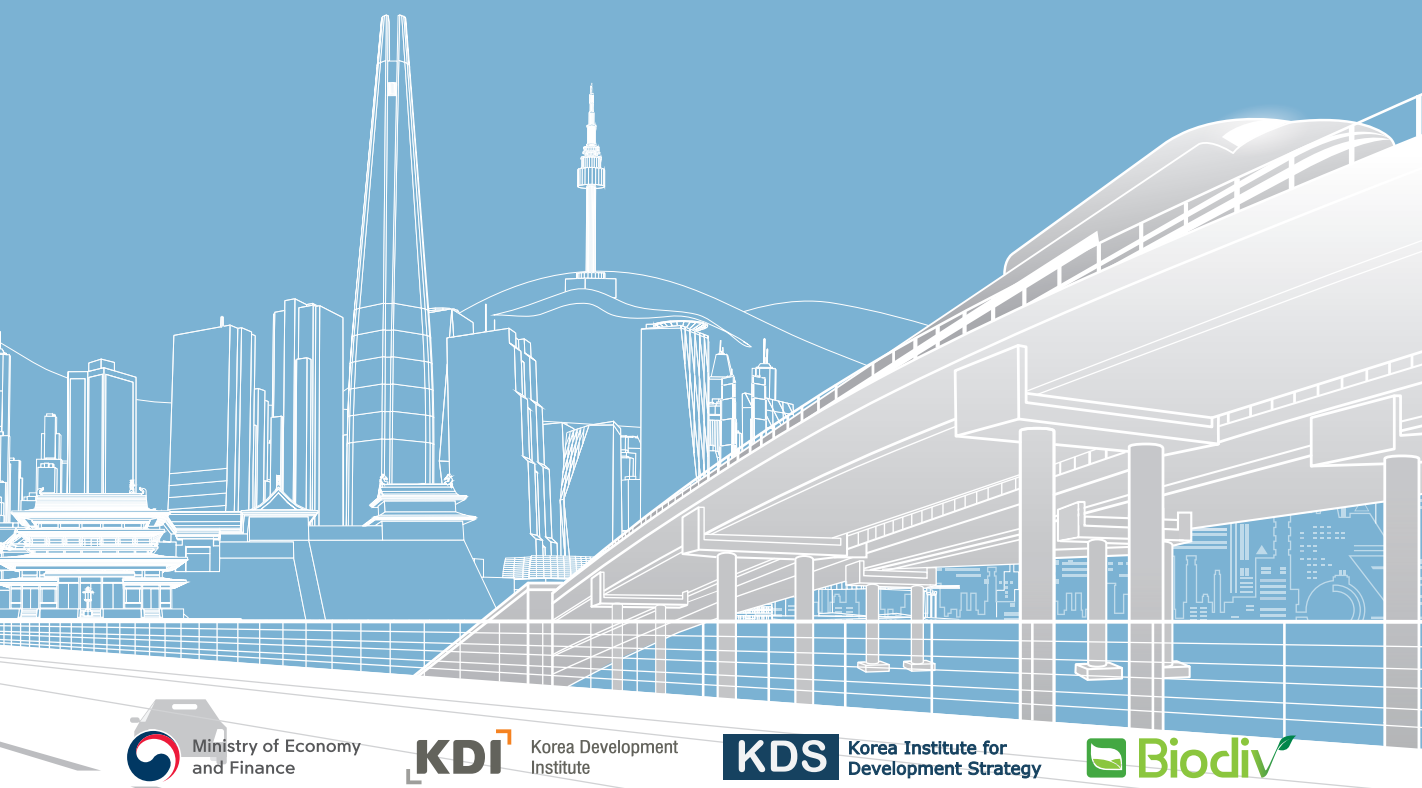
Knowledge Sharing Program

2020/21 KSP Policy Consultation Report

Ethiopia

Agricultural Supply Chain Analysis and Development Strategy in Ethiopia



Ministry of Economy and Finance

KDI Korea Development Institute

KDS Korea Institute for Development Strategy

Biodiv

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In Cooperation with	Ministry of Agriculture (MoA)

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2020/21 KSP Policy Consultation Report

Agricultural Supply Chain Analysis and Development Strategy in Ethiopia

Preface

Since its inception in 2004, the Knowledge Sharing Program (KSP) has significantly contributed to the socioeconomic development of various partner countries. The KSP has played an important role as an effective development cooperation platform, and many individual projects under the umbrella of the KSP have been implemented, providing substantive and practical implications to the policy-makers and governmental officials in respective partner countries. Although the core idea of the KSP is about sharing Korea's experience and lessons learned from its trajectory of socioeconomic development, both the Korean government and implementing agencies of the KSP have always pursued inclusive development of partner countries through equal and true partnership.

In pursuit of Korea experience in agricultural development, the Ethiopian government officially proposed a project "Agricultural Value Chain Innovation and Rural Development Plan Preparation for Framework Modeling and Fundamental Infrastructure Construction" in October 2018 to develop its capacity of the agricultural sector in Ethiopia. After carefully considering the proposal from the Ministry of Agriculture (MoA) of Ethiopia, the Korean government accepted the proposal and the MoA and the Korea Development Institute (KDI) jointly involved in the discussion to improve the initial proposal. At last, the Korean government launched a KSP project "Agricultural Supply Chain Analysis and Development Strategy in Ethiopia" in November 2020, designating the Korea Institute for Development Strategy (KDS) and Biodiv Inc. Consortium as the project implementing agencies from November 2020 to September 2021.

This KSP project consists of three topics: 1) Analyzing Ethiopian Agricultural Development Policy and Selecting Prioritized Agricultural Commodities, 2) Identifying Constraints to Supply Chain Connectivity of the Prioritized Agricultural Commodities, and 3) Policy Recommendations for Improving Supply Chain of Strategic Commodities. The implementation process of this project greatly reflects the core concept of the KSP in that the project has been implemented in the collaboration of Korean research team and the Ethiopian local consultants. Chapter 1 of the project report was written by Minho Lee, the senior research fellow at the KDS who has served as the principal investigator, assisted by Ibrahim Worku Mohammed, the local consultant in Ethiopia as the co-author. Chapter 2 was written by Tae-yu Yun, the CEO of Biodiv Inc. as a researcher, working together with Adane Bulo Dabissa, the local consultant as the co-author. In Chapter 3,

Policy recommendations as a conclusion was completed by Young Ho Park, the senior research fellow at the Korea Institute for International Economic Policy (KIEP) as researcher, teamed with Amir Seid Hussen, the local consultant as the co-author.

Although this KSP project has been affected by the COVID-19 outbreak since its inception, the project team has made continuing efforts to cope with the situations by exchanging e-mails, conducting tele-conferences, and conducting firsthand field surveys by the local consultants. In the process, the completion of this KSP would not have been possible without the considerable devotion and contribution of both Korean and Ethiopian stakeholders.

On behalf of KDS, I would like to express my deepest appreciation to the Government of Ethiopia (GoE) and the MoA of the GoE for their collaboration in the project. In particular, I would like to extend my profound gratitude to H.E. Oumer Hussein, MoA, Acting State Minister Germame Garuma, Agriculture Development sector, MoA, Director Zena Habtewold, Planning-Monitoring and Evaluation Directorate, MoA, and Director Esayas Lemma, Crop Development Directorate, MoA for their unwavering support. The completion of this project would not have been possible without their devotion. I also wish to thank the KSP consultation team—Senior Advisor Junwon Lee, Principal Investigator Minho Lee, Researchers Tae Yu Yun and Young Ho Park, and Local Consultants Ibrahim Worku Mohammed, Adane Bulo Dabissa, and Amir Seid Hussen—for producing this report.

Finally, I would like to express my deep appreciation to KDI Project Manager Hokyung Bang and the staffs of KDI for their support and guidance, to our staff members at KDS for their endless passion and devotion.

I firmly believe that the KSP will serve as a steppingstone to further elevate mutual learning and economic cooperation between Ethiopia and Korea, and hope it will contribute to their sustainable development.

Seung-Hun Chun
President
Korea Institute for Development Strategy (KDS)

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2020/21 KSP with Ethiopia

Young Jin Kwon (Korea Institute for Development Strategy)

2020/21 KSP with Ethiopia

Young Jin Kwon (Korea Institute for Development Strategy)

The governments of Korea and Ethiopia have been exchanging ideas on various topics of economic development since 2011 through the Knowledge Sharing Program (KSP) sponsored by the Ministry of Economy and Finance (MOEF) of the Republic of Korea. Both governments discussed the need for a KSP project to share the lessons from the experience in agricultural development of Korea as the agricultural sector is the backbone of Ethiopian economy with most of the population living in rural areas depending on agriculture for their livelihoods. Accordingly, in 2018, the Ministry of Agriculture (MoA) of Ethiopia formally requested the Korean government to consult on the development of Ethiopian agricultural sector and proposed a KSP project. The Korean government decided to accept the proposal considering the strategic importance of bilateral relations between the two nations as well as Ethiopia's agricultural growth potential and desire to implement the KSP with Korea. After thorough and comprehensive discussions between the MoA and the Korea Development Institute (KDI) to further develop the Ethiopia's initial proposal, a KSP project "Agricultural Supply Chain Analysis and Development Strategy in Ethiopia" with three sub-topics was launched by the Korean government in 2020.

The main purpose of the project is to analyze the current Ethiopian agricultural development policy in the context of the Ethiopian macroeconomic reform plan, the Homegrown Economic Reform (HGER) strategy program in 2019, and the Ten-Year Perspective Plan (TYPP) (2021-2030), in order to derive appropriate policy measures to foster agro-industrial development that would also improve the agricultural supply chain connectivity. In this light, three topics were chosen considering the request of the government of Ethiopia (GoE).

- Chapter 1: Analyzing Ethiopian Agricultural Development Policy and Selecting Prioritized Agricultural Commodities
- Chapter 2: Identifying Constraints to Supply Chain Connectivity of the Prioritized

Agricultural Commodities

- Chapter 3: Policy Recommendations for Improving Supply Chain of Strategic Commodities

Under the supervision of the KDI and overall guidance from the MOEF of Korea, the Korea Institute for Development Strategy (KDS) and Biodiv Inc. Consortium implemented the project from November 2020 to September 2021, with the project team headed by Dr. Minho Lee, the Principal Investigator (PI). The project team consisted of researchers, project officers, and local consultants for the effective joint research.

<Table> 2020/21 Knowlede Sharing Program with Ethiopia

No.	Sub-topics	Researchers	Local Consultants
1	Analyzing Ethiopian Agricultural Development Policy and Selecting Prioritized Agricultural Commodities	Minho Lee (KDS)	Ibrahim Worku Mohammed (Freelance)
2	Identifying Constraints to Supply Chain Connectivity of the Prioritized Agricultural Commodities	Tae Yu Yun (Biodiv Inc.)	Adane Bulo Dabissa (Freelance)
3	Policy Recommendation for Improving Supply Chain of Strategic Commodities	Young Ho Park (KIEP)	Amir Seid Hussen (Freelance)

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  Sanghoon Ahn (Former Executive Director, CID, KDI)
- Project Managers: Hokyung Bang (Director, CID, KDI)
  Kyung-Bae Park (Senior Vice President, KDS)
- Principal Investigator: Minho Lee (Senior Research Fellow, KDS)
- Researchers: Tae Yu Yun (CEO, Biodiv Inc.)
  Young Ho Park (Senior Research Fellow, KIEP)
- Project Officers: Nari Ahn (Senior Research Associate, CID, KDI)
  Hyung Suk Choi (Team Manager, KDS)
  Young Jin Kwon (Programme Officer, KDS)

Due to the global pandemic of COVID-19, the research was mostly conducted through collaborative efforts. The Ethiopian counterpart actively participated in the project and recommended a total of three local consultants. The local consultants showed devoted commitment to supporting the project while playing an important role in collecting local data and analyzing the current status in Ethiopia. With great supports from the MoA and the local consultants, the project was carried out smoothly following the procedures below.

1. Launching Seminar

On January 29, 2021, the official KSP launching seminar was held to introduce the research plan and briefly share Korea's agricultural development experience to the officials of the MoA of the Government of Ethiopia. The seminar was conducted through an online conference due to the COVID-19 crisis. The launching seminar also included a briefing by the MoA on the current status of Ethiopian agricultural sector and its political needs, followed by Q&A sessions on the research topics. During the seminar, participants discussed the KSP topics in depth while displaying their support and cooperation throughout the project.

2. Pilot Study

Between February 1, 2021 and April 9, 2021, the KSP research team conducted a pilot study to identify Ethiopian agricultural policies and select prioritized agricultural commodities. During the survey, the Korean researchers and the local consultants interviewed 15 Korean experts, who have experiences in African agriculture projects, and 20 Ethiopian experts such as public officials of the MoA, IAIPs, and private sector experts. At the same time, information on the latest Ethiopian agricultural policy and Integrated Agro-Industrial Parks (IAIPs) law and other relative data was gathered and analyzed.

3. Policy Seminar

On April 12, 2012, the KSP research team held the Policy Seminar through an online conference to report the progress of the research, discuss and collect feedback, and collect additional data. On the heels of researchers' presentations on each topic, discussions were held on the follow-up schedule of the project. A real-time Activity Arrangement (AA) signing ceremony was held together during the policy seminar to revitalize interests in the project and encourage the Ethiopian counterpart to actively support future project schedules.

4. In-depth Study

From April 4 to May 22, 2021, the KSP research team conducted the in-depth study on areas that require additional investigation for each topic. Since it was impossible for the Korean research team to visit Ethiopia in the COVID-19 crisis, the in-depth study was

conducted through the local consultants via on-site visits and interviews with stakeholders. The in-depth study was conducted twice in the Oromia region (from April 4 to April 28, 2021 and from May 4 to May 12, 2021), and once in the Amhara region (from May 16 to May 22, 2021). During the survey period, the supply chain of the top strategic crops in this study, wheat and sesame, were surveyed respectively. In order to analyze the local supply chains, the key players involved and the surrounding environment for each supply chain were examined.

5. Interim Reporting and Policy Practitioners' Workshop

On June 10, 2021, the KSP research team conducted a Practitioners' Workshop with the MoA and relevant ministries and organizations including the Ministry of Finance and Economic Development, the Ministry of Trade and Industry, Ethiopia Commodity Exchange Authority, Policy Studies Institute, and the Federal Cooperative Agency. The Policy Practitioners' Workshop was replaced with real-time online lectures as visiting Korea was not a viable option due to the COVID-19 situation. In order to share Korea's experiences such as Korean policies and industrial facilities related to the research topics, real-time lectures were given by the National Agricultural Products Quality Management Service (NAQS), the Korea Seed & Variety Service (KSVS), and the Korea National Food Cluster (FOODPOLIS). Along with online real-time training, the Korean research team also promoted the production of training videos to be delivered to Ethiopia. A total of two training videos have been produced with the cooperation of the FOODPOLIS and KSVS, which were delivered to the MoA in September and October 2021, respectively.

On June 11, 2021, the Interim Reporting was held with the MoA and the local consultants to present the interim report and discuss the feasibility of tentative policy recommendations. There was an active exchange of the views between the two countries which has been incorporated into the final report.

6. Final Reporting Workshop and Senior Policy Dialogue

On September 8, 2021, the KSP research team held the Final Reporting Workshop and Senior Policy Dialogue through online-video conference, with the MoA, relevant ministries and organizations, and local consultants in Ethiopia to present final reports and the policy

recommendations. In addition, the KSP research team released the first video of the Policy Practitioners' Workshop. Based on the research results, the Korean researchers made a detailed presentation of the policy recommendations, and the Advisor of the State Ministry of the MoA of Ethiopia expressed appreciation for the success of the KSP project despite COVID-19 situation and emphasized the importance of strengthening the cooperation between the two countries.

Executive Summary

Minho Lee (Korea Institute for Development Strategy)

Executive Summary

Minho Lee (Korea Institute for Development Strategy)

The Government of Ethiopia (GoE) deployed the Homegrown Economic Reform (HGER) strategy program in 2019 and the Ten-Year Perspective Plan (TYPP) (2021-2030) which include development strategies for each industrial sector. This macroeconomic reform plan has been required to address high inflation, external debt distress, and foreign currency shortages caused from the growth of jobless with public investment. Thus, in order to achieve these main objectives, the TYPP identifies the private sector as the leader in productivity and growth enhancement. The economic target is to increase exports and replace imports by enhancing agricultural productivity and the agri-food industry. In this project, three topic studies were conducted at the request of the GoE to analyze the current Ethiopian agricultural development policy in the context of the macroeconomic reform plan in order to derive appropriate policy measures to foster agro-industrial development, especially in a way to improve the agricultural supply chain connectivity.

- Chapter 1: Analyzing Ethiopian Agricultural Development Policy and Selecting Prioritized Agricultural Commodities
- Chapter 2: Identifying Constraints to Supply Chain Connectivity of the Prioritized Agricultural Commodities
- Chapter 3: Policy Recommendations for Improving Supply Chain of Strategic Commodities

According to the analysis result in Chapter 1, the current agricultural policy articulated from the country's TYPP has some negative attributes. Thus, some strategies for improving the agricultural policy implementation were identified through the crossed SWOT analysis as follows: 1) policy-project development in agro-industrial sector utilizing agro-ecological resources, 2) strengthening collaboration partnership/programs between the governmental agricultural agencies and the international development partners, 3) service and regulation improvement for agricultural product supply focused on the industrial sectors, 4) supporting

low-cost and climate-smart agriculture for smallholders to make their livelihood possible, 5) fostering commercial farming and agri-entrepreneurs to expand their farm land and business, and 6) fostering export agriculture as well as self-sufficiency of staple food with a large import substitution effect.

Recently, the GoE's intervention to foster the agro-industry, including primary production and agro-processing, has been realized as regional Integrated Agro-Industrial Parks (IAIPs) with a concentration of comprehensive national capacities on the basis of major strategic crop commodities by region. This study was conducted to survey the current status of the IAIPs and the status of the strategic crop commodities of the IAIPs. In particular, this project focused on the supply chain connectivity and on a very limited number of strategically prioritized crop commodities for hands-on policy recommendations from the Korean agri-food industrial development experiences like the Korea National Food Cluster, FOODPOLIS. It is not spontaneously generated but created by the national government with policy will for an integrated agri-food industry. The FOODPOLIS developed a one-stop-service not only for administration but also for various services including R&D service, supply chain networks and financial support. Thus, it can be a useful strategic model for the Ethiopian government's IAIPs, which is closely connected with the regional agricultural supply chains.

In order to foster export agriculture or import substitution with Ethiopian agricultural products, it is necessary to induce agriculture and manufacturing to produce their commodities that meet the quality standards and quantities required by the global markets. Thus, it is necessary to establish a successful model in a small number of strategic crop commodities for the GoE to effectively grow the export agriculture. Among the main 10 strategic crop commodities of the IAIPs identified by the African Development Bank and the GoE, the selection of the prioritized crop commodities was conducted in this study. Selection criteria and indicators were weighted with the Analytical Hierarchy Process (AHP) method by 15 Korean experts, having experience on African agriculture projects, and the scoring of indicator values for each crop was surveyed from 20 Ethiopian experts such as public officials of the Ministry of Agriculture, IAIPs, and private sector experts. Through step-by-step analysis, wheat and sesame were ranked as the top two prioritized crop commodities, and it is suggested that these commodities are properly reflected in the GoE's policy interests in promising export commodity and import substitution commodity.

In Chapter 2, the supply chain of wheat and sesame were surveyed in Oromia and Amhara regions, respectively. In order to analyze the local supply chains, we examined the key actors involved and surrounding environment for each supply chain including inputs and supporting services. In addition, the survey was conducted in consideration of

practical aspects such as agricultural production, information acquisition, and post-harvest management where ICT and technology can be introduced. Agricultural product marketing strategy and quality control were focused in the survey. In addition, the overall situation of agricultural inputs, supporting services and relevant issues are investigated in the survey.

Major constraints of the wheat supply chain are observed in improved seed supply, such as the shortage of improved seed variety, short life span (3-5 years) of new released variety before they are susceptible to disease and harsh environment, shortage of row planter, and lack of integration of all stakeholders in seed sectors. The main issues in production are incidence of pest and disease, which is related to resistant varieties, agricultural standard technology, and other inputs like pesticides. Wheat (raw material) supply shortage to processors, shortage of standard warehouses, lower membership and trust of farmers in cooperatives, unregulated market with several players hoarding produce are significant in aggregation and trading. The constraints observed in supporting services and the business environment in wheat supply chain are: credit distribution that does not favor producers and their organizations due to lack of collateral, adulteration of higher quality wheat with lower quality wheat or foreign materials, weak awareness about quality at the farmer level, lack of integration of stakeholders responsible to ensure quality and standards, absence of regulatory framework for enforcing contract farming, inconsistency in the regulatory environment for transactions for cooperatives and other actors. As for the IAIP in Oromia, very limited awareness by key supply chain actors and supporting function stakeholders about the IAIP and its mode of operation, weak preparation, and lack of clarity about how the supply chain for IAIP will be organized.

Low productivity is a critical constraint in sesame. The major causes of low productivity are: lack of resistant and productive improved sesame varieties, few improved varieties released and critical shortage in their supply, lack of knowledge and willingness to use fertilizer and large modern machineries, shortage of pesticide supply, outbreaks of pest and disease, climate change, high cost of harvest. Harvest and post-harvest loss are more significant in sesame compared to wheat. Limited value addition on sesame within the country, higher domestic price, lower membership of farmers in cooperatives are the main constraints in marketing. As for exporting, contract default in export sales, international price instability and stiff competition in the international market are the main pressures. The major constraints of supporting services and the business environment in sesame supply chain are: access to finance for primary cooperatives and farmers, weak implementation of land management regulation. The cooperatives in the sesame supply chain also complained that cooperative marketing regulation restricted their marketing channels in contrast to regulation for traders and processors which exacerbated their

already weak competitiveness. The identified constraints of IAIP in Amhara are: production volume unable to satisfy the demand volume of IAIP industries, weak preparation, and lack of clarity about how the supply chain for IAIP will be organized. For instance, there is no clarity around how the RTC and primary collection centers will be integrated as well as the role of ECX and the lack of skilled manpower for the industries operating in the IAIPs.

After analyzing the stakeholders and the cause of the problem, some recommendations were made in consideration of feasibility. Technical transfer cooperation with Korea can be arranged on improved variety seeds development, as well as the establishment and dissemination of cultivation technology. From a long-term aspect, research on varieties of major crops is required, including sesame and wheat, led by EIAR cooperating with other countries. In addition, the national certified seed supply system can be improved by sharing experience with Korea. From the Ethiopian government's standpoint, it is critical to trace transactions in order to impose appropriate taxes, and to accurately predict supply and demand by knowing the production, inventory, and distribution of agricultural products and agricultural materials; it is possible to establish strategies and prepare countermeasures accordingly. Therefore, to monitor and manage information flow through the whole supply chain, using a digitalized system needs to be considered. In the context of digitizing and management system of data and information, it is believed that cooperation sharing based on Korea's excellent ICT technology is possible.

Chapter 3 identifies prioritized interventions and provides policy recommendations for addressing the obstacles identified in the preceding chapter. This chapter begins with recognition of the importance of strategic commodities, which offer multiple/dimensional values. Supply chain mapping of strategic crops reveals that cash crops are relatively structured, whereas staple crops are unstructured. Fragmentation is evident within the supply chain of wheat because the crop does not have active transactions and consequently has low connectivity with its markets.

The majority of policy recommendations presented in this study, though not all, are based on Korea's successful agricultural development experiences. Given that Korea and Ethiopia have different initial conditions such as their farming systems, soil, and climate, there are many Korean experiences that are not appropriate to share with Ethiopia. However, on the other hand, it is also true that Korea has a wealth of agricultural development experiences which are applicable to Ethiopia. This research explored what Korean policy experiences could be shared with Ethiopia through literature reviews as well as group discussions with experts in both Ethiopia and Korea. The result is that Korea has a variety of policy experiences that can be shared with Ethiopia throughout the supply chain, especially in

terms of seeds, fertilizers, agricultural machinery, post-harvest management, distribution, agricultural product quality management, and cooperatives.

This study pays attention to the following topics for the supply chain development of target commodities: capacity building of cooperatives, attracting foreign direct investment (FDI), private sector development (PSD), and strengthening institutional capacities for effective implementation of policy tasks.

01

CHAPTER

Analyzing Ethiopian Agricultural Development Policy and Selecting Prioritized Agricultural Commodities

Minho Lee (Korea Institute for Development Strategy)
Ibrahim Worku Mohammed (Local Consultant)

Keywords
Ethiopian Agriculture, Agricultural Development Led Industrialization (ADLI), Homegrown Economic Reform (HGER), Ten Year Perspective Plan (TYPP), Integrated Agro-Industrial Parks (IAIPs), Prioritized Crop Commodity, Agricultural Supply Chain, Integrated Agri-Food Industry, Korea National Food Cluster

Analyzing Ethiopian Agricultural Development Policy and Selecting Prioritized Agricultural Commodities

Minho Lee (Korea Institute for Development Strategy)
Ibrahim Worku Mohammed (Local Consultant)

Summary

The Ethiopian economy has been accelerating for the past 15 years with a remarkable nearly double-digit real GDP growth. High public investments in infrastructure, human resource development, and economic reform have been effective in the economic growth. However, the public investment has not entirely been successful in achieving structural transformation and stimulating exports. In order to solve these macroeconomic problems, the Government of Ethiopia (GoE) deployed the Homegrown Economic Reform (HGER) strategy program in 2019, and the main contents of the HGER program, the Ten-Year Perspective Plan (TYPP) (2021-2030), include development strategies for each industrial sector. This macroeconomic reform plan has been required to address high inflation, external debt distress, and foreign currency shortages caused from the growth of jobless with the public investment during the GTP II period (2016-2020). Thus, in order to achieve these main objectives, the TYPP identifies the private sector as the leader in productivity and growth enhancement. The economic target is to increase exports and replace imports by enhancing agricultural productivity and the agri-food industry. The agricultural sector has planned to raise the incomes and livelihoods of farmers and pastoralists, and to end poverty by making agriculture more productive and competitive. This project was conducted to analyze the current Ethiopian agricultural development policy in the context of the macroeconomic reform plan in order to derive appropriate policy measures to foster the agro-industrial development, especially in a way to improve the agricultural supply chain connectivity.

According to the analysis result, the current agricultural policy articulated from the country's TYPP has some negative attributes. A strategic plan must show how it could improve itself using continuous monitoring and evaluation (M&E) tools. In this regard, the current agricultural policy does not show boldly how the policy sustainably improves plans and piling up experiences. In addition, even the governmental agricultural extension

agencies have been well organized in Ethiopia, the extension workers have a low level of specialized knowledge and skills. The policy had to put in place an unambiguous approach to foster experts in agricultural extension service providers. Thus, some strategies for improving the agricultural policy implementation were identified through the crossed SWOT analysis as follows: 1) policy-project development in the agro-industrial sector utilizing agro-ecological resources, 2) strengthening collaboration partnership/programs between the governmental agricultural agencies and the international development partners, 3) service and regulation improvement for agricultural product supply focused on the industrial sectors, 4) supporting low-cost and climate-smart agriculture for smallholders to make their livelihood possible, 5) fostering commercial farming and agri-entrepreneurs to expand their farm land and business, and 6) fostering export agriculture as well as self-sufficiency of staple food with a large import substitution effect. In consideration of the TYPP's development targets in the manufacturing and agricultural sector, in which domestic agri-food products locally manufactured will substitute imported goods like wheat-based products and cooking oils. In order to realize policy implementation, it is necessary to improve the agricultural sector policy in terms of the agricultural supply chain connectivity. Since the manufacturing industry using primary agricultural products requires large-scale agricultural products to meet the expanded domestic and international market demand, the agricultural sector needs to take responsibility for supplying agricultural products at an affordable level.

Recently, the GoE's intervention to foster the agro-industry, including primary production and agro-processing, has been realized as regional IAIPs with a concentration of comprehensive national capacities on the basis of major strategic crop commodities by region. The IAIPs projects are being implemented in four regions by the GoE, with the support of several bilateral and multilateral development banks to complete the regional industrial parks. This study was conducted to survey the current status of the IAIPs and the status of their strategic crop commodities. In particular, this project focused on the supply chain connectivity and on a very limited number of strategically prioritized crop commodities for hands-on policy recommendation from the Korean agri-food industrial development experiences like the Korea National Food Cluster, FOODPOLIS. The Korea National Food Cluster is not spontaneously generated but created by the national government with policy will for an integrated agri-food industry. The FOODPOLIS can be a useful strategic model for the Ethiopian government's IAIPs, which are closely connected with the regional agricultural supply chains. The FOODPOLIS has developed the one-stop-service not only for administration but also for various services including R&D service, supply chain networks and financial support.

In order to foster export agriculture or import substitution with Ethiopian agricultural products, it is necessary to induce agriculture and manufacturing to produce their commodities that meet the quality standards and quantities required by the global markets. Thus, it is necessary to establish a successful model in a small number of strategic crop commodities for the GoE to effectively grow the export agriculture. The GoE has already selected the 10 strategic crops for the IAIPs through an economic feasibility evaluation with AfDB. From this strategic approach, among the main strategic crop commodities of the IAIPs, the selection of the prioritized crop commodities was conducted in this study. Considering the vulnerability of supply chains from the demand side after the COVID-19 pandemic, some strategic commodities were excluded in the study even if they are strategic crops for the IAIPs.

Selection criteria and indicators were weighted with the Analytical Hierarchy Process (AHP) method by Korean experts, having experience on African agriculture projects, and the scoring of indicator values for each crop was surveyed from Ethiopian stakeholders such as public officials of the Ministry of Agriculture, IAIPs, and private sector experts. Through step-by-step analysis, sesame and wheat were ranked as the top two prioritized crop commodities, and it is suggested that these commodities are properly reflected in the GoE's policy interests in promising export commodity and import substitution commodity. That is, sesame and wheat were selected as the prioritized crop commodities in terms of export trade increase with primary processed production and staple food self-sufficiency (import substitution), respectively.

1. Introduction

The Ethiopian economy registered a remarkable real GDP growth of average 9.8% over last 10 years from 2010 (World Bank, 2021). Ethiopia's economy grew by 6.1% in 2020, down from 8.4% in 2019, largely because of the COVID-19 pandemic (AfDB, 2021). However, it is a very good performance compared to the global economic downturn. The growth was led by the service and industry sectors. Export revenues increased by 12% in 2020, as exports of gold, flowers, coffee, and Chat (Khat) increased while imports declined by 8.1%. This has had the effect of alleviating Ethiopia's chronic current account deficit. In the mid to long term, economic growth is expected to recover again during 2021 (Moody's, 2021a[1]).

1 Moody's downgraded Ethiopia's B2 rating in March 2021 to Caa1 in May (Moody's, 2021b). However, this is not a judgement based on macroeconomic trends, but rather a warning that the implementation of the existing reform promises is insufficient. Thus, in this study, Moody's evaluation of Ethiopia's macroeconomic trends in March 2021 is still valid.

Economic growth is further encouraged by non-traditional sectors, such as manufacturing and services, much of the manufacturing, including textile and leather industries, and service industries are based on agriculture. When service sector exports declined by about 6% caused from lower revenue of Ethiopian Airlines in the COVID-19 pandemic (AfDB, 2021), agri-business services contributed the high increased export revenues with the agricultural commodities. Thus, agriculture-led industrialization has been fostered from by the Government of Ethiopia (GoE) while the agriculture sector's share of GDP shrank by 18.7% between 2010 and 2019. Notably, the Homegrown Economic Reform (HGER) program (Federal Democratic Republic of Ethiopia, 2019), under the leadership of Prime Minister Abiy Ahmed, planned to privatize leading state-owned enterprises, and to shift toward market-based reforms. This is a macroeconomic reform plan in accordance with the need to address high inflation, external debt distress, and foreign currency shortages caused from the growth of the jobless with the public investment led model of Growth and Transformation Plan (GTP) II (2016-2020) which reflects the GoE's economic development vision.

Agricultural productivity has grown rapidly in the past decade in Ethiopia due to intensification of agricultural inputs. However, it was limited to only some key crops and remains insufficient to meet domestic food security and industrial needs. In 2019, Ethiopia imported over 195 million USD of cereals, including wheat and other staple grains for which the country has sufficient domestic production capacity. The governmental interventions are focused on the import substitution of wheat, cotton, rice, and oilseeds for export commodities to generate foreign exchange.

Therefore, the structural transformation in agriculture is being required to increase commercialization, that is market-driven agricultural production, productivity improvement and value addition. An especially effective linkage between agricultural producers and commodity markets is needed through an agri-food supply chain. However, the Ethiopian economy has limited processing capability and restricted products to penetrate the domestic and international markets. This requires interventions that implement an efficient output market system addressing quality products and build the institutional capacity of market actors to facilitate supply chain linkages. In order to accelerate growth in the agri-food industry with a focus on strategic crops for exports and import substitution, the GoE has established IAIPs in four pilot areas: Amhara, Oromia, SNNP, and Tigray regional states. These pilot project areas are mainly based on the potential of existing agricultural resources and related sectors, infrastructure, and facilities. The establishment plan of the regional IAIPs has been supported by the HGER program, and the Korean EXIM Bank is the biggest initial investor providing 50 million USD of the soft loan among the total cost of 85.9 million USD (AfDB, 2018).

In addition, as the economic grows, consumer demand for processed foods, such as cooking oil, sugar, meat and dairy products, wheat-based products and beverages, are expected to increase in Ethiopia. In order to satisfy the customers' growing needs, the increased production from investments in the local agro-processing sector are expected as well. Thus, it is important to promote an integrated agri-food industry through the policy program like the IAIPs in order to meet the national tasks of food security, fostering export agriculture, and satisfying consumer trends in food demand.

The developmental path of the integrated agri-food industrial supply chains has been experienced also in Korea. Therefore, in order to share the Korean knowledge and experience in the related development, Chapter 1 has been conducted to analyze the Ethiopian agricultural development policy, including the IAIPs plan, from the perspective of the integrated agri-food industry and to identify strategic crops from an economic and social perspective and to select the top two prioritized agricultural commodities among the main strategic crops to be distributed as value-added food products through the IAIPs. Chapter 2 is intended to analyze constraints in supply chains of the selected commodities through an on-site survey and to suggest a phased practical solution against the main constraints. In addition, Korean development experiences are reviewed for their application to Ethiopia's overall agro-industrial development in Chapter 3 and, under the applicability of Korean experiences, policies are recommended for improvement of the integrated agri-food supply chain connectivity.

Among the main strategic crop commodities of the IAIPs,[2] it is necessary to establish a successful model in order for the GoE to grow effectively the export agriculture and to substitute food imports. Thus, the selected commodities among the strategic crops in Chapter 1, are able to be considered as model resources for the establishment of fostering export agriculture or import substitution. Selection criteria and indicators were weighted with the Analytical Hierarchy Process (AHP) method by Korean experts, having experience on African agriculture projects, and the scoring of indicator values for each crop was surveyed from Ethiopian stakeholders such as public officials of the Ministry of Agriculture, IAIPs, and private sector experts. Through step-by-step analysis, two of the top prioritized commodities have been selected in terms of export trade increase with primary processed production and staple food self-sufficiency (import substitution), respectively.

2 Top 10 strategic commodities for the IAIPs presented by the economic feasibility evaluation with AfDB (2018).

<Box 1-1> Concept of Agricultural Supply Chain

In this study, the agricultural supply chain means a logical linkage among the input suppliers, producers, primary agro-processors (sorting, cleaning, storage and packing), logistics/distributors, secondary processors and market area. Through the supply chain connectivity, primary agricultural products are collected, stored, and distributed to the next stage actors, where they undergo processing and become food or processed commodities with added value.

Since most developing countries are vulnerable in agricultural production and primary processing, it is very difficult to produce value-added products in the forward chain (Nicita *et al.*, 2013). Currently, global manufacturing and service trade are closely linked to the global value chain (GVC), and supply chains are diversifying, whereas Ethiopia relies on simple manufacturing and production chains. GVC is focused on specific sectors and small numbers of companies, centering on three regional hubs in East Asia, Europe, and North America, and the supply chain of materials and parts is being segmented and divided into several countries. Therefore, Ethiopia needs to find a strategy for linking GVC to respond to this trend. However, as recommended in the UNCTAD (2013) report, in view of Ethiopia's current manufacturing capacity, efforts to increase agricultural production and primary processing capacity need to be preceded. From this point of view, this study focused on strategies and prioritized crop commodities that could strengthen the supply chain connectivity based on agricultural production and primary processing rather than the overall value chain approach.

Source: Authors.

2. Analysis of the Ethiopian Agricultural Development Policy

2.1. Brief Review of Agricultural Development Policies

Historically, the GoE has implemented agricultural development policies in line with the national economic development strategy. Particularly, the GTP I (2011-2015) and II (2016-2020) under the Agricultural Development Led Industrialization (ADLI) strategy has raised productivity in agriculture since 1991. Through the GTP I and II, the GoE abolished all subsidies and price support measures in agriculture. The way of agricultural transformation was to reduce the role of the government and increase the role of the market (Shikur, 2020). These policy interventions have resulted in increased agricultural productivity and reduced rural poverty. The poverty headcount, in terms of percentage of the population, declined by 15 percentage points from 38.7% in 2004 to 23.4% in 2015 (Federal Democratic Republic of Ethiopia, 2016; The World Bank Data, 2021).

The main strategic pillars for agricultural and rural transformation promoted in the GTP II are as follows (Federal Democratic Republic of Ethiopia, 2016);

(1) Strengthening the development of crop and pastoral agriculture of smallholders and thus, mobilizing them for growth and rural transformation during the GTP II strategy period;
(2) Full support for youth education and employment in terms of agricultural investment;
(3) Attraction of foreign investment in agricultural sectors such as crops, flowers, vegetables and fruits, and livestock;
(4) Implementation of the scaling up strategy proper to the diversified agro-ecological development zones; and
(5) Preparation of integrated solutions to the constraints and challenges for the supply of agricultural inputs and the use of agricultural technology.

Although poverty reduction yielded remarkable results through national economic development, it has been observed that agricultural growth under the GTP II plan is limited if the government cannot mobilize the massive financial investment required (Federal Democratic Republic of Ethiopia, 2019). During the GTP I and II period, the agricultural sector has received particular attention, yet the sector is still characterized as the least productive. Specifically, GTP II had clear vacuums in inducing internal structural changes and modernization of the agriculture sector. Since the sector is potentially dependent on rain-fed and fragmented farming systems, the rural population has been struggling for survival during drought and many rural dwellers are living life below the poverty line. Thus, the GoE established the new macroeconomic reform plan, HGER, sustaining economic growth in a way that could create jobs through private sector-led equity financing instead of governmental debt financing.

There have been significant political commitments in the HGER program to improve all-round support given to all actors in the agricultural sector, especially to improve the role and participation of the private sector improving supply of inputs and finance, improving agricultural production methods, reducing post-harvest loss, and promoting import substitution on major agricultural crop production, as well. Through the structural reform process, policy intervention is expected to design an import substitution strategy, saving large sums of foreign currencies expenditure including edible oil, wheat, and other commodities by domestic production. In addition, the IAIPs have been established in order to encourage domestic job creation as well as Foreign Direct Investment (FDI).

In accordance with the macroeconomic reform agenda, a long-term development plan with a duration of ten-years (2021-2030) has been prepared including the agricultural sector (Planning and Development Commission, 2020). The Ten-Year Perspective Plan (TYPP) identifies the private sector as the leader in productivity and growth enhancement through the strengthened public-private partnership. The main objectives of the agricultural development plan are to raise the incomes and livelihoods of farmers and pastoralists, and end poverty by making agriculture more productive and competitive. The following targets have been set to accomplish the objectives of agricultural development plan until 2030 (Planning and Development Commission 2020):

- To increase the total annual quantity of crop production in all production systems from 543 million quintals[3] to 925 million quintals;
- To increase horticulture production from 181 million quintals to 261 million quintals;
- To increase the quantity, variety, and productivity of livestock and fisheries;
- To reduce annual soil pollution from its current level of 20.5 tons CO2E per hectare to 15.84 tons CO2E per hectare by enabling farmers and pastoralists to adopt improved technologies and practices, in order to ensure sustainable development and utilization of natural resources;
- To raise the rate of annual increase of soil carbon content from 1.8% to 2.18% by increasing the amount of additional annual biomass quantity from 27 million metric tons to 75.2 million metric tons;
- To establish associations vested with legal personality for 10 thousand catchment areas in order to enhance sustainable natural resources development, management and conservation; and
- To enhance the reduction of greenhouse gas emissions from 36.84 million metric tons to 125.8 million metric tons by mainstreaming environmental issues into sectoral plans and by implementing a green economy strategy as an integral part of regular work programs.

Such development targets in the agricultural sector need to be linked to the integrated agri-food industrialization policy in consideration of the targets in the manufacturing sector, in which the domestic market share of locally manufactured industrial products will increase from 30% to 60% by expanding manufacturing industries that produce substitutes of strategic import goods like wheat and cooking oils (Planning and Development Commission 2020). In addition, the manufacturing sector will raise the number of small and medium-scale manufacturing enterprises (SMEs) from 2,000 to 11,000 by attracting high quality investments and focusing on those industries that employ advanced technologies.

3 1 quintal = 0.110231 ton

Therefore, it is necessary to take over the targets of fostering SMEs and creating jobs in the agri-food industry, including agro-processing and agri-business services.

2.2. Analysis of the Current Agricultural Development Policy

In order to analyze the Ethiopian agricultural development policy based on the TYPP and the HGER program under the agri-business environment context, a SWOT analysis was conducted with focus group interviews (FGIs) with over 20 of Ethiopian experts and public officials from the Ministry of Finance, Ministry of Agriculture, Ethiopian Commodity Exchange Agency (ECXA), and IAIPs (See Box 1-2 and Table 1-1) in participation.

<Box 1-2> Overview of Focus Group Interviews (FGIs) on the Ethiopian Agricultural Development Policy

A total 20 of Ethiopian experts and public officials were interviewed through FGIs via in-person interviews or telephone interviews from February 1st to April 9th, 2021 in this study. The policies and the strategies here include the GTP II, HGEP, and the agricultural strategic plan in the TYPP. The interviewees were asked to describe their experiences and views on general and implementing strengths, weaknesses, opportunities and threats of Ethiopia's national agricultural strategy and policy. In particular, they were asked to look the attributes in the recent national strategy and policy for promoting the IAIPs as well as the priority of strategic crops of the IAIPs. The organizations interviewed were as follows:

- Ministry of Agriculture;
- Ministry of Fimamce;
- Ethiopian Commodity Exchange Agency (ECXA); and
- Integrated Agro-Industrial Parks (IAIPs) and three private sector investors.

Source: Authors.

For the detailed analysis, the attributes of SWOT were analyzed by dividing the characteristics of the agro-industrial policy itself and the agricultural business environment related to the policy.

<Table 1-1> SWOT Analysis of the Agro-Industrial Policy and Related Business Environment in Ethiopia

Strengths	Weaknesses
<Agro-industrial policy>	
• Large share of the country's GDP is coming from the agriculture sector, which helps make strong policies • Well-articulated and comprehensive policy document with clear outcome measurement indicators that could be used for monitoring & evaluation • It embraces development agencies like agricultural extension agencies and strong research institutions • The policies accommodate wide exploitation of the country's irrigation potential by expanding relevant infrastructure • The policies alleviate financial gaps (*e.g.*, establishing of Agricultural Bank); strongly recommend foreign aid funds	• Weak stakeholders' integration • Land policy in relation with ownership of fragmented lands • Costly agricultural inputs (not arriving on time) • Extremely low achievements caused from a limited policy implementation potential • It is not clearly stated a mitigation plan during external shocks (less resilient to observe shocks and alternative financing during shocks are not portrayed well) • To transform agriculture, 10% of the country's annual budget may not be sufficient • Many of agricultural policies have been focusing on raw products which are usually followed by low returns (primary products are the focus with limited value add) • Very weak capacity building strategies particularly for special skills (*e.g.*, low specialized agricultural extension workers) • Complex bureaucratic management chains hinder realization of the policy • Lack of alternatives to reduce the chemical hazard to imported poor agro-chemicals like fertilizer • International failures in sustainably improving plans and piling up experiences
<Policy-related business environment>	
• The policies give high weights to market linkages with the IAIPs and international markets • High governmental commitment towards agricultural modernization, market-led agricultural policies give relative freedom to the farmers and other stakeholders • Policy advocates improved agricultural input supply, including improved seeds, for productivity • The 10 years strategic plan harbors big commercial and mechanized agricultural practices as well as small land owner's mechanization and clustering • The policies advocate agricultural products' demand as basis and incorporate the role of private sector investment • Favorable environmental condition and cheap labor for agricultural production	• Low institutional setup • Rain-dependent agriculture • Huge shortage of agricultural technology supply, relatively low investment in agricultural sectors • Very traditional agricultural technology supplying system • Weak infrastructure in the supply chains such as warehouses, poor cooling system, road connectivity, etc. • Big gap in plant and animal health service delivers due to poor infrastructure (*e.g.*, unstructured medicines supply chain) • Low financial resources to fully functioning the policy • Not accommodated with much planting permanent and drought resistant cash crops

<Table 1-1> Continued

Opportunities	Threats
<Agro-industrial policy>	
• Splendid experience in agricultural extension advisory system • Ever-increasing international development partners participation in agricultural sector • Increasing number of agricultural TVET colleges	• Job creation strategies that are not in harmony with the majority of the population living in rural areas • Constraints in external technology supply, and expertise scarcity in some specialized fields • Existence of legal and constitutional barriers (*e.g.*, land ownership problems) • Budget (financial) constraints • Practical marginalization and demotivating private sectors (*e.g.*, no performance-based appreciation, rewards, loans, etc.)
<Policy-related business environment>	
• Vast arable land, owing sustainable sufficient water resources • Big productivity potential which could be improved just by using simple technological packages • Diversified organic genetics/species (*e.g.*, high number of animals) and agro-ecology • Domestic and international public awareness and interest for organic agriculture products • Existence of abundant labor force • Rising demand due to population growth • Construction of many IAIPs which needs large volumes of input supply • The culture and religious integrity among the farmers help in cluster farming • Rich in cultural and indigenous farming skills • Wide private sector powers that could participate in the sector • Expected to increase FDI attraction under normal conditions though some decline seen in recent times • Presence of wide global market demand for agricultural products, especially being near to Middle East market which has low agricultural production environment • Large regional market (*e.g.*, the Africans Continental Free Trade Areas, ACFTA) • Increasing trends in food prices globally	• Low awareness for Ethiopian products globally • Unexpected global crises like COVID-19, international sudden price decline, etc. which can distract the value chains • High global market production • Political interference by other countries like UAE • Extended input supplies constraints • Unpredictable climate change which could result in extremely devastating natural hazards • Gradually growing political instability caused from ethnic diversity • Growing shortage of foreign currency • Exponentially growing inflation rate • Poor infrastructure and unorganized market supply chain • Diseases and pest invasion • Chemical discharged from imported fertilizers may mutilate the fertility of the land and affect the environment thereof

Source: Authors.

In terms of strength and opportunity attributes, the GoE has high government commitment towards agricultural modernization, and market-led agricultural policies give relative freedom to the farmers and other stakeholders. In addition, the government has development agencies such as agricultural extension agencies and strong research institutions. The policy implementation is able to be achieved with favorable environmental conditions such as vast arable land, big productivity potential, abundant labor force, IAIPs being constructed and increasing international development partners.

However, Moody's evaluation on Ethiopia's Environmental, Social and Governance (ESG) is highly negative, as shown in the ESG Credit Impact Score (CIS-5) (Moody's, 2021b). It is caused mainly from the reliance on rainfall for irrigation, and recurring droughts can

have a significant negative impact on the agriculture and hydroelectric energy plants. The environment profile is also susceptible to nationwide outbreak of pests like locusts.

In addition, the current agricultural policy articulated from the country's TYPP has some negative attributes, weaknesses and threats. A strategic plan must show how it could improve itself using continuous monitoring and evaluation (M&E) tools. In this regard, the current agricultural policy does not show boldly how the policy sustainably improves plans and piling up experiences. One of the aims of the agricultural policies is to foster investor farmers. However, there is no clear and tangible evidence which show how many farmers become investors. Obviously, many Ethiopian farmers' levels of education is very low if not totally illiterate. The policy does not show capacity building strategies for the farmers to fill their skill gaps in modern agriculture.

Even though the governmental agricultural extension agencies have been well organized in Ethiopia, the extension workers have low specialized knowledge and skills. The policy had to put in place an unambiguous approach to make experts in agricultural extension service providers. One testing scenario for the agriculture is responding to natural shocks through the policy document. However, the document does not clearly state a mitigation plan during external shocks, i.e., shock forecasting capacity of the document is very minimal. When the policy and strategies were formulated, the approaches were top-bottom, i.e., policy makers and developers do not consult lower state and regional governments in a very desired manner. As a result, there is a vagueness among the implementing agents. The policies and strategies need to put emphasis on a climate-smart approach such as developing drought resistant cash crops. Persistent complaints by farmers and other stakeholders are raised regarding the chemical hazard from imported fertilizers solidified due to delayed supply. The current policy does not show alternative solutions to minimize the damage.

In addition to the above-mentioned weaknesses, the policy's full implementation is exposed for some threats. One potential challenge is the very low effort to advocate Ethiopian products at the international level. Secondary problems could be random and unexpected global crises like pandemics (*e.g.*, COVID-19), natural disasters (drought, extreme rainfall, etc.), high global market production and sudden decline of international prices. Thirdly, internal or external political and peace instability could be challenging against the realization of the policy.

Thus, even though the recent national agricultural development policies, especially based on TYPP, have a comprehensive document, it is necessary to improve their implementation plans or look for alternative solutions, in which their targets are vague or very challenging to achieve during the target period (*e.g.*, how to establish 10 thousand associations for

sustainable natural resources development and how to develop their human resources and organizational capacities, etc.). In order to find alternative solutions in agricultural policy, cross analysis between the internal attributes and the external attributes was conducted from the SWOT analysis. As Strengths-Opportunities (SO) linking strategy, three alternatives have been identified in this study as follows:

(1) **Policy-project development** in the agro-industrial sector utilizing agro-ecological resources: Ethiopia's abundant genetic resources can be utilized to develop various cash crops or materials of the agri-food industry through a policy-project designed by the GoE. These projects will mobilize rural communities, farmer cooperatives and associations, to participate in the training programs and collective activities for natural resource development and conservation.

(2) **Strengthening collaboration partnership/programs** between the governmental agricultural agencies and the international development partners: Agricultural research institutes, extension service agencies, universities and cooperative unions have their capacities to suggest or participate in collaborative programs to promote agricultural support from the international donors including Korea.

(3) **Service and regulatory improvement** for agricultural product supply focused on the industrial sectors, especially the IAIPs: It is required for the Ministry of Agriculture to expand more collaboration and support not only with farmer stakeholders but also with stakeholders in the food manufacturing industries and distributors. In particular, in order to promote the export of value-added products, instead of primary agricultural products, the food safety policy needs to satisfy the domestic and export market demand of the quality-improved agricultural raw materials.

As Weaknesses-Threats (WT) escaping strategy, the other three alternative approaches have been identified as follows:

(4) **Supporting low-cost and climate-smart agriculture for smallholders** to make their livelihood possible: In addressing the frequent climate crisis, it is necessary to develop many agricultural services and technologies to secure the livelihood of smallholders from the public as well as the private sectors. The government can support the private sector to find opportunities to apply their innovative technologies in these fields. Fertilizer distribution, for example, has been managed by the government-based public enterprise, Ethiopian Agricultural Business Corporation (EABC).[4] However, it is being required to improve fertilizer inventory management with a real-

4 The current status of inputs and supporting services including fertilizer distribution is explained in detail in Chapter 2.

time monitoring system for timely distribution according to cropping season. If the participation of private sector companies equipped with ICT technology is allowed, innovation of the fertilizer inventory management system will be possible.

(5) **Fostering commercial farming and agri-entrepreneurs** to expand their farm land and business: If the government removes regulations, businesses in the IAIPs can easily obtain raw agricultural produces from farmers investors of which capacities will be built as key partners in the agri-food supply chain.[5]

(6) **Fostering export agriculture as well as self-sufficiency** of staple food with a large import substitution effect: Exporting primary processed agricultural products, rather than directly exporting raw agricultural products, can be positive to food security and foreign currency acquisition.

2.3. Consideration of Policy Improvement to Address Constraints to Agricultural Supply Chain Connectivity

In consideration of the TYPP's development targets in the manufacturing and agricultural sector, in which the domestic agri-food products locally manufactured will substitute import goods like wheat-based products and cooking oils. In order to realize the policy implementation, it is necessary to improve the agricultural sector policy in terms of agricultural supply chain connectivity. Since the manufacturing industry using primary agricultural products requires large-scale agricultural products to meet the expanded domestic and international market demand, the agricultural sector needs to take responsibility for supplying agricultural products at an affordable level. Therefore, it needs an integrated agri-food industrial approach, not only in terms of agricultural production but also in terms of supply chain connectivity including post-harvest management, agro-processing as well as agri-business services. It will promote the agricultural industry and increase the commercialization in agriculture.

In order to connect the agricultural supply chain smoothly, the ability to supply raw agricultural products that meet the quantity and quality at the time the agri-food industrial actors need it is necessary. This is difficult to achieve with a simple production increase policy, instead, it requires both financial and technical support so that all actors participating in the supply chain can collaborate with each other. Several cases of Korean policies that contribute to creating such a business environment will be dealt with in the following chapters, including an integrated agri-food industry promotion policy in this chapter.

5 The expansion of contract farming scheme is discussed as a policy tool for fostering commercial farming in Chapter 3.

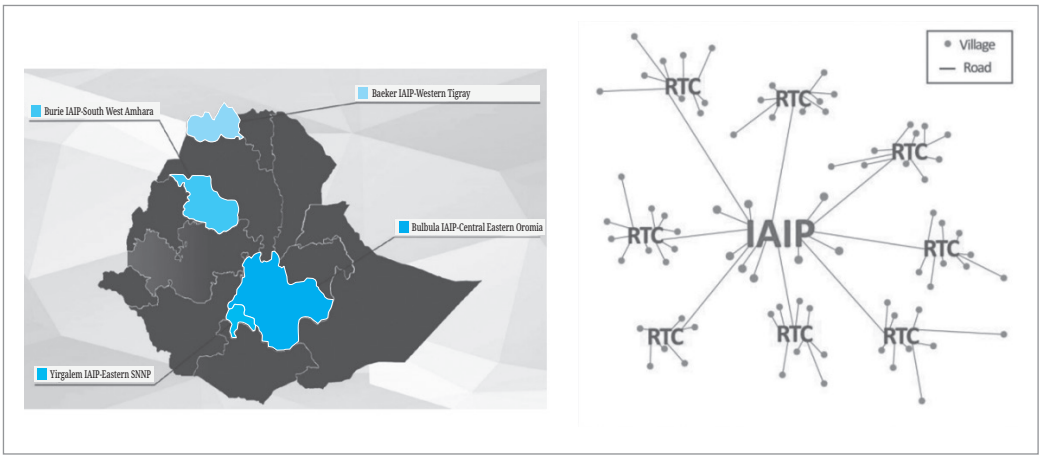
3. Current Situation and Prospects of the Integrated Agro-Industrial Parks (IAIPs)

3.1. Current Situation of the IAIPs

Ethiopia is striving to foster rapid industrialization by boosting the manufacturing and agro-processing industries, thereby to accelerate economic transformation. The GoE has placed top priority on the development of IAIPs. An IAIPs is an area with distinct boundaries designated by the appropriate organ, that is, the Ethiopian Investment Board (Federal Democratic Republic of Ethiopia, 2017), to develop a geographic cluster of independent enterprises grouped together to gain economies of scale and positive externalities by sharing infrastructure and taking advantage of opportunities for bulk purchasing and selling, training courses, and extension services. The IAIPs include open area production zones, controlled environment growing, precision farming, knowledge hubs and research facilities, rural hubs, modern infrastructure including collection centers, primary processing hubs, social infrastructure, and agri-marketing infrastructure. Each IAIP is served by a network of Rural Transformation Centers (RTCs) which provide linkages to producers.

The IAIPs supporting project (2019-2023), commenced by the GoE with many other Development Partners, provides part of the infrastructure required for agro-industrial activities on the four IAIPs and will develop requisite skills and agricultural value chain capacity to ensure competitiveness, productivity and inclusiveness in their operation (AfDB, 2018). For the implementation of the project, the GoE established the Industrial Park Proclamation (No.886/2015), the Industrial Parks Council of Ministers Regulation (No. 417/2017) as well as the Regional Industrial Park Development Corporation (RIPDC) as an Industrial Park operator. When the project is implemented as expected, the infrastructures such as waste management plants, potable water systems and 5 kilometer of access roads on two of the IAIPs will be built. In addition, training of public officials in Staple Crop Processing Zone (SCPZ) coordination; engagement of farmers, cooperatives and unions on value chain development; and equipping the youth with processing technology and entrepreneurial skills should be conducted. It is estimated that 200,000 (50,000 direct and 150,000 indirect) new and sustainable jobs will be created in the IAIPs by the project intervention until 2023. Specifically, human resources with agro-industrial skills will be prepared for over 6,000 youth and women under this project. Agri-businesses operating in the IAIPs will operate more efficiently at reduced costs in the Parks. About 200 new private sector investors are expected to set up in the IAIPs during the project period.

[Figure 1-1] Map of the 4 Regional Integrated Agro-Industrial Parks (IAIPs) in Ethiopia, and the Network Diagram of Rural Transformation Centers (RTCs) Supporting Each IAIP



Source: UNIDO (2015).

Currently, three IAIPs among the four IAIPs plan, namely Yirgalem IAIP in Eastern SNNP, Burie IAIP in South West Amhara and Bulbula IAIP in Central Eastern Oromia, are inaugurated. In this study, the focus has been only in Burie and Bulbula IAIPs as case study.

(1) **Sites-locations:** Both of the IAIPs are established in close proxies to places that are well-known in agricultural production and have a long history of agricultural trading. The sites are also made to be supplemented with the primary markets, in case of Amhara Regional State, and RTC/or Collection Centers in Oromia Regional State.

(2) **Internal layouts and infrastructure configurations:** the parks and their vicinity infrastructures have been built through a phase-by-phase manner. In their current status both IAIPs are packs with administration buildings, sample shades, and employees and employers' dormitories. The pedestrians, ditches and the asphalt roads for vehicles are well built. The pedestrian lights and waste management systems are environmental-friendly. The construction for utility services, especially for water, is under way. But the electricity and the internet services, which are indispensable for swift implementation of the IAIPs seem not yet in placed. In addition, plots are earmarked for prospective investors. Bulbula IAIP could have a capacity to host about 103 firms and Burie IAIP earmarked about 264 ha of land to reside firms.

(3) **Occupation rate:** currently in Bulbula IAIP two firms start machineries installations and operations. Whereas in Burie IAIP, one of the shades is occupied and five more investors are under their ways to construct their own shades. As the two IAIPs have just started their operation very recently, the overall occupation rates are very minimal.

3.2. Prospects of the IAIPs

3.2.1. Observational Assessment of the Regional IAIPs

Regarding the prospects of the Burie and Bulbula IAIPs, an observational assessment was conducted by looking at the infrastructure, occupation, human resources, and supply chain prospects of the IAIPs through the IAIPs-related stakeholder interviews (See Box 1-2).

(1) **Infrastructural prospect:** Since the country is striving to construct renewable power sources, they could help to supply the higher power demanded by prospective industries. Given that industries operating in the country in general are facing power outage and the current status of power infrastructure construction in the IAIPs may indicate that firms in the IAIPs could encounter a power shortage risk. For a sustainable power-supply, it is imperative to consider alternative power sources. The good news for telecom services for the IAIPs is that the provision of telecommunication services, long reserved by the government, is now open to the private sector. Perhaps this could bring an opportunity to configure robust IT-services both inside and outside the IAIPs. However, to take advantage of this opportunity, it requires an early push to a newly established consortium of private telecom services providers to supply strong alternative IT services to the IAIPs.

(2) **Occupational prospect:** Ethiopia is developing different types of manufacturing industry parks, and the overall occupation rate of these types of parks and the using rate of the shades for the planned purpose are encouraging. To replicate the same performance in the IAIPs, it is essential to exchange experiences from already established manufacturing parks. It was also recognized that continued efforts were required to attract more domestic and international investors and so as to improve the occupation rate. Unlike the already established manufacturing parks, the occupation and operation kick-off time gap in the IAIPs would be much higher due to the construction of shades in the IAIPs that will be made by the tenant firms themselves.

(3) **Human resources prospect:** Concerning the labor supply, given the country endowed with abundant labor, the IAIPs would have sufficient supply for labor input. However, the human capital development must be under way to induce the skills of the laborers. In addition, the IAIPs must be reconnected with an alternative transportation system and villages around the IAIPs must be endowed with well-established infrastructures so as to attract more labor inputs. The agro-industrial sector is expected to grow from

66,000 (2015) nationwide to 3.8 million employees in 2025. These forecasts indicate that the IAIPs will account for 85% of total agro-industrial jobs by 2025, and that 85% of the required workforce should be skilled with technical and vocational education (TVET) level. Therefore, it will require approximately 368,000 TVET graduates per year in the field of agro-processing nationwide in Ethiopia (AfDB, 2018). However, it is still unclear whether a TVET program has been developed for this purpose and how the education will be funded and implemented.

(4) **Supply chain prospect:** One of the main drivers of Ethiopia's economic growth is the increasing exports, of which agriculture contributes the most. The GoE appreciates the need to expand exports through agriculture. The IAIPs project provides an opportunity for the GoE to drive the necessary transition from a supply-oriented agriculture to a demand-driven agriculture. The IAIPs need reform across all parts of the agricultural supply chain: from primary agricultural production through the various stages of processing and trade, to wholesale and consumer markets, locally, regionally and globally. the IAIPs are mostly expected to get their input supplies from the agricultural production areas around them. However, according to an intuitive survey in this study, it was evaluated that the current production area/stakeholders are not closely connected to the supply chains in the IAIPs. Thus, it is expected that it may not be easy to secure sustainable input supplies for the IAIPs. Thus, in order to ensure good production inflow for the IAIPs, it may be necessary to adjust or include the existing agricultural distribution chain system around the IAIPs through introduction of modern agriculture and contract farming coordinated by the tenant firms in the IAIPs.

3.2.2. Weaknesses and Threats of the IAIP Strategies

Industrial parks have been focusing on areas of economic and social development in Ethiopia since decades ago. For developing countries like Ethiopia, constructing huge industrial parks are believed to contribute to poverty reduction by creating immense employment opportunities and generating income. In the third world nations in which the economy is mainly led by agriculture, industrial parks are primarily linked to agriculture. Agriculture-led industry, thus, is assumed to be the first step in structural reform of an economy. Under the context of the IAIPs, they are liable to the following weaknesses and threats as follows:

(1) Weaknesses

- Low advocacy and awareness creation activities at both national and international stages.
- Limited international investment flow.
- Weak capacity of the country in supplying sustainable and dependable industrial inputs.
- The agriculture policy does not plainly show the institutional and regulatory arrangements that would help to solve weak input supply system.
- Construction and implementation of industrial parks in general and the IAIPs take an extremely long time which in turn leads to development and policy failure.
- Existence of loose legal packages which connect the farmers and the IAIPs could be bold weakness of industrial parks' strategies.
- There is not strong infrastructure for the parks which considers pastoral potential (animal and animal product).
- Rural Transformation Centers (RTCs) are not fully operational yet.
- Lack of knowledge among farmers in identifying products for different purposes and low quality of their products.
- Most IAIPs are not fully functional; hence, to alleviate such gaps strong strategies must be designed.
- In IAIPs there is excessive labor exploitation like down-to-earth payments.
- Unreliable power and water supply in the IAIPs vicinities.
- Some investors acquire vast lands illegally, simply for the purpose over-loan request. In such cases, a big portion of the land remains unproductive.
- Low level of local knowledge and skills in value addition and processing raw agricultural products.
- "Cart before the horse" approaches, i.e., there is not enough feasibility study before the establishment of the IAIPs. For example, in some sheds, extreme raw agricultural products supply shortage are seen.
- IAIPs expansion are politically motivated. Expansion and distribution of IAIPs needs to be based on evidence, pilot test, learning and profitability.

(2) Threats

- Climate change issues (drought, flood, etc.).
- Shortages in hard currency and factors of production could be inevitable challenges for the successful implementation of IAIP-related policies.
- Limited institutional and structural capacities in relation to administration of the IAIPs.

- Immature international market experience with low quality products.
- Low human capital in highly sophisticated skills.
- Limited trend in engaging TVET and other trainees in the actual agricultural work during their stay at school.
- Weak raw agricultural products supply chain.

The creation of an industrial complex with little relevance to the agricultural supply chain in the agricultural sector is inefficient in terms of policy and industry, in which it is difficult to expect good performance. In the past, industrial complexes were created in agricultural areas in Korea as well to simply use agricultural labor as employment in the manufacturing sector, but as a result, it proved to be a failed case. However, recently, Korea's agri-food industrial cluster has been able to secure the foundation of success by closely linking agricultural production regions and their supply chains.

3.2.3. Korean Case, the Korea National Food Cluster, as a Best Practice of the IAIPs

In Korea, the government-led food cluster[6] was first established in 2012, predicting that the increase in global agri-food demand caused by the continuous increase of the world population[7] and the demand increase for healthy food according to the improved income level of the people. Particularly, utilizing the national agri-food cluster, the Korean agri-food industry needs to preoccupy the Northeast Asian market which will become the world's largest food market.

Food clusters in most developed countries are formed spontaneously. The representative cases are 'Food Valley' consisting of 1,400 food companies and related institutions in the Netherlands and 'Napa Valley' of over 400 wineries in the United States (Food Valley, n.d.; Napa Valley, n.d.). These clusters have established value chains such as agri-tourism as well as agricultural production and food processing in connection with companies, research institutes, universities and farmers' organizations within the cluster area. However, a business environment was not created in Korea in which most food companies could voluntarily form integrated supply chains as an industry cluster.

6 In the 1980s, Rural Industrial Parks (RIPs) were established in Korea to revitalize rural region that were declining due to rapid urbanization and industrialization. The first 7 pilot RIPs were built in 1984, and a total of 386 RIPs were established by 2011 in Korea (Choi, K.-H., Y.-L. Kim and B.-S. Yoon, 2012). Because the RIPs were mainly located in underdeveloped rural areas, unlikely general industrial complexes, the occupation rate of the parks was low. In addition, the economic inefficiency due to the weak connectivity with local agricultural products became a major failure factor for the RIPs. The establishment of a national food cluster that compensates for the vulnerability of these agricultural and industrial complexes is being presented as a new model.

7 The world's population is expected to grow to 9.7 billion by 2050 (United Nations, 2019).

<Box 1-3> Concept of National Food Cluster

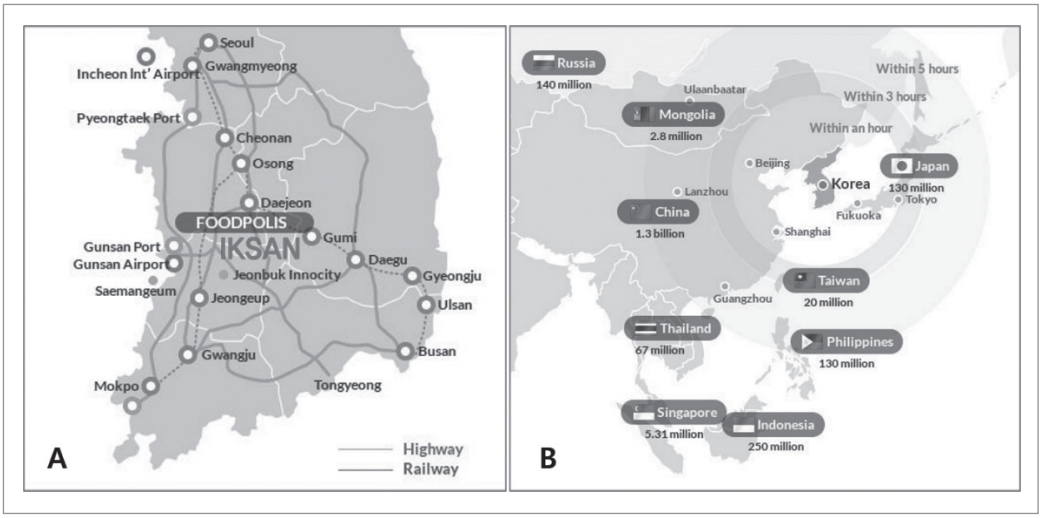
An industry cluster is a collection of related companies and organizations that serve different functions in similar industries. The IAIP is an industrial complex with a concept similar to an industry cluster, focused on agricultural supply chains. The collected companies are able to create new knowledge and skills through interaction between companies and institutions in the cluster. In general, if an industrial complex has the goals of individual company growth and cost reduction, the industry cluster is effective in establishing a business network that creates new knowledge and growth of the overall industry.

As part of the national growth strategy for enhancing the competitiveness of the agri-food industry and increasing income of farmers and fishermen, a national food-specialized industrial complex has been established by the Korean government, where interrelated enterprises, specialized parts suppliers and service providers including research institutes were integrated.

Source: Authors.

Policy development for the Korea National Food Cluster was promoted as a follow-up to the Korea-U.S. FTA. That is, in order to strengthen the infrastructure of the food industry to lead the development of the agricultural and fishery sectors, which is likely to be damaged by the conclusion of the Korea-U.S. FTA negotiations in 2007, and to strengthen agricultural competitiveness by closely connecting the agricultural supply chain with the food industry, a national development plan and master plan for creating the food cluster were established by 2012. According to this master plan, an institution, the Korea Food Industry Cluster Promotion Agency (KFICPA), which would be responsible for the creation and operation of the Korea National Food Cluster, FOODPOLIS, was established (FOODPOLIS, n.d.). The Cluster is located on the western coast and rural area of just over 3.5 million m^2 of land, where is a strategic location for transit available nationwide with KTX railroads and major highways as well as for easy access to raw agricultural products. In addition, businesses in the Cluster have access to more than 60 major international cities within a two-hour flight as well as a very convenient location for logistics by ship.

[Figure 1-2] Strategic Location of the Korea National Food Cluster, FOODPOLIS, in Korea



Source: FOODPOLIS (n.d.).

As of June 2021, 66% of the industrial site (1.52 million m^2) was occupied by food companies and related industries, meaning that almost all of the shaded areas, except for foreign investment zones and green spaces, are occupied by the tenant companies, including 103 domestic companies, 1 foreign company, and 39 venture companies.

The KFICPA, dedicated to comprehensive cluster management, provides one-stop support for investment and businesses, and coordinates between businesses and service centers in the Cluster for the food packaging center, food quality and safety center, functional food evaluation center, functional food formulation center, etc. The agency shares procurement information about the tenant companies' agricultural products demand with the local governments, and thus it provides adequate coordination support for agricultural supply chain connectivity between the local farmer cooperatives and the enterprises in the Cluster. In addition, the KFICPA has a program supporting youth food start-ups by providing food production practice opportunities and education programs to build capacities of the food venture companies and start-ups.

The FOODPOLIS has a vision of becoming a hub for innovative growth in the food industry and aims to build a business ecosystem that helps start-ups grow into global food enterprises. In order to achieve this vision, the Cluster has its own strategy as follows:

(1) **Business-friendly infrastructure:** developing a food industrial complex creating high value and comfortable living environment for those in the food industry

(2) **Facilities to support corporate innovation:** construction of three major Research and Development (R&D) facilities for low costs and high value

(3) **R&D and networks for creating high value:** R&D support for developing high value-added products and functional foods with establishing domestic and overseas industry-school networks

(4) **Base for food export and mutual growth with the agriculture/fishery industry:** serving as an export base for high value-added foods, supporting development of a food export market, establishing an efficient food logistics system, linking the agricultural/fishery industry with the food industry to facilitate mutual growth

(5) **Enhanced corporate capabilities:** securing and developing human resources for the food industry, and enhancing capabilities of tenant companies such as funding and consulting

As a successful model of an agri-food industrial cluster that is not spontaneously generated but created by the national government with policy will, Korea's FOODPOLIS can be a useful strategic model for the Ethiopian government's IAIPs, which are closely connected with the regional agricultural supply chains. Although the IAIPs are being established with an integrated and artificial design, it seems that policy intervention is insufficient to facilitate innovation in R&D and supply chain networks between the regional agriculture and the food/manufacture sector, which are shown in the FOODPOLIS. In addition, most of the one-stop-service in the IAIPs are related to administration. Therefore, the extended concept of one-stop-service in the FOODPOLIS, not only administration but also R&D and financial support, will be a good model for the improved services and incentives of the IAIPs.

3.3. Strategic Crop Commodities for the IAIPs

In order to achieve the policy targets of the IAIPs, the strategic crop commodities were selected during the project feasibility survey in economic and financial performance by the AfDB. The increased value-addition from farming activities is on the basis of about 10 crops and production models, including, 1) coffee, 2) wheat, 3) barley, 4) sesame, 5) haricot beans, 6) potato, 7) tomato, 8) fish, 9) dairy and beef, and 10) honey. This is because these crops are expected to greatly contribute to job creation and the reduction of the unemployment and poverty rates, as well as increase the industry's contribution to GDP with the SMEs, linked to IAIPs (AfDB, 2018). In addition, this project will enhance the up- and downstream value

chains linked to the agro-industrial parks with Good Agricultural Practices (GAP) training which will help to increase productivity and production output.[8] The current status of the 10 strategic commodities in Ethiopia is shown as follows:

(1) **Coffee:** Coffee is absolutely the top cash crop in Ethiopia; the GDP share of coffee is over 7.7%, and thus, over 524,099 MT of it was produced annually throughout the last three years (2018-2020) in a total 749,783 ha of cultivation area. The Coffee Sector Development Strategy (CSDS) was established well in Ethiopia with a support from the European Union (EU) in 2014. The CSDS is designed for one single goal, the increase of Ethiopia's earning in terms of foreign currency from the export of coffee for the benefit of all involved along the value chain, with special emphasis on the producers. The quantity and quality of Ethiopian coffee, prices, and nationwide consumption trends are analyzed based on the CSA data in the strategy. In order to achieve better production, supply chain bottlenecks and low productivity issues will need to be addressed even though the strategy was well documented. Diversified agricultural research centers and universities are responsible for research on the suitability and produces of coffee varieties in different agro-ecological zones and for distribution of improved seeds to farmers. The Ethiopia coffee sector would benefit from the well-organized public and private sector partnerships. Therefore, it is considered that the necessity of further analysis and advice on coffee in this study is low.

(2) **Wheat:** Wheat is the second most important staple food crop after Teff[9] in Ethiopia; the GDP share of wheat is over 4.7%, and thus, over 5,436,707 MT of it was produced annually throughout the last three years (2018-2020) in a total 1,744,740 ha of cultivation area. Wheat makes up about 18% of the country's total cereal production and is a key crop for food security. Ethiopian wheat is a cool-weather grain grown at an altitude of 1,500 to 3,200 meters above sea level in the southern (i.e., Arsi and Bale) and central (i.e., Shewa and Gojam) highlands. The GoE has a plan for wheat self-sufficiency by 2023 by leveraging the enormous production potential of favorable agro-ecologies and expanding irrigation areas for wheat production to achieve self-sufficiency and reduce wheat imports. The government has allocated 5.98 million USD to establish agricultural machinery rental service centers in grain-producing areas to empower farmers and increase efficiency.

(3) **Barley:** Total production of barley has been increasing steadily over the past decade

8 One of the main outputs of the AfDB's IAIPs project is the increase of the GAP products in the strategic crops (AfDB, 2018).

9 Teff is absolutely the most staple food crop in Ethiopia but because its demand has been mainly for the domestic market it was excepted from the 10 strategic crops list of the IAIPs by the AfDB project feasibility team.

driven by increased yields. Barley production consistently falls far behind other major cereals. The average annual production of barley was over 2,277,565 MT during the last three years (2018-2020) in a total 904,839 ha of cultivation area. The recent construction of several new malt plants has increased the demand for malt barley (USDA, 2020a). Most farmers often do not use modern farming methods when growing barley. Various organizations are working to support malt barley production through improved seed supplied by the Ethiopia Institute of Agricultural Research.

(4) **Sesame:** Ethiopia's oilseed sector plays an important role in generating foreign exchange earnings. The three major oilseed crops (sesame, soybean and Niger seed) contribute to nearly 20% of Ethiopia's total agricultural export, second only to coffee (USDA, 2020b). Among them, sesame contributes to 0.7% of Ethiopia's total GDP. Over 264,636 MT of it was produced annually during the last three years (2018-2020) in total 346,694 ha of cultivation area. The recent production of sesame is stable, which can be seen as a positive effect of the recently implemented Agricultural Commercialization Cluster[10] farming approach, where sesame is one of the strategic crops under relatively new farming initiatives. Sesame is one of the most widely produced oilseed crop, accounting for 30% of total oilseed production in the country. The national sesame production comes from Amhara region, followed by Tigray (31%), and Oromia (13%). According to the Ministry of Trade and Industry (MoTI)'s directive, registration of export sales contracts is required for all export commodities traded at ECX including sesame. This is a measure to control the imbalance between the domestic market price and trade transaction price of sesame caused by a lack of foreign currency. There are two large-scale edible oil complexes under construction in the country. One of the edible oil factories was built in the Amhara area with an investment capital of around 78 million USD. This mega edible oil plant has the capacity to produce 1,400 MT of oils per day. This edible oil factory is expected to account for 60% of Ethiopia's cooking oil demand. Thus, these mega edible oil factories would significantly substitute cooking oil imports with local productions of soybean, sunflower, Niger seed as well as sesame, and even create opportunities for exports.

(5) **Haricot beans:** Haricot beans are the most important legume crop in Ethiopia. The GDP share of haricot beans is over 0.6%, and thus, over 549,261 MT of it was produced annually during the last three years (2018-2020) in a total 291,969 ha of cultivation

10 Agricultural Commercialization Cluster initiative is a market-oriented platform that brings local farmers together to produce the same high value agricultural commodities using the same package selected based on similar agro-ecology, proximity and market demand.

area. The crop has been grown as a food crop for a long period and as an export crop. It is well suited to low input systems as the beans can be stored for long periods without refrigeration and provided an excellent nutritional complement to maize, which is one of the most important grain cereals (Ferris and Kaganzi, 2008).

(6) **Potato:** Ethiopia has the greatest potential for potato production among African countries. Mainly 70% of the arable land at highland areas above 1,500 m, is suitable for growing potatoes. Since nearly 90% of Ethiopia's population lives in the highlands, potatoes could play an important role in ensuring food security. In Ethiopia potato production can fill a gap in food supply during the 'hungry months' of October to December before the grain crops are being harvested (Bymolt, 2014). The GDP share of potato is over 1.7%, and thus, over 2,951,733 MT of it was produced annually during the last three years (2018-2020) in a total 120,296 ha of cultivation area.

(7) **Tomato:** Tomato is an essential ingredient in the diet of the Ethiopian population and it is consumed in large quantities in many traditional foods. The GDP share of tomato is over 0.04%, and thus, over 31,711 MT of it was produced annually during the last three years (2018-2020) in a total 5,190 ha of cultivation area. The Agro-Commodity Procurement Zone (ACPZ) of Central Eastern Oromia is one of the best performing areas across Ethiopia in terms of tomato production. The growing demand for fresh tomatoes and tomato products can provide an opportunity for growers with limited resources to generate additional income by selling their products. In particular, the pilot operation of the IAIP in Oromia will create market opportunities for producers located within the ACPZ. FAO has developed a strategy and intervention plan for fresh and industrial tomatoes in the ACPZ of the IAIP in Oromia.

(8) **Fish:** Ethiopia's water bodies include 7,334 km^2 of major lakes/reservoirs, 275 km^2 of small water bodies, and 7,185 km of rivers. The Blue Nile and Omo are the main rivers. Aquaculture production in Ethiopia, however, has not really taken off, and is rather a potential than an actual practice. Accurate data on production volumes are not documented. However, according to FAO estimates, total fish production increased steadily from 15 to 25 tonnes annually. There is one company that is trying to utilize the potential by establishing a large-scale commercial fish farm (Yalew, Dejen and Spliethoff, 2015). The National Strategy for Aquaculture Development (NADS) includes incentive packages that attract local and foreign investors.

(9) **Dairy and beef:** Cattle milk and meat is one of the main sustenance products for the rural region of Ethiopia. Ethiopia has great potential for the cattle dairy and beef

development due to its large livestock population of 59.5 million cattle. Given the significant potential for income and job creation for smallholders from high value-added dairy and meat products, development of livestock in Ethiopia can contribute significantly to poverty reduction and nutrition. In particular, dairy production system represents different classifications depending on their geographic locations; urban, peri-urban and rural dairy production system. Among the existing production systems, the traditional dairy production is related to smallholder farms. The traditional milk production system, dominated by indigenous breeds, accounts for 97-98% of annual milk production in Ethiopia. More than 85% of the milk produced in rural households is consumed within the producer households, with a sales ratio of less than 7% (CSA, 2011). Since many producers involve but sell only a small amount of milk, the low marketable production is limited in market potential due to high opportunity costs. Livestock production in Ethiopia accounts for approximately 30% of the total agricultural GDP and 16% of national foreign currency earnings (Getabalew, Alemneh and Akeberegn, 2019).

(10) **Honey:** Due to a favorable climatic condition, Ethiopia has the largest bee population in Africa, with more than 10 million bee colonies, of which 5 to 7.5 million have beehives and the rest are in the wild (Tadesse and Kebede, 2014). As a result, Ethiopia is the leading honey producer and one of the top 10 countries (453,000 MT) in the world and fourth beeswax producer (3,800 MT) (Fiku, 2015). Beekeeping plays an important role in generating and diversifying the income of Ethiopian smallholder farmers and landless youth. According to the government policy, the beekeeping sub-sector has a great opportunity to create jobs for small business owners in both rural and urban areas of the country. A long-lasting beekeeping practices in Ethiopia have helped beekeepers develop their indigenous knowledge of traditional beehive manufacturing form a variety of locally available materials (Dekebo *et al.*, 2019).

4. Selection of the Prioritized Agricultural Commodities for Improved Connectivity of Agricultural Supply Chains

4.1. Focusing on the Agricultural Supply Chain Instead of the Value Chain

Over the past 40 years, the gradual liberalization of cross-border trade, advances in production technology and information services and improvements in transport logistics services have served enterprises to the advantage of segmenting production processes and delocalizing geographically. Global supply or production chains (GSCs), where commodities are produced with intermediate inputs, often occurring in many countries due to cost-cutting strategies, are now common in many industries and have expanded to more and more developing countries. From an economic point of view, transnational corporations (TNCs) relocate their production processes, such as R&D, design, manufacturing, packaging, marketing, distribution, in different countries to increase productivity and minimize cost to maintain their competitiveness. By doing so, TNCs can use the most useful human and physical resources in other countries.

For developing countries and their companies, the opportunities of joining the GSC are significant. Indeed, integration into the GSC has become an important pillar of policy for export-led development. Producers in the GSC can gain modern management know-how and practical information on quality standards and technologies, thereby increasing their competitiveness. These producers also learn quickly about demand patterns in high-income markets and consumer preferences in those markets. Participating in the GSC can also create economic-wide external effects for developing countries, such as employment, skill improvement, increased production capacity and diversification of exports to more added value. As a result, such external effects will increase FDI attraction, thus policymakers in many developing countries are very interested in how to connect their private sectors to the GSC for these potential benefits (Nicita *et al.*, 2013).

However, observing the disruption of the GSC due to the COVID-19 pandemic, particularly the disruption in the supply of local food and overseas raw materials for the food processing industry, it is necessary to rethink the GSC, which has been thoroughly segmented in the supply chain globally by TNCs. In particular, dairy products were disrupted from the demand shock, in which excess inventory led to storage capacity shortages and the destruction of perishables (International Labour Organization, 2020). In addition, serious supply disruptions for other agricultural goods were caused by national lockdowns and

the restrictions on cross-border movements of people. Thus, the GSC shocks suggest that an acceleration in reshoring or near-shoring in some industries is a consequence of the COVID-19 pandemic, particularly those where supply chains have been highly disrupted or sectors with strong export controls by governments (European Council, 2020).

Nevertheless, it is required still to develop policies to improve the overall business environment in the country, and to ensure that domestic companies are increasingly integrated into the GSC-dominated markets. There will be a need for improvement in trade policies, especially in the participation of the country's companies in the GSC, including upgrading the quality and scale of agricultural products, the production process, and export of agricultural products. However, in this study, although the GSC is considered, it was not intended to study the policy to improve the value chain to be integrated into the GSC. As revealed earlier, there is no way to avoid the risk of fragmented production in the GSC under a global disaster like the COVID-19 pandemic. Therefore, rather than focusing on GSC, this study focused on how to produce more primary or processed agricultural products as finished products at the national level agri-food chain of Ethiopia, which are attractive to the regional and global markets. In addition, this study focused on asking how Ethiopian agriculture can sustainably maintain production scale and quality so that the agri-food industry can be stably fostered.

4.2. Selection of the Prioritized Crop Commodities for the Agricultural Development Led Industry with Promoting the IAIP's Supply Chain Connectivity

This study attempted to select strategically prioritized crop commodities that could reinforce the agricultural supply chain, centering on the IAIPs, while meeting the GoE's agro-industry promotion strategy. For this purpose, a survey was conducted to determine the weight of selection criteria and indicators for the strategic crops with AHP analysis in terms of national economic importance, supply chain connectivity and social impact from Korean agricultural experts having project experience on African agriculture.[11] In addition, a survey was conducted on the importance of the value of each criterion considered by the Ethiopian experts for each of the major strategic crops of the IAIPs. The twenty of Ethiopian experts who participated in the survey consisted of public officials of the MoA, MoF, IAIP, ECXA, and private sector (See Box 1-2).

The reason for the selection of the prioritized crop commodities was to focus the study on

11 Most of the Korean interviewees were agricultural experts with experience as KOPIA (Korea Program for International Cooperation in Agricultural technology) directors in African countries.

the supply chain analysis of key crops that are expected to have a high impact. Thus, because of the limited time and fund constraints, only two of the top prioritized crops from the list were selected for further study of their supply chain analysis in Chapter 2. The prioritized crop list was prepared according to priority by comprehensively reflecting the comparison of quantitative indicator values and evaluation results of Ethiopian experts only for the six agricultural crops among the strategic commodities of the IAIPs. As mentioned above, since the national coffee development strategy has already been well established in Ethiopia, coffee was excluded in this study. In addition, even though teff is the most important staple food crop in Ethiopia, it is not included for the strategic export crop of the IAIPs. In addition, fish, honey and meat/dairy products were excluded in the study even though they are strategic crops for the IAIPs. As mentioned earlier, this is because these supply chains are expected to be vulnerable enough to be subject to greater changes from the demand side compared to the other crops after the COVID-19 pandemic situation.

4.2.1. Methodology: Analytical Hierarchy Process (AHP) Analysis

Analytical Hierarchy Process (AHP) is a structured multi-criteria decision analysis that deals with both qualitative, quantitative criteria and data with a high degree of uncertainty (Saaty, 1980). It involves 1) organizing of assessment criteria/sub-criteria (indicators) into a hierarchy of goals, 2) assessment of the relative importance of the criteria (weights) by setting the pair-wise comparison matrices that are converted into numbers (See Table 1-2), and 3) comparison of the variables for each crop based on the judged importance of each one over another with respect to a common criterion, and finally, an overall ranking of the strategic crops assessed.

The calculation of the criteria weights is accomplished using a pair-wise comparison matrix (A) obtained according to the decision maker's judgements a_{ij} for n elements as follows:

$$A=\begin{vmatrix} 1 & a_{12} \dots & a_{1n} \\ a_{21} & 1 \dots & a_{2n} \\ \vdots & \vdots & \vdots \\ a_{n1} & a_{n2} \cdots & 1 \end{vmatrix}, \text{ where } a_{ji} = 1/a_{ij} \text{ for variables } i, j = \quad (1)$$

<Table 1-2> AHP 9-Point Fundamental Scale

Numerical scale	Definition
1	Two elements are equally important
3	One element is slightly more important than another
5	One element is strongly more important compared to another
7	One element is very strongly more important over another
9	Absolute dominance of one element over another
2, 4, 6, and 8	Intermediate values between two neighboring levels
Reciprocals (1/*x*)	A value attributable when variable *i* compared to variable *j* becomes the reciprocal when j is compared to i

Source: Saaty and Kearns (1985).

As a result, the relative weights (ω) of matrix A are calculated by the equation as follows:

$$(A = \lambda_{max} \text{ x } I) \text{ x } \omega = 0 \quad (2)$$

I: an identity matrix

0: a zero matrix

λ_{max}: the maximum eigenvalue of matrix A.

Alignment judgement for the order n of pairwise comparisons are examined for consistency by two statistically significant factors: the Consistency Index (*CI*) and the Consistency Ratio (*CR*), respectively defined as follows:

$$CI = (\lambda_{max} - n) \text{ x } (n-1) \quad (3)$$

$$CR = CI/RI \quad (4)$$

n: the size of the matrix

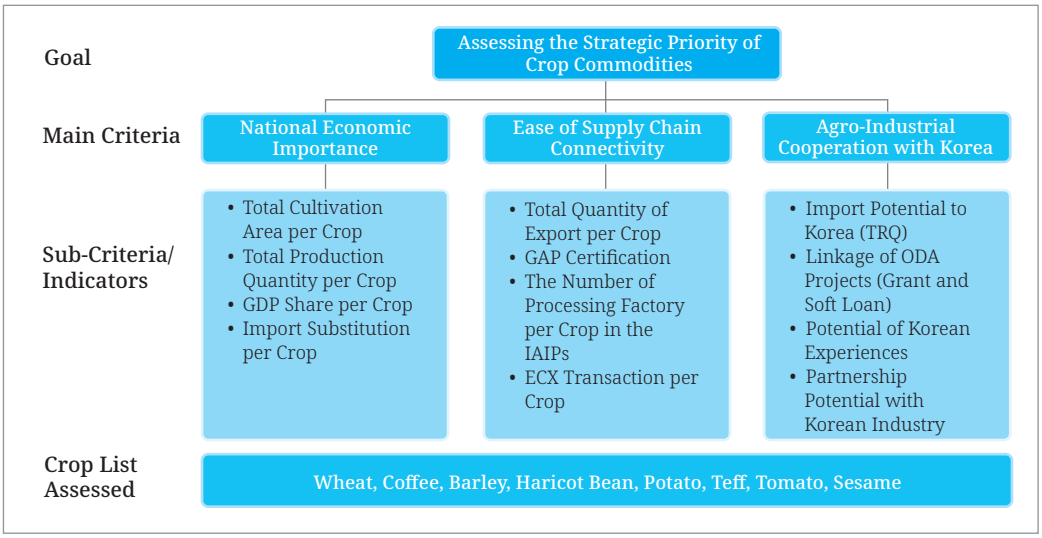
RI: a value that represents Saaty's calculated random index measures for various sizes of the matrix (n)

The consistency of the comparison matrix can be considered acceptable when $CI<CR<0.1$. If large CR values are obtained, the decision maker's judgment needs to be revised.

(1) Criteria selection, definition, and determining their weights: Overall, a set of 12 indicators was selected in order to fully cover the three pillars of strategic criteria, national economic importance (NEI), ease of supply chain connectivity (ESC), possibility of agro-industrial cooperation with Korea (AIC) according to the goal of assessing the strategic priority of crop commodities in the study. Selection of the

indicators under the criteria was conducted based on their potential to thoroughly reflect the most representative indicators which could get as quantitative as possible. Pairwise comparisons and criteria weights were calculated with combining the overall judgement received from an African agricultural project-experienced group of Korean experts (total 15 individuals) in public agricultural research institutions or academia.

[Figure 1-3] Overall Structure of the Two-Stage AHP Model Used in this Study



Source: Authors.

(2) Criteria definition: The indicators are single sets of values, usually derived from public open sources. More specifically, some indicators, such as GAP certification, the number of processing factory, ECX transaction, Korean TRQ, linkage of ODA projects implemented by the Korean donor agencies, etc., were selected from the perspective of expansion of the IAIPs or trade with Korea. Apart from that, an additional survey was conducted using additional criteria reflecting the Ethiopian context for the Ethiopian stakeholders including the MoA, and the IAIPs: the current and possible potential the country have to supply the product (sustainability, SUS), the potential the product could be tradable in other alternative markets (alternative markets, MAR), and the configured infrastructure that is available across all the supply chain that could help to market the product (available infrastructure, INF), the capital requires to extend and modernizing the infrastructure across the value and the net return obtain from the product (value for money, INV).

(3) To this context, a detailed field survey has been conducted to assess the prioritization of the strategic crop commodities. Most of the quantitative values for each crop were collected for the last 3 years (2018-2020) and used as the 3-year average values. All of these quantitative variables of the indicators were normalized for comparative analysis with the same scale.

(4) Limitations of the AHP analysis: the determination of the main criteria's weight according to the opinions of Korean agricultural experts may be somewhat different from the interests of stakeholders in Ethiopia. This bias was attempted to be compensated for through the additional survey to the 20 Ethiopian stakeholders. In addition, unlike the determination of weights by comparison among the main criteria, there is a possibility that different results may be derived due to the method of classifying the Sub-criteria/indicators which are not able to be compared directly between the indicators belonging to different criteria.

4.2.2. Results: The Prioritized Crop Commodities

According to the AHP method used in the first step, the comparison matrix for determining the weights of the 3 criteria, NEI, ESC, and AIC is presented in <Table 1-3>. Weights calculated from the expert responses indicate that the NEI is the most important selection factor (0.704), followed by the ESC (0.215) and the AIC (0.081) main criteria, respectively. This suggests that the main national economic importance of the strategic crop may affect larger impact towards the agro-industrialization through the IAIPs. Even though the consistency ratio (*CR*) value does not fall within the acceptable value of <10%, because the consistency index (*CI*), 0.108, is closed to 0.1, it is considered that there is a similar trend although the Korean experts' opinions do not agree. Similarly, the weights for indicators calculated from their comparison matrices using the AHP method are shown in <Table 1-4>. The weights decision for the indicators in a group, NEI, ESC, and AIC, were clear because the *CR* values falls within the acceptable values.

Regarding the NEI criterion, total production quantity and total cultivation area per crop are the most important indicators presenting the similar local weight of 0.370 and 0.361, respectively, among the sub-criteria group in the NEI main criterion. Based on the calculated weights assigned to ESC criterion, total quantity of export per crop is ranked as the most important indicator having a local weight 0.480. Among the AIC's sub-criteria, the most important is linkage of ODA projects, with a local weight of 0.389 followed by import potential to Korea (0.309).

<Table 1-3> Comparison Matrix and Weights of Main Criteria for Impact of Strategic Crop on the Agro-Industrialization

Criteria	NEI	ESC	AIC	Weights
NEI	1	5.70	6.18	0.704
ESC	0.18	1	4.21	0.215
AIC	0.16	0.24	1	0.081
λ_{max} = 3.216, CI=0.108, CR=0.186				

Source: Authors.

<Table 1-4> Local and Global Weights for Sub-Criteria

Main Criteria	Weights	Indicators	Local Weights	Global Weights
NEI	0.704	Total cultivation area	0.361	0.254
		Total production quantity	0.370	0.260
		GDP share	0.160	0.113
		Import substitution	0.108	0.076
		λ_{max} = 4.328, CI=0.109, CR=0.121		
ESC	0.215	Total quantity of experts	0.480	0.103
		GAP certification	0.160	0.034
		The number of processing factories	0.261	0.056
		ECX transaction	0.100	0.021
		λ_{max} = 4.122, CI=0.041, CR=0.045		
AIC	0.081	Import potential to Korea	0.309	0.025
		Linkage of ODA projects	0.389	0.032
		Potential of Korean experiences	0.164	0.013
		Partnership potential with Koran industry	0.139	0.011
		λ_{max} = 4.122, CI=0.041, CR=0.045		

Source: Authors.

<Table 1-5> Macro-Data of Each Crop for Quantitative Indicators

Crop	Total Cultivation Area per Crop (ha)	Total Production Quantity per Crop (MT)	Total Quantity of Export per Crop (MT)	Unit Price per Kg	Production per Crop (Billion Birr)	GDP Share per Crop
Barley	904,839	2,277,565	0	19.32	39.78	0.0214
Coffee	749,783	524,099	271,917	118.75	56.46	0.0304
Haricot bean	291,969	549,261	48,447	22.28	11.10	0.006
Potato	120,296	2,951,733	0	11.75	31.38	0.0170
Sesame	346,694	264,636	221,962	55.75	12.99	0.0071
Teff	3,067,019	6,034,262	0	26.15	142.95	0.0770
Tomato	5,190	31,712	0	27.50	0.78	0.0004
Wheat	1,744,740	5,436,707	0	17.84	87.92	0.0472

Note: Annual mean value for 3 years, 2018-2020.
Source: Authors.

In the second stage, the results of the comparison value for each crop were obtained by the aforementioned criteria weights in <Table 1-6> with quantitative macro-data of the indicators (See Table 1-5) as well as the qualitative survey data. As shown, the total sum of the normalized values of each crop was based on the main criteria and indicators with their global weights.

Although the priority of the strategic crops, as shown in <Table 1-6>, was produced from the Korean experts' responses, the final decision making needs to be synthesized by reflecting the interests of the Ethiopian stakeholders. Thus, the additional priority crop list resulted from the other survey data of the Ethiopian stakeholders, in which each crop commodity's importance by the extended criteria were scored in <Table 1-7>. The Ethiopian priority according to scores before and after applying weights for each criterion and indicator was the same, thus, the detailed data was omitted. Since the extended criteria for the Ethiopian context and their main interests were already closely related to the sub-criteria, that is, the indicators (i.e., total production quantity, total quantity of export, the number of agro-processing company, etc.), the weights could be calculated using the local weights of the existing indicators of the NEI, ESC and AIC.

<Table 1-6> Normalized Values of the Strategic Crops Based on the Main Criteria and Indicators

Crop	Normalized Variable Values with Veights Applied for Each Criteria/Indicator				Priority
	NEI	ESC	AIC	Total Sum	
Barley	-0.04153	-0.00507	0.00044	-0.04616	4
Coffee	-0.23473	0.24436	0.01915	0.02879	3
Haricot bean	-0.45146	0.03959	-0.07405	-0.48592	7
Potato	-0.18247	-0.11005	0.10458	-0.18793	6
Sesame	-0.46455	0.2586	0.04000	-0.16594	5
Teff	1.14151	-0.20735	-0.07405	0.86011	1
Tomato	-0.60300	-0.11005	0.03232	-0.68073	8
Wheat	0.83621	-0.11005	-0.04839	0.6777	2

Source: Authors.

<Table 1-7> Scores of the Strategic Crops for Each of the Criteria Extended

Crop*	Mean Score by Criteria								Priority
	NEI	ESC	AIC	SUS	MAR	INF	INV	Total Sum	
Barley	7.00	6.20	6.85	6.90	6.95	6.35	7.25	47.50	6
Haricot bean	7.85	6.95	7.75	7.70	8.20	6.75	7.70	52.90	2
Potato	7.35	6.30	7.50	7.90	6.65	6.00	7.35	49.05	5
Sesame	9.30	8.05	8.70	8.30	8.85	6.75	8.95	58.90	1
Tomato	7.45	6.50	7.90	7.80	7.25	5.95	7.65	50.50	4
Wheat	7.95	6.20	7.25	8.25	7.15	6.05	8.10	50.95	3

Note: Coffee and teff were excluded in this questionnaire survey as explained in the text.
Source: Authors.

In the present study, the integrated method was conducted to assess the priority of the strategic crop commodities with the application of the AHP data from the participating Korean experts as well as the Ethiopian stakeholders. The strategic crop list was selected and prepared based on the GoE's national development strategy (i.e., HGER and TYPP), the ADLI and agri-food industrialization through the IAIPs. Among the strategic crops, mainly focused on the IAIPs, staple food crops like barley, teff, wheat, which are produced in large amounts and distributed nationwide, have been placed as the top priority due to the 70% weight given to national economic importance (NEI) (See Table 1-5). This may be evaluated as being overweighed by the Ethiopian stakeholders who are highly interested in fostering

export commodities or import substitution effects. It can be seen that their interest level was reflected in the crop priority in <Table 1-7>. Thus, sesame and haricot bean were placed as the top priority.

To this context, the third alternative priority crop list is presented in <Table 1-8>, that is, the results obtained by synthesizing the two priority scores from both the Korean experts and the Ethiopian stakeholders as an arithmetic mean value. Consequently, the top prioritized crop commodities were selected as wheat and sesame as the top two ranks except for teff and coffee. Therefore, further studies have been conducted with the top two prioritized crop commodities, wheat and sesame in Chapter 2. Because sesame, as the export commodity, and wheat, for the import substitution effect, are very important in Ethiopia, the subsequent analysis and policy implications are expected to differ greatly between the two crops.

<Table 1-8> Synthesized Priority of the Strategic Crops

Crop	Priority with the Quantitative Variables Weighted	Priority based on Response from Ethiopian Stakeholders	Synthetic Priority
Barley	4	6	5
Coffee	3	N/A	2
Haricot bean	7	2	5
Potato	6	5	6
Sesame	**5**	**1**	**3**
Teff	1	N/A	1
Tomato	8	4	6
Wheat	**2**	**3**	**2**

Source: Authors.

The Ethiopian stakeholders, especially MoA, have responded in saying that this selection result is very reasonable. That is, wheat is mass-produced in the Oromia region and it is a key crop with a great import substitution effect. In addition, sesame is one of Ethiopia's main export commodities produced in the Amhara region.

5. Conclusion

Chapter 1 was conducted to analyze Ethiopia's agricultural development policy, including the IAIPs plan, and to investigate strategic crops from the perspective of the integrated

agri-food industry. Through the review and SWOT analysis on Ethiopia's recent agricultural development strategy and policy, especially based on the HGER plan and TYPP (2021-2030), the authors identified the weaknesses and threats that hinder the implementation of agricultural policies as well as the IAIPs. Particularly, in order to escape the negative impact and achieve the development outcomes, some alternative approaches were suggested; 1) policy-project development in agro-industrial sector utilizing agro-ecological resources, 2) strengthening collaboration partnership/programs between the governmental agricultural agencies and the international development partners, 3) service and regulatory improvement for agricultural product supply focused on the IAIPs, 4) supporting low-cost and climate-smart agriculture for smallholders to make their livelihoods possible, 5) fostering commercial farming and agri-entrepreneurs to expand their farm land and business, and 6) fostering export agriculture as well as self-sufficiency of staple food with a large import substitution effect. The practical solution and policy recommendation are discussed in detail in the following Chapters except for the IAIPs.

That is, the authors suggested that Korea's national food cluster, FOODPOLIS, can be a useful strategic model for the Ethiopian government's IAIPs, which are closely connected with the regional agricultural supply chains. Because the IAIPs' policy intervention is insufficient to facilitate innovation, R&D and supply chain networks, the extended concept of one-stop-service in the FOODPOLIS, not only administration but also R&D and financial support, will be a good model for the improved services and incentives of the IAIPs.

In this Chapter, the major strategic crops to be developed as value-added products through the IAIPs were reviewed. Amid the COVID-19 pandemic situation, some commodities (fish, honey, meat and dairy products) were expected to be subject to greater changes from the demand side compared to the other crops. Thus, these commodities were excluded in the selection of prioritized agricultural commodities. Because of the limited time and scope of the study, the authors focused on the top-two prioritized crops, wheat and sesame, which were selected with the AHP analysis from the national economic importance, supply chain connectivity, and social point of view.

Regarding the prioritized agricultural commodities, wheat and sesame, selected in Chapter 1, the supply chain constraints of the selected commodities and the causes of their problems are analyzed in Chapter 2 through the field surveys, and the authors suggest practical solutions for the identified constraints. In addition, Chapter 3 reviews whether Korea's development experience is able to be applied to the overall agro-industrial development in Ethiopia, and recommends policies to improve the connectivity of the integrated agri-food supply chain within the scope of applying Korea's experience.

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Appendix

SWOT Analysis Results

[Appendix Table 1-1] SWOT Analysis for Wheat Value Chain

Strengths	Weaknesses
• High awareness, experience and demand of farming community in using modern technology • Production and productivity of the area • Presence of food processing industries in close proximity	• Shortage of improved seed supply • Shortage of improved seed supply • Shortage of row planter • Lack of access to finance by farmers and primary cooperatives • Lack of professionalism and trained professionals in cooperatives • Skilled labor shortage for processing industries • Unorganized and unregulated wheat market usually with long channels
Opportunities	**Threats**
• The presence of Integrated Agro Industrial Park (IAIP) and Rural Transformation Centers in close proximity • Presence of research centers and extension outreach in wheat belt area such as Kulumsa Agricultural Research Center • High irrigation potential in the country due to its possession of several lakes and rivers. Ethiopia is also called fountain of water in Africa. Irrigated wheat production initiative already started. • Start of embedded service provision from food processing industries to downstream value chain actors, such as transport and warehouse service, for wheat product they purchase through contract agreement • Industries within the IAIPs will create market access • Digital economy will facilitate market efficiency • Improved regulatory environment for doing business in Ethiopia • Government priority to enhance private investment in the new 10 year Home Grown Economic Plan	• Climate change • Wheat rust disease • Flooding sometimes causes damage to crop and road affecting production and transportation, respectively • Locust infestation

Source: Authors.

[Appendix Table 1-2] SWOT Analysis for Sesame Value Chain

Strengths	Weaknesses
• Availability and ownership of large land size and flat landscape for promoting commercial farming and use of modern technologies • Presence of fertile land • Presence of large number of commercial level producers • Regulated market for sesame through ECX trading platform • Presence of market information that benefited farmers in negotiating price	• High loss during harvest and post-harvest • Shortage of productive improved seeds • Inaccessibility and unaffordability of modern agricultural machineries • Lack of awareness and willingness to adopt best farm management practice and modern agricultural inputs • Labor shortage • Lack of domestic value addition • Presence of inexperienced traders that distort the market • Weak cooperatives market share to provide alternative market for farmers • Lack of access to finance by farmers and primary cooperatives
Opportunities	**Threats**
• The presence of Integrated Agro Industrial Park (IAIP) and Rural Transformation Centers in close proximity • High demand for Ethiopia's sesame in Europe, Asia, and Middle East • Suitable agro ecology for sesame production • Improved regulatory environment for doing business in Ethiopia • Government priority to enhance private investment in the new 10 year Home Grown Economic Plan • Job creation • Lower domestic consumption creates opportunity for export growth through domestic value addition	• Insecurity • Climate change and erratic weather conditions and the occurrence of new insects damaging sesame crop in the field • Stiff competition in the international market

Source: Authors.

02

CHAPTER

Identifying Constraints to Supply Chain Connectivity of the Prioritized Agricultural Commodities

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Keywords
Agricultural Supply Chain, Value Chain, Constraints, Wheat, Sesame, Certified Seeds, IAIPs

Identifying Constraints to Supply Chain Connectivity of the Prioritized Agricultural Commodities

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Summary

In Ethiopia, agriculture is a very important field in terms of GDP and employment. The Ethiopian government's efforts to make agriculture the basis of economic development is continuing, and there are achievements, but Ethiopia's agriculture still has low inputs, low infrastructure and rain-fed cultivation. In this study, we analyze the supply chain of wheat and sesame, which are strategic crops that meet the Ethiopian government's agricultural development policy, and share Korea's experiences. In order to analyze the local sesame and wheat supply chain, we examined the key actors involved and surrounding environment for each supply chain including inputs and supporting services. We investigated the supply chain of wheat and sesame targeting regions around the IAIPs in Oromia and Amhara regions to identify constraints. To achieve this objective, the research was focused on the connectivity of the supply chains in light of food security and the promotion of exports. In addition, the survey was conducted in consideration of practical aspects such as agricultural production, information acquisition, and post-harvest management where ICT and technology can be introduced. Agricultural product marketing strategy and quality control were focused in the survey.

The overall situation of agricultural inputs, supporting services and relevant issues has been investigated. The fertilizer usage rate in Ethiopia is considered low and is mainly concentrated in grains. The main issues are that the prices of fertilizers purchased by farmers are high, and the data on the amount of fertilizer demand survey and the data on the amount of fertilizer inventory are inaccurate in the state-led monopoly fertilizer import system. Chemical fertilizers are entirely imported. There are three systems in the seed sector, a formal system in which certified seeds are produced and distributed, an informal system in which farmers are self-harvested or purchased or exchanged to neighboring farmers, and a system that combines the two types. Since most seeds are supplied through

informal systems, there is a lack of quality seed production and dissemination. Pesticides are mainly supplied through import. The regulatory system including pesticide registration and certification is weak, and the lack of expertise of those who handle pesticides is pointed out as constraints. Ethiopia has a very high percentage of farmers' labor and cattle use and has a low rate of mechanization. There were agricultural policies that recognized the necessity of agricultural mechanization, but the development strategy for agricultural machinery has been developed recently, and therefore, practical strategies to increase mechanization rate of agriculture and to promote the agricultural machinery sector are needed.

As for the extension services, Ethiopia has a relatively well-established extension service system and a high number of extension workers compared to other African countries. However, the extension system struggles with inefficiency and low linkage to other sectors. The production and post-harvest management technology of farmers are limited, so more technical advice and training is needed. Limited extension services are provided through development programs. The private sector rarely participates in extension services. Agriculture is the sector with the least financial support in Ethiopia. Fixed assets are essential as collateral to get loans, and farmers have difficulty accessing agricultural financial services. Although the government is implementing a policy to engage farmers in the market through cooperatives and some farmers' cooperatives and unions are active in the seeds, fertilizers, pesticides and agricultural finance sectors, the lack of operational and management capabilities and weak linkage to higher level organization (unions) hinders the market participation of farmers. For agricultural research, there are government-led central research institutes, regional research institutes and universities. It is difficult for farmers to acquire modern production technology and post-harvest management skills due to the fact that many farmers cultivate small land and are located in remote areas, but Ethiopian agriculture, where the role of government agencies is large, public enterprises are responsible for distributing new technologies. The Ethiopian Commodity Exchange (ECX) was established for the safe trade of agricultural producers such as farmers and cooperatives, and buyers like middlemen and exporters. Eight agricultural products—coffee, sesame, wheat, corn, white pea beans, green mung beans and red kidney beans—are traded through the ECX system. Transparent disclosure of price information and quality-based transactions are considered as the ECX systems achievement. The rural land tenure system of Ethiopia is characterized by its state ownership. There is controversy about this system.

The methodology employed in this study is two folds. First, secondary data collection methods like in-depth literature reviews were conducted to collect data on processes, core actors, supporting functions and the business environment. Literature reviews were conducted to understand the overall supply chain of the selected crops. Primary data

collection, such as field survey, key informant interviews and observation, were conducted in the Oromia and Amhara regions to strengthen and empirically validate the secondary information collected. Considering each region's actual and potential production of the selected prioritized agricultural commodities, analysis of the wheat supply chain was conducted in Oromia and analysis of the sesame supply chain was conducted in the Amhara region.

The main market channels for wheat which roughly accounts for over three quarters of the market share include 1) Farmers → Traders → Food Processors → Retailers → Consumers and 2) Farmers → Traders → Food Processors → Bakeries → Consumers. Major constraints are observed in improved seed supply, such as shortage of improved seed variety, short life span (3-5 years) of new released variety before they are susceptible to disease and harsh environment, shortage of row planters, and the lack of integration of all stakeholders in seed sectors. The main issues in production are the incidence of pest and disease which are related to resistant varieties, agricultural standard technology, and other inputs like pesticides. Wheat (raw material) supply shortage to processors, shortage of standard warehouses, lower membership and farmers' trust in cooperatives, and an unregulated market with several players hoarding produce are significant in aggregation and trading. The constraints observed in supporting services and the business environment in the wheat supply chain are: credit distribution that does not favor producers and their organizations due to lack of collateral, adulteration of higher quality wheat with lower quality wheat or foreign materials, weak awareness about quality at the farmer level, lack of integration of stakeholders responsible to ensure quality and standards, absence of regulatory framework for enforcing contract farming, and inconsistency in the regulatory environment for transactions for cooperatives and other actors. As for the IAIP in Oromia, very limited awareness by key supply chain actors and supporting function stakeholders in the IAIP and its mode of operation, weak preparation and lack of clarity about how the supply chain for IAIP will be organized.

The main market channels for sesame which roughly accounts for 99% of the market share include: 1) Farmers → Primary Collection Center → Traders → Ethiopian Commodity Exchange → Processing Industry/Exporters → Export Market, and 2) Farmers → Primary Collection Center → Primary Cooperative → Union → Ethiopian Commodity Exchange → Processing Industry/Exporters → Export Market. Low productivity is a critical issue in sesame. The major causes of low productivity are: lack of resistant and productive improved sesame varieties, few improved varieties released and critical shortage in their supply, lack of knowledge know-how and willingness to use fertilizer and large modern machineries, shortage of pesticide supply, outbreaks of pest and disease, climate change, high cost of

harvest, insecurity causing challenges for production and procuring labor at peak harvest season, and high product loss during harvest and post-harvest. Harvest and post-harvest loss are more significant constraints in sesame compared to wheat. Limited value addition on sesame within the country, higher domestic price, and lower membership of farmers in cooperatives are the main constraints in marketing. As for exporting, contract default in export sales, international price instability and stiff competition in the international market are the main pressures. The major constraints of supporting services and business environment in sesame supply chain are: access to finance for primary cooperatives and farmers, and weak implementation of land management regulation. The cooperatives in sesame supply chain also complained that cooperative marketing regulations restricted their marketing channels in contrast to regulation for traders and processors which exacerbated their already weak competitiveness. The identified constraints of the IAIP in Amhara are: the production volume does not satisfy IAIP industries' demand volume, and weak preparation and lack of clarity about how the supply chain for IAIP will be organized. For instance, there is no clarity around how the RTC and primary collection centers will be integrated as well as the role of ECX, and lack of skilled manpower for the industries operating in the IAIPs.

Farmers and primary cooperatives are the most constrained actors in both chains. Input of agricultural materials such as supply of improved seeds and agricultural production technology are the key parts in the wheat chain. In sesame, overall inputs are serious obstacles. The supply of improved seeds is also an important issue like in wheat. The productivity was troubled with harvest and post-harvest losses as well as the lack of production technology. The government can intervene at each stage of the chain, research on varieties, technology development and dissemination of technology in input and production, and the management of RTC and the IAIP in both chains. Especially for sesame, the coordination of IAIP and ECX needs to be considered. In order to improve wheat and sesame supply chains and its integration with the IAIPs, a focus on the major constraints identified around provision of agricultural inputs, production and post-harvest should be given priority. Side by side, the government should be forward-looking to enhance the supply chain through better organization of the supply chains through contract farming as well as strengthening forward and backward linkages.

After analyzing the stakeholders and the cause of the problem, some recommendations were made in consideration of feasibility. Technical transfer cooperation with Korea can be arranged on improved variety seeds development, establishment and dissemination of cultivation technology through the KOPIA project. The improved seed supply system requires long-term research investment to foster high-yielding varieties that are resistant to climate change and various pests. From a long-term aspect, it is required to research

varieties of major crops, including sesame and wheat, led by EIAR cooperating with other countries. In addition, the national certified seed supply system can be improved by sharing experience with Korea. From the Ethiopian government's standpoint, it is significant to trace transactions in order to impose appropriate taxes, and to accurately predict supply and demand by knowing the production, inventory, and distribution of agricultural products and agricultural materials, it is possible to establish strategies and prepare countermeasures accordingly. Therefore, to monitor and manage information flow through the whole supply chain, using a digitalized system needs to be considered. In the context of digitization and the management system of data and information, it is believed that cooperation in sharing Korea's excellent ICT technology is possible.

1. Introduction

Ethiopia has seen continued economic growth despite the effects of the COVID-19 pandemic. It has registered real GDP growth of 6.1% compared to a 2.6% average decline in economic growth for Sub-Saharan Africa (IMF, 2021). Agriculture has been a leading sector of the economy in Ethiopia, even though its share in the national GDP declined from 63% in 1992 to 33% in 2019[1] (The World Bank Database, 2021).

The GoE has developed and implemented various agricultural policies to use agriculture as leverage for economic growth of Ethiopia (Shikur, 2020). The IAIPs and HGER Strategy reflect the main purpose of the government policies, to transform the agriculture sector through commercialization and to promote the agro-industry. In this regard, the GoE requested partner and donor international organizations including the Korean government to support its efforts to foster agro-industrial manufacturing.

The purposes of this research are 1) to provide a comprehensive strategy for improving the supply chain of strategic commodities and an action plan to foster the strategic commodities to agro-industry, and 2) to provide policy advice necessary for strengthening the connection to the Global Value Chain. It is expected that the research results could be used in designing strategies to improve the supply chain of major agricultural strategic commodities.

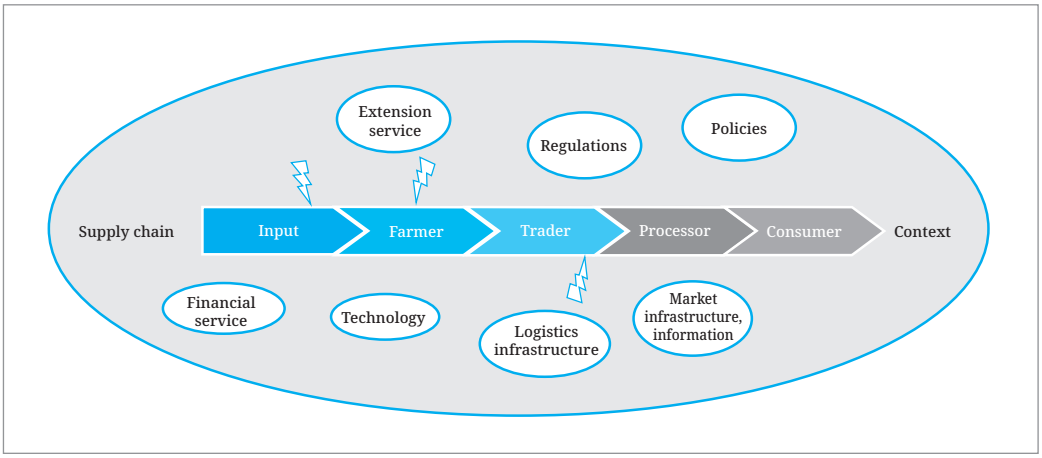
Amongst the agricultural commodities focused on by the GoE, commodities were prioritized based on a set of criteria. Accordingly, wheat and sesame were selected as the top two prioritized strategic commodities by the study in Chapter 1: Analyzing Ethiopian

1 The percent of GDP includes agriculture, forestry and fishing.

Agricultural Development Policy and Selecting Prioritized Agricultural Commodities. Following, analysis of supply chains, constraints and mapping was conducted for the selected agricultural commodities in this chapter.

Production of quality agricultural commodities which are enough to ensure food security and increase export is important at a practical level to achieve the policy objectives. Many authors use the terms “supply chain,” “value chain,” “agri-food system” to reflect different views (Chen, Shepherd, and Silva, 2005) on the flow of agricultural commodity from farmers to consumers. The analysis of the “supply chain of agricultural products” is a commonly used method to understand related markets, various actors and activities (Liu, Li, Cavaye, Jim, and Ariyawardana, Anoma, 2020). Identifying constrains of a chain itself is important to ensure the quality production of crops, however, pressures in the external environment could be critical. Therefore, inputs, services supporting the supply chain, and other issues affect the chain included in this study (See Figure 2-1).

[Figure 2-1] A Supply Chain, Its Supporting Services, and Environment



Source: Attaie and Fourcadet (2003).

The selected crops are very important in Ethiopian agriculture; being strategic crops for the IAIPs, wheat for food security, and sesame for export. The objective of this chapter is to identify problems and prioritize each issue by exploring the current status of the supply of wheat and sesame from seeds to raw materials for the IAIPs, which is part of the implementation of the Ethiopian government policy to achieve economic growth through fostering the agricultural processing industry. In this process, research was conducted from the viewpoint of sharing Korea’s experiences and expecting future cooperation.

This chapter is structured as follows: to investigate the overall issues outside a supply chain (inputs, services and other issues affecting the supply chain), to analyze the supply chain of the target crops, to identify the constraints and the cause of the problems, and to suggest possible practical solutions for the identified constraints.

2. Inputs and Supporting Services of the Agricultural Commodity Supply Chain in Ethiopia

2.1. Inputs

2.1.1. Seeds

Quality seed supply is one of the key factors in Ethiopian agriculture. According to the Seed System Development Strategy of Ethiopia, the seed system can be classified into three sectors: formal, informal and intermediate. The formal sector is institutional based on improved variety development, multiplication, processing, storage and distribution to farmers. This sector includes research institutions, public seed enterprises, large private corporations, and small private seed enterprises (See Table 2-1). Conversely, the informal seed sector mainly comprises of farmers producing or carrying over seeds from the previous year and its use in production during the subsequent years. Farmers also exchange and purchase seeds locally among each other. While the formal sector is limited to a few major crop varieties developed by agricultural researchers, the informal sector remains the major supplier of seeds of improved and local varieties for many crops grown by small-scale farmers. Lastly, the intermediate seed sector encompasses community-based seed production and distribution. For instance, cooperatives multiply seed on members' farming land and distribute mainly to their members.

<Table 2-1> Main Stakeholders in the Formal Seed Sector of Ethiopia

Stakeholders	Functions
Ethiopian Institute of Agricultural Research (EIAR)	Breeding, Basic seed production
Regional Agricultural Research Institutes (RARIs)	Breeding, Basic seed production
National Variety Release Committee (NVRC)	Registration & release of new variety
National Seed Council (NSC)	Regulation
Ethiopian Seed Enterprise (ESE)[1)]	Production, processing and distribution
Regional Seed Enterprises (RSE)	Production, processing and distribution
Cooperatives	Production

Note: 1) The name has been changed to Ethiopian Seed Corporation (Sisay, Verhees, Frans J. H. M, and van Trijp, Hans C. M 2017, 323-355).
Source: Sisay *et al.* (2017).

However, the seed sector suffers from supply shortage of improved variety and inefficiency due to limited private sector participation and bureaucratic public management. The private sector capacity is also limited due to shortage of hard currency, access to land, and limited know-how. Nevertheless, the private sector plays a critical role in the seed sector and also imports and distributes different agricultural chemicals including pesticides and herbicides.

Currently, the Agricultural Transformation Agency (ATA) is implementing digital-based agricultural inputs (mainly fertilizer) distribution and a payment system called the e-Voucher through cooperative societies. Government-affiliated and private enterprises active in agricultural inputs/seed/sector are listed below (See Table 2-2).

<Table 2-2> List of Public and Private Entities in Agricultural Input Sector in Ethiopia

Government Affiliated Enterprises	Private Owned Agricultural Inputs Companies/ Association
• Amhara Regional Seed Enterprise (ASE) • Oromia Regional Seed Enterprise (OSE) • South Seed Enterprise (SSE)	• Ethiopian Seed Growers and Processors Association • Pioneer Hi-Bred Ethiopia • Alemayehu Makonnen/Seed Co. • Anno Agro-Industry • Avallo Seed Company • Hadia Seed Company

Source: Agricultural Transformation Agency (2013).

2.1.2. Fertilizers

The agricultural inputs system in Ethiopia is mainly characterized by government intervention. For instance, fertilizers like urea and diammonium phosphate (DAP) are solely sourced and supplied through the Ministry of Agriculture and its line structure in the region, zone, district and kebele.[2] It is finally distributed to farmers through primary cooperatives which are based at the kebele level. Private sector participation in fertilizer supply and distribution is limited due mainly to its requirement of bulk purchases and huge capital. The Agricultural Input Supply Ethiopia (AISE), a government company, plays the role of the "only one importer" and cooperatives distribute fertilizer to farmers (Negatu, Grethe, and Agbahey, 2015). The major actors in the fertilizer sector are listed below (See Table 2-3). Since Ethiopia has no fertilizer factories, the fertilizer supply is solely dependent on imports. However, there is an initiative to produce fertilizers in the country (Legasse and others, 2019).

2 The lowest administrative level in Ethiopia. Ethiopian administrative structure: federal → regional → zone → district → kebele.

<Table 2-3> Main Actors in the Fertilizer Sector in Ethiopia

Stakeholders	Function
Agricultural Input Supply Enterprise (AISE)	Import, distribute to commercial farms
Agricultural Inputs Marketing Directorate (AIMD)	Collect and synthesize the data
Bureaus of Agriculture (BoA)	Collect requirement data
Development Agents (DA)	Collect requirement data
Commercial Bank of Ethiopia (CBE)[1)]	Issue a credit letter for import
Cooperative Unions (CU)	Storage and wholesale
Primary Cooperatives (PC)	Retail, distribute to farmers

Note: 1) The name has been changed to Ethiopian Seed Corporation (Sisay, Verhees, Frans J. H. M, and van Trijp, Hans C. M 2017, 323-355).
Source: Negatu *et al*. (2015).

Fertilizer usage is still low even though the amount of fertilizer has increased over the years (The World Bank Database, 2021). It is known that the farm gate price of fertilizer is relatively higher than Asian countries due to transportation costs, but another study considers the constraints mainly come from the not-reliable requirement survey system including mal poor documentation of fertilizer storage data and storage cost (Negatu, Grethe, and Agbahey, 2015).

2.1.3. Pesticides

Pesticides are important inputs that are applied to prevent plant disease and pests, and improve crop productivity. In countries that need increased agricultural productivity, agricultural policies tend to promote pesticide usage. Ethiopia's pesticide use has increased from 242 tons in 1993, to 4,128 tons in 2017 (FAO Statistics, 2021). Most of the pesticides are imported and there is only one local formulating company in Ethiopia (Mengistie, 2016a). The importers act as distributors, and retailers and cooperatives deliver the pesticides to farmers (Mengistie, 2016b).

<Table 2-4> Major Actors in Pesticides Sector in Ethiopia

Stakeholders	Functions
Animal and Plant Health Regulatory Directorate (APHRD)	Regulation and monitoring
Plant Health Regulatory Directorate (PHRD	Registration, certification
Pesticide Advisory Board (PAB)	Support regulation, certification
International pesticide companies	Import and distribute, technical assistance
Retailers	Collect requirement data
Cooperatives	Retail, distribute to farmers

Source: Mengistie (2016b).

An inefficient pesticide governance system regulating registration, certification, inspection and distribution was identified as a constraint in the Ethiopian pesticide sector (Mengistie, 2016b).

2.1.4. Agricultural Machineries

Farmers' labor and oxen power systems are used in Ethiopia. In particular, farm work, which prepares land using cattle as a power source, is the most important in grain cultivation. In an agroforestry system, a hand hoe is the most used equipment in terms of human labor (Deribe and Jaleta, 2019). The rate of agricultural mechanization is considered very low. According to Berhane, in the Feed the Future survey 2015, only 9% of the surveyed farmers were using modern agricultural machinery and more than half of the machinery used to prepare land was rented (64%).

Identified stakeholders related to agricultural machinery are listed below (See Table 2-5).

<Table 2-5> Major Actors in Agricultural Machinery Sector in Ethiopia

Stakeholders	Functions
Agricultural Mechanization Service Enterprise (AMSE)	Rental & maintenance service
Metals and Engineering Corporation (METEC)	Import, assembling and manufacturing
Private companies	Import, assembling and distribution
Federal Agricultural Mechanization Research Center	Research focused on tef and wheat
Oromia Mechanization Research Centers	Research and training
Amhara Agricultural Mechanization and Food Science Research Center	Research and training

Source: Derive and Jaleta (2019) and Kelemu (2015).

There was no direct and specific policy on agricultural mechanization, and a draft Agricultural Mechanization Strategy has been developed recently, however, a guiding mechanization policy needs to be set (Deribe and Jaleta, 2019).

2.2. Supporting Services

2.2.1. Agricultural Finance Services

The financial sector in Ethiopia is mainly consisted of two types: formal and informal. The formal includes commercial banks which mainly target large scale investors and microfinance institutions which target rural and urban poor communities. There is also the rural saving and credit association (RuSACCO) established by farmers' organizations to solve financial constraints faced by members for agricultural inputs purchasing and output marketing. On the other hand, the informal sector dominates the financial sector and comprises of local money lenders, friends, trade credit, and etc.

In comparison, the agricultural sector is the least financed sector of all in Ethiopia. For instance, in 2019/20 fiscal year, its share was 9.2% of the total loan disbursed by banks (National Bank of Ethiopia, 2020). Particularly, the rural poor smallholder farmers do not have access to credit for inputs purchasing or investing in their farms. They are mainly reached by the informal financial sector. There are many factors contributing to the low reach by formal financial institutions. These include higher risk associated with agricultural investment, absence of collateral, lower infrastructure in remote locations, and ill guided government intervention and investment prioritization.

In Ethiopia, in order to get loan, fixed assets are required as collateral. In comparison to other similar countries, the collateral required is also usually larger than the loan amount approved. This, in particular, hindered smallholder farmers from accessing loans from commercial banks. As a solution to this problem, the International Financial Corporation and Ethiopian Commodity Exchange initiated warehouse receipt finance in 2008 to enable the farming community to access credit using commodity as a guarantee. Even though the initiative started a decade ago, its performance was weak, and was recently relaunched with a pilot on maize commodity and in two locations: the Bure, Amhara region and the Nekemte, Oromia region. Currently, five commercial banks involved and some commodity suppliers are processing applications to get loans using this financing scheme (Personal Communication with KIs from IFC and ECX).

On the other hand, under the new agricultural reform agenda lead by the Ministry of Agriculture, the government acknowledged the lower prioritization of the agriculture sector in access to finance in the past. Therefore, to meet the strategic priority given to the private sector in the new Home Grown Economic Reform Plan and to realize the agricultural sector structural transformation by adding value in agricultural products, the establishment of the

Agricultural Bank was proposed among other financing schemes (Yewondwossen, 2020).

The track records of past loan disbursement by the Development Bank of Ethiopia and Commercial Bank of Ethiopia to large scale agricultural investments and repayment performance were bad due to corruption and disguised investment. As a result, the government intervened and changes were made to the loan request assessment as well as serious attention given to the feasibility of the projects before disbursing any loan.

2.2.2. Agricultural Extension Services

In Ethiopia, similar to the agricultural inputs system, agricultural extension is provided mainly by the government through the Ministry of Agriculture (MoA). According to the MoA, there are over 60,000 development agents (DA) deployed to the entire country who provide advisory service to farmers on the ground. As per the extension system of Ethiopia, three development agents were assigned for each kebele: one for crop extension, one for animal husbandry and one for natural resource management. The federal and regional MoA's structure and responsibilities are listed in <Table 2-6>. Even though the government extension system has succeeded in increasing agricultural production, it failed to significantly increase productivity and meeting the countries food demands due to inefficiencies and lack of integration with other agricultural development strategies of the country (Spielman *et al*, 2011).

<Table 2-6> MoA's Extension Hierarchy

Department	Roles and Responsibilities
Federal Ministry of Agriculture (MoA)	• Develop national level agricultural and rural services policies and strategies • Provide technical support to regional bureaus of agriculture
Regional Bureaus of Agriculture	• Adapt the national extension packages to respective regional condition • Develop implementation strategies of the extension packages and set regional targets • Provide technical support to zonal bureaus of agriculture
Zonal Bureaus of Agriculture	• Develop implementation plan for the zonal agricultural extension service • Provide technical support to woreda offices of agriculture
Woreda Office of Agriculture	• Develop implementation plan for the woreda agricultural extension service targets • Support the administration of FTCs in the woreda • Provide technical support to kebele offices of agriculture
Kebele Office of Agriculture and Farmers Training Center (FTC)	• Provide advisory service to farmers • Train farmers

Source: Belay (2015).

There are also some extension services provided through non-governmental organizations which are limited to specific crops and project duration period. Private sector participation in agricultural extension services is limited or non-existent. The business environment is not favorable for the private sector to provide the services. Cooperative societies are the only private enterprise providing agricultural training which are also limited to their members. Besides, farmers' awareness and willingness to pay for such services are underdeveloped.

2.2.3. Agricultural Research Institutions

In Ethiopia, agricultural research started with the establishment of Ambo and Jimma College of Agriculture in 1947. However, it is with the establishment of the Institute of Agricultural Research (IAR) in 1966 that agricultural research became nationally coordinated and initiated research in its centers and sub-centers across the country. Since 1993, research activity of the institute decentralized to the regions through the establishment of regional research institute with the aim to coordinate region specific agricultural research undertaking. The Ethiopian Institute of Agricultural Research (EIAR) was re-established in 1997 (Bechere, 2007).

According to Bechere (2007), the national agricultural research system was arranged in three levels: federal, regional and higher educational institutions. The federal institute maintained its strategic place and some well-built research centers for coordinating research on nationally important strategic commodities.

Currently, EIAR has 17 research centers across the country in different agro ecology zones, mandated for different commodities. The national and regional research centers are listed below. The Agricultural Research Institutes are external agencies of the MoA (See Appendix 2-4).

<Table 2-7> EIAR Coordinated Research Centers

Research Center	Region	Year Established	Focus Area
National Agricultural Biotechnology Research Center	Addis Ababa	Recently	-
Ambo Research Center	Ambo, Oromia	1977	Pathology, plant disease
Assosa Research Center	Assosa, Benishangul Gumuz	1986	-
Bako Maize Research Center	Bako, Oromia	1964	Maize
Chiro Sorghum Research and Training Center	Chiro, Orimia	2014	Sorghum
Debre Zeit Research Center	Bishoftu, Oromia	1953	Dairy, livestock
Fogera Rice Research and Training Center	Fogera, Amhara	2013	Excellence center for rice research
Holetta Research Center	Holetta, Oromia	1966	Excellence center for bee research, vertisol and dairy research
Jimma Research Center	Jimma, Oromia	1967	Excellence center for wheat research, integrated soil fertility
Kulumsa Research Center	Oromia	1966	Excellence center for wheat research; Wheat, malt barley and highland pulse crops research
Mehoni Research Center	Tigray	2004	Research on lowland high-value tree crops and horticulture crops
Melkassa Research Center	Oromia	1969	Horticulture research center
Pawe Research Center	Amhara	1986	-
Tepi Spices Research Center	SNNP	1973	Excellence center for spice research, heat and spices research
Werer Research Center	-	1964	Research on cotton crop
Wendo Genet Research Center	SNNP	2009	Agricultural research mainly on aromatic, medicinal and bio-fuel plants
Fisheries and Aquatic Life Research Center	-	-	-

Source: Authors.

- Regional research centers
  - Afar Pastoral & Agro-pastoral Research Institute (AFPARI)
  - Amhara Regional Agricultural Research Institute (ARARI)
  - Gambela Agricultural Research Centers (GARI)
  - Oromia Agricultural Research Institute (ORARI)
  - South Agricultural Research Institute (SARI)
  - Somali Pastoral & Agro-pastoral Research Institute (SoPARI)
  - Tigray Agricultural Research Institute (TARI)

2.2.4. Production and Post-Harvest Technology

The GoE set policies and strategies to increase smallholder commercialization through use of modern technology (MoFED, 2006; MoFED, 2010; Planning and Development Commission (PDC), 2016; PDC, 2020). However, to this date, Ethiopian agricultural production is traditional and dominated by low productive technologies. Moreover, over 30% of the country's annual crop production is lost due to low post-harvest technology use and practices.

Most agricultural technologies are promoted via government extension and projects carried out by non-governmental organizations. Farmers organizations also provide agricultural machinery rent service and supply low-cost technologies to members and non-members either through credit or direct purchase. Modern agricultural technologies are intensively used in few agricultural commercialization clusters (ACCs) particularly in the wheat and barley belt of the country stretching from Arsi to Bale areas in Oromia region, Ethiopia. The current government is also promoting irrigation to boost production of strategic commodity like wheat and minimize dependency on aid or imports to meet the demand and supply gap.

Also, farmers' adoption of these technologies is limited. This is mainly due to farmers' lack of access to affordable production and post-harvest technologies, limited know-how to use these technologies, lack of access to finance, absence of auxiliary services like maintenance, and religious and cultural factors like extended holidays in rural areas. Moreover, despite the government efforts to cluster agricultural production, resistance, fragmented and small land size of individual smallholder farmers make it unprofitable to adopt agricultural technologies such as tractors, harvesters and composers. However, the recent tax exemption reform on agricultural machineries and agricultural equipment lease financing initiatives expected to promote and increase mechanization in Ethiopian agriculture. Furthermore, best local technologies should be given proper attention to scale them up for wider use and to further develop them through research.

With the purpose of improving efficiency and capacity, in 2015, five state-owned enterprises responsible for sourcing and supplying agricultural inputs and technologies were merged to form the Ethiopian Agricultural Business Corporation (EABC). These enterprises include the Ethiopian Seed Enterprise, Agricultural Equipment and Technical Services Share Company, Agricultural Inputs Supply Enterprise, Natural Gum Processing and Marketing Enterprise, and Agricultural Mechanization Service Enterprise. The main services of the EABC are agricultural inputs supply, integrated agricultural mechanization services, and natural gum processing & export.

2.3. Other Related Issues

2.3.1. Cooperatives

The history of cooperative development in Ethiopia has gone through different phases. Tefera *et al*., (2017) divided the history of cooperatives based on regime and policy changes into five phases. The major phases are 1950-1974 of the imperial periods; the planned economy 1974-1991 of the Derg regime; and the institutional renewal, market integration and value chain development focus of cooperatives from 1991 to present which is further divided into three distinct phases. In all the phases, the government was the main driver of cooperative movement. Particularly, during the Derg regime, cooperatives were used for political patronage, controlled by the state, and membership was forced. As a result, after the fall of the Derg regime, most cooperatives collapsed. This coupled with low leadership capabilities and corruption within cooperatives resulted in huge distrust in essence of the cooperatives and hardened interest for membership in the following periods.

However, recognizing the importance of cooperatives for socioeconomic development of the rural poor, the government formulated agricultural cooperative society proclamations 85/1994 and later amended in proclamation 147/1998 to encompass the entire cooperative society. The proclamation stipulates cooperative principles such as voluntary membership, contributed to the members' socio-economic improvements, joint ownership, and controlled democratically by the members. Later, the Federal Co-operative Commission (now the Federal Co-operative Agency) was created by proclamation 274/2002 to serve as an umbrella organization to promote cooperative development, support cooperatives technically and oversee their operation (Tefera, Bijman, and Slingerland, 2017).

The main essence of cooperative movement at the initiation was to improve the growth of agriculture and the rural economy. As a result, cooperatives were focused on inputs distribution to increase agricultural productivity and production. Later, besides provision of inputs and other services to members, the focus of cooperatives was geared towards strengthening smallholder commercialization by playing a critical role in agricultural products value addition and marketing (MoFED, 2006). Due to the acknowledgement of the value of cooperatives, the government targeted expanding cooperatives in the cooperative development plan, and as a result, the number of cooperatives and membership size increased throughout time. The plan also aims to establish one primary cooperative per kebele. Yet, cooperative distribution and the number at each level of the regional government structure varies from region to region. According to Federal Cooperative Agency 2018, there are a total of 85,496 primary cooperatives and with a total of 19, 502,786

members (32% female) throughout the country. Among these cooperatives, 31% are engaged in agriculture, 39% in the non-agricultural sector, 25% in saving and credit, and 5% are consumer associations.

Considering the performance of cooperatives in input and output marketing, two surveys were conducted by the government in 2005 and 2006 on smallholder farmers and cooperatives, respectively. The survey results showed that cooperatives share 70% of the inputs distribution market while they share 10% of agricultural output marketing. This implies that the focus was more on growing agricultural production and ensuring food security than value addition and marketing. Despite the government's attempts to integrate smallholder farmers to the local and global market through cooperatives, their share in these markets remains lower. There are several factors contributing to this which include weak linkage of actors within the cooperative structure from farmers to primary cooperatives to the federation level, the absence of a regulatory framework for contract farming, weak leadership and governance capacity of cooperatives' leadership, government intervention, and ineffective and inefficient cooperatives' operation as a result of the lower use of ICT-based technology.

2.3.2. Food Safety and Quality

Standardization was introduced in Ethiopia in 1950 even though the first standardization body was established in 1970. The Ethiopian Standard Agency is the sole body mandated to develop national standards related to products, processes, services and management systems in Ethiopia. The agency is an affiliate and member of some international and local organizations like the IEC, International Organization for Standardization (ISO), the Codex Alimentarius Commission (CAC), the African Regional Organization for Standardization (ARSO), and the Common Market for Eastern and Southern Africa (COMESA) (Abebe and Kassem, 2018).

In Ethiopia, public awareness on food safety laws and regulations and its enforcement in the domestic food market is weak. However, recently, due to the increase in food retail and wholesale in large cities, increase in stringent food quality and safety requirements by international buyers, and the country's economic dependence on exporting primary agricultural commodities, the country has been continuously updating food safety regulations and strengthening its enforcement.

According to Abebe and Kassem (2018), the food safety and quality management system in Ethiopia is in immature stages. They recommend: 1) a comprehensive food strategy and

policy to enforce food safety laws and regulations in the country; 2) tracking system that allows international buyers to track each item along the supply chain., particularly for the export commodities; 3) making available sufficient infrastructure and manpower required to perform complicated laboratory tests related to hazardous substances such as pesticide residues and mycotoxins, and 4) enduring transparency, cooperation between enforcement agencies and existing regulations to focus on food safety issues. The responsibilities and roles of various regulatory agencies are not clearly defined so functions are overlapping; a lack of a mechanism to enforce regulation and inspection, and lack of competent inspection personnel, equipment, and laboratories are considered limitations (Delesa, 2017).

With regards to international food quality and safety standards, such as GAP, HACCP, Fairtrade, Rainforest, UTZ, regulation EEC 834/07, USDA AND GAIN-NOP Final Rule, and the Japanese Agricultural Standard for the Production of Organic Foodstuffs (JAS), they are practically enforced on export commodities and their suppliers. Mostly, there are local agents that conduct the assessment required to issue these certificates. The agents also provide training on the requirements and gaps identified through assessment to enable the suppliers to qualify for the certification. However, these agents do not have power over the approval or renewal of these international certificates.

The following table summarizes the major laws, regulations, and governing body for food safety, animal and plant health in Ethiopia.

<Table 2-8> Laws, Regulations, and Governing Body for Food Safety, Animal and Plant Health in Ethiopia

Category	Laws and Regulations	Objectives	Responsible Institution
Plant Quarantine	Plant Quarantine Regulation No. 4/1992	• To control pests, diseases and weeds entering to and originating from Ethiopia • Importers are obliged to obtain an import permit and phytosanitary certificate from the country of origin	MoA
	Pesticide Registration and Control Proclamation No. 674/2010 –	• Banned the manufacture, import, trading and application of unregistered pesticides	MoA

<Table 2-8> Continued

Category	Laws and Regulations	Objectives	Responsible Institution
Animal Diseases Prevention and Control Laws	Animal Diseases Prevention and Control Proclamation No. 267/2002	• Provides general provisions as well as specific legislative framework on the prevention and control of animal diseases, the migration of animals, animal products and by-products, and the registration of animal health specialists and delivery of services	MoA
	Live Animals Marketing Proclamation No. 819/2014 and Council of Ministers Regulation No. 341/2015	• Provides the legal framework and regulatory measures for animal marketing centers, the rights and obligations of market stakeholders, and the marketing and health control of live animals	MoA
Food, Medicine and Health Care Administration and Control	Proclamation No. 661/2009	• Address setting of standards; licensing and regulation of food and medicine production, import, export, distribution, promotion and storage; and quarantine services at entry and exit ports.	Ethiopian Food and Drug Authority (EFDA)[1)]
	Regulation No 299/2013	• Provides definitions and stipulates general rules related to food safety and quality • Establishes specific rules for food manufacturing; food adulteration and counterfeiting; food storage, transportation and display; food fortification; food irradiation; food import and export; food supplement and genetically modified foods; infant and follow up formula and complementary food; trans-regional water supply; and sale of alcohol.	EFDA

Note: 1) The FRDA has issued several directives related to food safety and quality. Among them are the Food Importers-Exporters and Wholesalers Directive (No. 22/2014); Food Supplement Directive (No. 23/2014); Food Advertisement and Control Directive (No. 33/2015); Food Registration Implementation Directive (No. 34/2017); Food Manufacturing Factories Pre licensing Directive (No. 37/2018); and Infant Formula and Follow-up Formula Directive (No. 21/2014).
Source: Abebe and Kassem (2018).

2.3.3. Current Situation of ECX

The Ethiopian Commodity Exchange (ECX) was installed in 2007 with the purpose to modernize the countries agricultural trading system. At the same time, Ethiopia Commodity Exchange Authority established with the responsibility of regulating the proper functioning of the Exchange; to ensure that the marketing system is fair, transparent and efficient; and to protect the interests of the actors in market system and the public at large. The Exchange was established by the government and it is state owned. Previously, the ECX used to report to the Ministry of Agriculture and starting from July 2017, it is reporting to the Ministry of Trade.

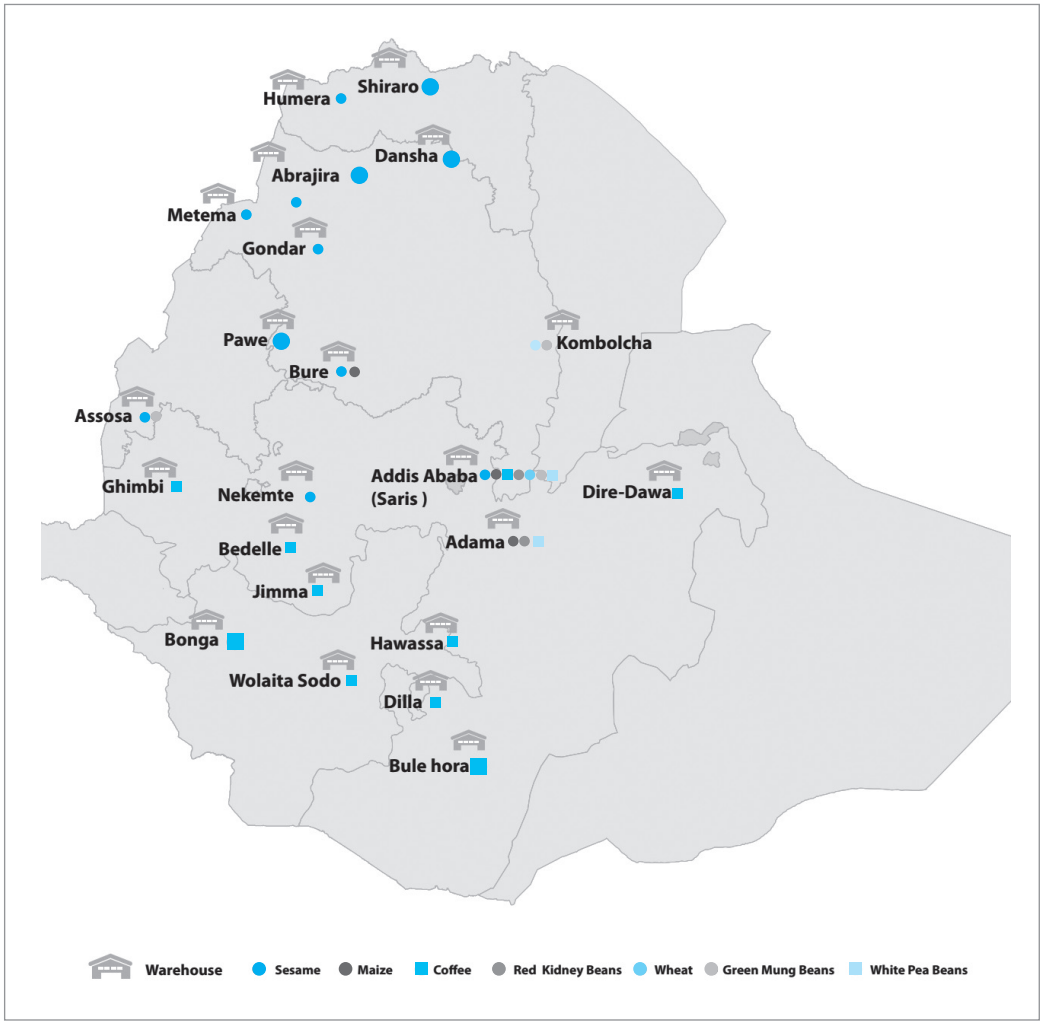
According to a key informant from the Exchange, currently, ECX has 25 branches and 60 shades across the country. Each branch has receiving and delivery warehouses and quality grading laboratories. According to the Exchange, it has succeeded in: 1) bringing attitudinal change on policy makers, supply chain actors and service providers regarding the necessity of modern trading system; 2) enhancing its accessibility by expanding its branches; 3) establishing a zero default clearing and settlement system; 4) improving the efficiency, effectiveness, transparency and accountability of the trading system by using IT; and 5) serving as center of excellence for other African countries (ECX, 2018).

The Exchange has two types of memberships: 1) full membership which includes trading members who self-trade and agent members who trade for their clients; and 2) non-member direct traders who are individuals or legal entities that have trading licenses from the Ethiopian Commodity Exchange Authority and fulfil the preliminary trading procedures for trading for themselves without membership. Non-member direct traders can be small scale farmers, suppliers or exporters. The Exchange has 347 seats and 32 of these are owned by unions. Recently, with the introduction of non-member direct traders' recruitment direction, 92 traders who fulfilled the trading requirements were given the rights to trade (ECX, 2018).

Until now, the ECX has launched 12 commodities into the trading system including maize, wheat, coffee, sesame, white pea beans, green mung beans, red kidney beans, soya bean, chickpeas, pigeon beans, niger seeds, and speckled beans. Except maize, wheat, chickpeas and niger seeds, the others are mandatory crops which means that they are legally required to be traded in the ECX platform. According to the ECX (2018), commodity arrival at the Exchange warehouse reached 693,983 metric tons and trade value also reached 32.79 billion Ethiopian Birr in 2017/18 fiscal year. In the same year, from the total traded volume, 67% was coffee and 30% was sesame.

The future plans of the Exchange are increasing its accessibility by establishing regional electronic trading centers and branches in selected areas, introducing new products to the trading, engaging in future and forward contracts in agricultural commodities, including new services, and trading high standard inputs to new agro-industries established. On the other hand, the Exchange also faced some challenges including lack of supply of agricultural commodities in terms of quantity and quality, lack of awareness on quality among farmers, lack of sufficient infrastructure, unavailability of high standard warehouses, low participation of private investors on warehouse service, lack of knowledge in warehouse management and quality control, and contraband trade (ECX, 2018).

[Figure 2-2] Map of Warehouse Location and Grain Traded in the ECX



Source: ECX 10 Year Anniversary Bulletin (2018).

2.3.4. Land Tenure System

Since the agrarian reform in 1975, Ethiopia maintained its state ownership rural land tenure system (Zegeye and Kim, 2018). The size of farmland varies according to the number of farm families (Mengistu, 2014) and the national average farmland size per household is about 0.96 ha (Heady *et al.*, 2014) in Ethiopia. There have been various discussions about disadvantages like farmers being unable to use land as collateral when they need credit because farmers only have the right to use land, and tenure insecurity issues. However, the state ownership land tenure system has advantages such as that equal opportunities are provided, and it facilitates the development of state-led infrastructure (Zegeye and Kim, 2018).

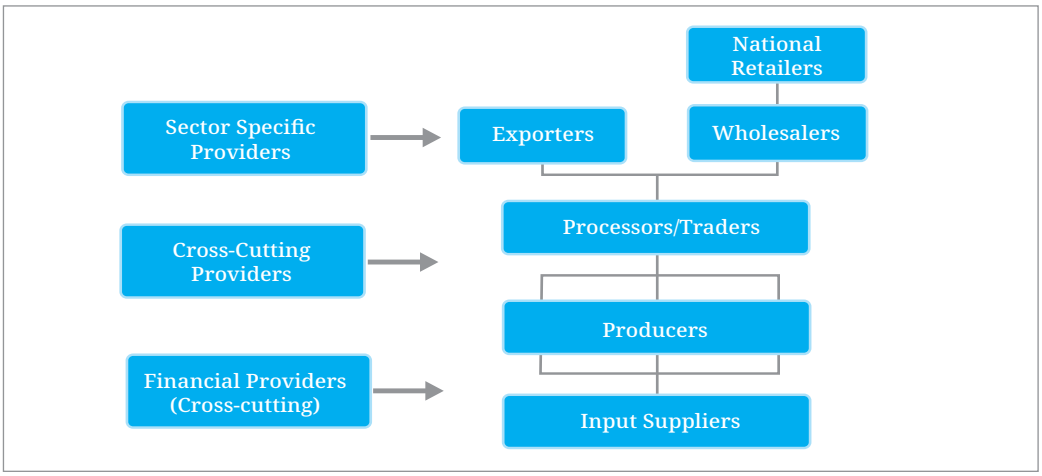
3. Analysis of the Supply Chains of the Selected Agricultural Commodities

3.1. Key Concepts and Research Method

The methodology employed in the study is two folds. First, secondary data collection methods like in-depth literature review were conducted to collect data on process, core actors, supporting functions and business environment. Besides, literature review was conducted to understand the overall production volume, total area of cultivated land, market surplus, and trends of the selected priority strategic commodities.

On the other hand, primary data collection, such as field surveys, key informant interviews and observation, were conducted in the Oromia and Amhara regions to strengthen and empirically validate the secondary information collected. Considering each region's actual and potential production of the selected prioritized agricultural commodities, analysis of the wheat supply chain was conducted in Oromia and analysis of the sesame supply chain was conducted in the Amhara region. The primary data was collected by taking at least one or two samples from supply chain core actors, supporting functions, regulators. In total, 2 key informants (KIs) from federal institutions, 18 KIs were interviewed in the Oromia region and while 10 KIs were interviewed in the Amhara region. We used a supply chain conceptual framework to map the local chain structure (See Figure 2-3) and furthermore, to understand supply chain relationships and governance structure. Moreover, we used a SWOT analysis to identify constraints within each strategic priority commodity supply chain that hinder its connectedness and upgrading.

[Figure 2-3] Supply Chain Conceptual Framework



Source: Adapted from Marketlinks (https://www.marketlinks.org/good-practice-center/value-chain-wiki/value-chain-framework).

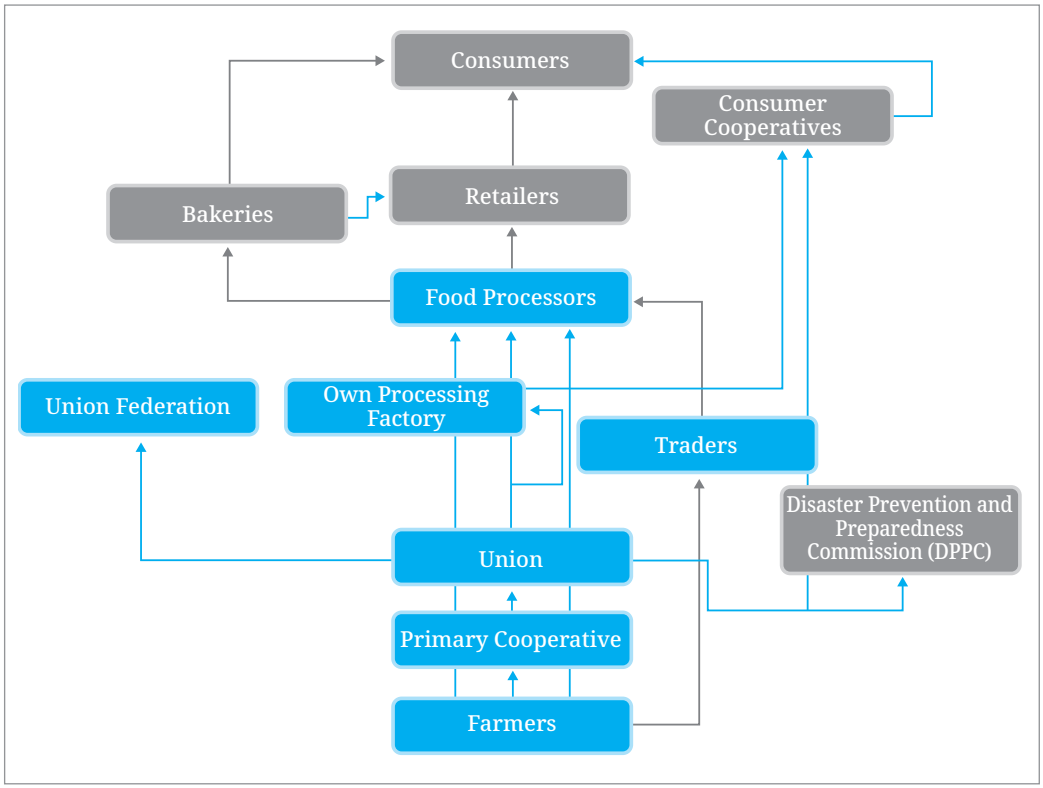
In this section, we will first present the supply chain map for wheat and sesame and discuss the general information and specific constraints of each actor and supporting and regulating functions of each prioritized commodity. The discussion will be presented separately for the wheat and sesame supply chains. The information presented here is based on desk review and results of the field surveys in Oromia and Amhara.

3.2. Wheat Supply Chain

Based on literature reviews and field survey in Oromia, the following wheat supply chain map and market channels were identified. According to the map, the main market channels for wheat which roughly accounts for over a third quarter of the market share include:

- Farmers → Traders → Food Processors → Retailers → Consumers
- Farmers → Traders → Food Processors → Bakeries → Consumers

[Figure 2-4] Supply Chain Map for Wheat



Source: Authors.

Next, we will provide general information and discussion of main constraints identified at each level of the wheat supply chain.

3.2.1. Input Supply

In wheat production, there are different agricultural inputs used. The most commonly used agricultural inputs include fertilizer, improved seeds, pesticides, and agricultural machinery.

1) Fertilizer

In Ethiopia, fertilizer is one of the key inputs in both smallholder and commercial wheat production due to decreasing fertility of the soil and for productivity reasons. Fertilizer is imported by the government and distributed to farmers through primary cooperatives. For instance, Ethiopia used a total volume of 1.63 metric tons of fertilizer on 0.95 million hectares of land in 2019/20 production year out of which 22% were applied in wheat production (CSA, 2020). The main fertilizers used in wheat production include NPS and Urea. Fertilizer is not taxed and only the transport cost to transport it to the farmer level is added.

2) Improved Seeds

Unlike fertilizer, the Ethiopian government releases improved seeds via agricultural research centers and multiplies the lion share of seeds on its own seed enterprises' farms and distributes them to farmers through cooperatives, certified and licensed agro-dealers, and youth cooperatives are organized to distribute seeds in a commission payment. The other sources of improved seeds are farmers' seed primary cooperatives (SPC), and farmers to farmers' exchange. These suppliers get the basic and pre-basic seeds from research centers.

Ethiopian Seed Enterprise and regional Seed Enterprises take the lion share of the market for improved seed supply for wheat in Ethiopia. In the 2019/20 production year, 0.41 million metric tons of wheat improved seed applied on 0.31 million hectares of land by 0.83 million holders (CSA, 2020). The seed enterprises outsource the distribution of seed to Direct Seed Marketing (DSM) youth groups through commission payment. According to Oromia Seed Enterprise, this channel covers 70% of the total wheat improved seed distribution in the region. Seed enterprises also supply a small proportion to cooperatives, agro-dealers, and farmers.

There is a regulatory body established to assess the quality of improved seed production and distribution. In the Oromia region, this regulatory body is called the Oromia Quality Control Office. The improved seed produced should pass two levels of quality checks

which are the field standard and laboratory standard before it is packed and distributed to customers. The most commonly used improved wheat varieties include Ogelcho, Kubsa, Wane, Diglu, Long Bird, Kekeba, Dendea, Limu, Huluka, Hogena, Shorima, and Hidase (EABC, 2021). One quintal of improved seed per hectare is recommended as a standard cultivation practice.

<Box 2-1> Constraints in Improved Seed Supply

- Shortage of improved seed variety is one of the major constraints in agricultural inputs system in Ethiopia
- Shortage and delay to access pre-basic and basic seeds for multiplication
- Limited/absent private sector participation in seed multiplication
- Limited/absent incentive package to attract private sector
- Short life span (3-5 years) of new released variety due to disease
- Lack of integration of all stakeholders in the seed sector
- Limited access to land for seed multiplication
- Seed cleaning machine shortage

Source: Authors.

3) Pesticides

Different chemicals are used in wheat production. Among them are herbicide, fungicide, and insecticide. The chemicals are used mainly to protect the field from weeds, treat wheat rust disease (steam or leaf rust) which is caused by fungicide, and repel insects. The chemicals are mainly supplied via primary cooperatives and agro-dealers which in turn are sourced from large importers such as union federation (only supply to member cooperatives), Ethiopian Agricultural Business Corporation, Chemtex etc. Besides supplying chemical to farmers, the suppliers usually provide training and technical assistance on how to apply it on the wheat field. With regards to application rate, herbicide for weed is applied once in a year. However, fungicide for rust is applied twice to four times a year on average depending on the disease prevalence.

<Box 2-2> Constraints in Pesticides Supply

- Existence of unethical and unprofessional chemical distributors in the local area. Due to wrong recommendation of some of these distributors, damage to crops and human health were caused in the past.

Source: Authors.

4) Agricultural Machinery

In the wheat belt of Ethiopia, mechanization has been used for a long time and remains to be one of the most necessary input in agricultural production. For instance, the first attempt to modernize subsistence farming through a comprehensive package including machineries was the Chilalo Agricultural Development Unit (CADU) project in 1967 in Arsi zone, Oromia region (Bisrat Aklilu, 1980). In today's wheat production, the most commonly used machineries are tractors and combiners. Other machineries used include raw planters and hay bailors. Mechanization services are mainly provided by cooperatives unions and private renters. The cost depends on the type of land and distance from the town even though it is implied as affordable by farmers in the study location due to better supply as compared to other wheat producing locations like the Amhara region.

The use of modern machineries like row planters improves efficiency and reduces wastage. As an illustration, according to the Bureau of Agriculture, 0.1 ton of improved seed per hectare is recommended as a standard cultivation practice. However, as per the CSA (2020) farm management practice report, the average improved seed used was more than twice the recommended amount (0.41 million tons improved seeds vs 1.74 million hectares cultivated area) which imply inefficiency and wastage that could have been improved through availing row planters in sufficient amount and promoting row planting practice.

<Box 2-3> Constraints in Agricultural Machinery Supply

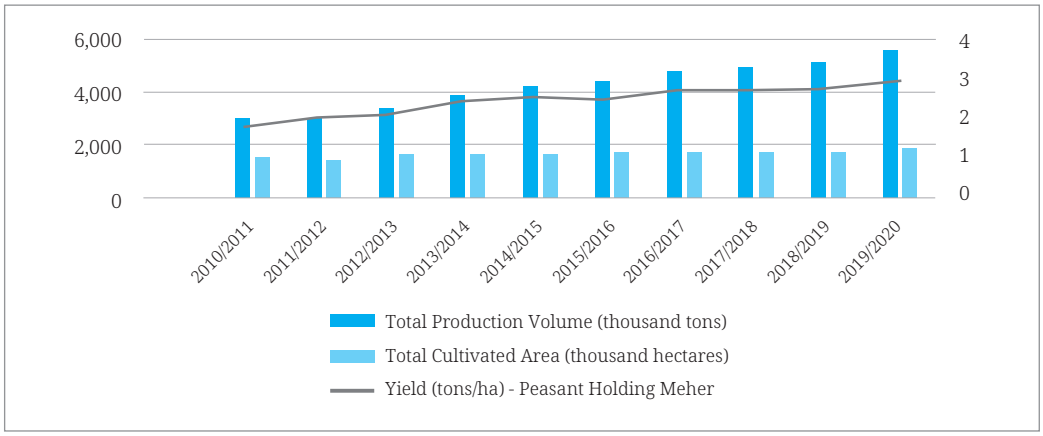
- The shortage of raw planters is one of the major constraints in the wheat supply chain. Due to its advantage in efficiency for application of wheat improved seeds and fertilizers, raw planters are in high demand by farmers. However, the shortage in raw planter supply forced them to continue using broadcasting during planting, and as a result, causing wastage. This has significant implications on their cost of production and return.
- Limited maintenance service providers in proximity. Especially for new type of machineries, they depend on the supplier. Most of the service providers are also based in Addis Ababa and Adama which result in additional costs for transportation and expenses during their stay in the cities.
- Shortage of spare parts
- Shortage of farm mechanization centers

Source: Authors.

3.2.2. Production

Ethiopia is the second largest producer of wheat in Africa (FAO Statistics, Crops, accessed July 3, 2021). Wheat is also the third largest produced cereal crop after maize and teff (CSA, 2020). [Figure 2-5] shows that the production volume of wheat increased from 3.06 to 5.67 million metric tons with 89% growth in 10 years and with an annual average growth rate of 7%. On the other hand, in the same period, the total cultivated area for wheat increased by 19% from 1.60 million to 1.90 million hectares.[3] Yield on peasant holding also increased from 1.8 MT per hectare in 2010/11 to 2.8 MT per hectare in the 2019/20 production year which is an increase of 62% with an annual growth rate of 6%. The national wheat average yield is 2 metric tons per hectare (See Table 2-9). Wheat is produced both by smallholder farmers and commercial farms. Smallholder producers account for 94% of the total wheat production in 2019/20.

[Figure 2-5] Wheat Production Volume, Cultivated Area and Yield



Note: Data for total volume and cultivated area of large-scale commercial farms for 2011/12-2014/15 is not available due to discontinued survey.

Source: CSA Agricultural Sample Survey for multiple years (2020).

Considering the main cultivating areas of wheat, in the 2019/20 production year, the Oromia region produced 3.09 million metric tons and this accounts for approximately 60% of the national wheat production volume. On the other hand, the Oromia region cultivated 0.97 million hectares of land which is about 54% of the total wheat cultivated area in the country. The Amhara region is the second largest producer of wheat followed by the SNNP region. The Amhara and Oromia regions combined covers approximately 90% of the national wheat production and 85% of the total cultivated area. Furthermore, there are over 4.8 million smallholder wheat producers in Ethiopia.

3 The figures for total production volume and total cultivated area are only for Meher (main production season and extends from June – September) excluding Belg season (short rainy season from March-April) production as it is insignificant.

<Table 2-9> Wheat Production, Cultivated Area and Yield by Region - Peasant Holding Meher Season

Region	Number of Holders	Area Cultivated in Hectares	Production in Metric Tons	Yield (Tons/Ha)
Tigray	386,778	102,258.28	223,907.18	2.19
Amhara	1,932,885	578,034.07	1,611,784.14	2.79
Oromia	1,831,185	970,517.66	3,093,398.18	3.19
S.N.N.P	715,807	134,475.11	376,561.35	2.80
Harari	1,412	111.01	169.92	1.53
Total	4,868,067	1,785,396	5,305,821	2
% Share of Oromia	38	54	58	-
% Share of Amhara	40	32	30	-

Source: CSA Agricultural Sample Survey for 2019/20 (2020).

<Box 2-4> Constraints in Wheat Production

- High incidence of wheat rust disease (yellow rust and steam rust)
- Lack of incentive mechanism for farmers to increase wheat production
- Lack of production planning and farm budget analysis to identify the profitability of any farm activity
- Absence of crop insurance

Source: Authors.

3.2.3. Aggregation, Processing and Marketing

As per the farmers' responses, out of the total produced wheat, roughly 30% is consumed at home. The remaining volume is mainly aggregated and marketed through traders and cooperatives. The main channel through which wheat is traded is through traders, covering around 85% of the total market share. Cooperatives' share is very low (up to 10%) due to their lack of competitiveness in the market and inefficiency.

Food processing industries that use wheat as input mainly source their wheat from traders being linked by brokers. There are few contracts on farming experience between processors and producers or cooperatives. The main challenge is the lack of trust between them. Brokers also contribute to the mistrust by distorting market information by under grading, weight loss, and undervaluing the product.

There are over 600 food processing industries in Ethiopia with two-thirds being grain processors and the bakery industry (Soethoudt *et al.*, 2013). The majority of them use wheat as raw materials. A large proportion of wheat produced is also channeled to these industries

and processed into products such as wheat flour, pasta, macaroni, animal feed (residue), and etc. However, due to the supply shortage, the factories on average produce below half of their full potential capacity. Nevertheless, factories based in the Oromia region are advantageous in better using their capacity compared to factories based in other regions due to large production volume in the region. Wheat is also commonly traded across regions via traders. However, there is no documented evidence whether there is cross border wheat trade with neighboring countries of Ethiopia.

Imported wheat with subsidy support from the government is used to make flour in contracted mills, which sell the flour to bakeries at a fixed price. The price of imported wheat is sometimes lower than the price of wheat produced locally. According to Tenaye (2020), price fluctuations in wheat have less effect on production area compared to other staple crops such as teff and barley.

<Box 2-5> Constraints in Aggregation, Processing and Marketing

- Wheat supply shortage
- Lack of legal framework for contract farming. This also led to weak contract enforcement and default in instances where contract farming attempted. Lack of involvement of independent third party, which provide quality testing and grading to create transparency, also worsen success of contract agreement.
- Unregulated wheat market with several illegal players in the supply chain
- Lower margin for producers discourages productivity and quality
- Lower membership and trust of farmers in cooperatives due to bad governance led to lower bargaining power of farmers
- Shortage of standard warehouses particularly at primary cooperative and farmer levels
- Hoarding produce by traders in speculation of price increase which also destabilize the market
- Absence of appropriate technologies locally, particularly for processing industries
- Shortage of spare parts for machineries installed in food processing industries

Source: Authors.

3.2.4. Consumption

Wheat has become one of the important cereal crops in the food basket of Ethiopians. However, due to population growth, urbanization, change in food habits, and service sector growth, the demand for wheat has increased (USDA and GAIN, 2020; Mamo *et al.*, 2020). There is a supply and demand gap and the country is self-insufficient in wheat supply. For instance, the total production of wheat in 2019/20 was 5.32 million MT and the demand was 6.67 MT with supply shortage of 1.35 million MT (USDA and GAIN, 2020; CSA, 2020).

As a result, Ethiopia is a net importer of wheat. In 2020, the GoE imported over one million metric tons of wheat and meslin (ITC Trade Map, 2021). As can be seen from Table 2-10, Argentina, USA, Ukraine, Russian Federation, and Romania were the top five countries from which Ethiopia imported wheat in 2020. In the same year, the total value of imported wheat was 431 million dollars. For longer time, USA was the top exporting country of wheat to Ethiopia. Recently, GoE has focused on import substitution of wheat through irrigated wheat production. Furthermore, mainly processed wheat in the form of wheat flour is used at home or is used in bakery houses which also supply bread to urban and peri-urban dwellers.

<Table 2-10> Imported Wheat and Meslin Volume by Ethiopia – Top Five Exporting Countries

(Unit: tons)

Exporters	2016	2017	2018	2019	2020
	Imported Quantity	Imported Quantity	Imported Quantity	Imported Quantity	Imported Quantity
Total	2,475,980	1,076,876	1,088,490	1,361,284	1,054,866
Argentina	-	-	-	-	372,083
United States of America	473,664	347,641	248,500	290,650	336,824
Ukraine	324,242	98,500	140,134	512,867	199,274
Russian Federation	214,023	92,149	270,312	232,612	64,025
Romania	775,470	351,128	353,211	198,493	53,984

Source: ITC Trade Map (2021).

3.2.5. Supporting Service Provision

1) Extension Service

Largely, extension services are provided by the government. Agriculture and Rural Development Office is mandated to provide extension services, such as best agronomic practices and technology use, through development agents deployed at the lowest administrative. The office also coordinates distribution of fertilizers to farmers in collaboration with cooperatives.

On the other hand, the Cooperative Promotion Agency (CPA) existing up to district level administration promotes the establishment and development of the cooperative's society. They provide business development services, as well as regulatory and market linkage for cooperative societies. Furthermore, the Trade and Market Development Office provides marketing information and regulate small and medium enterprises (SMEs) as well as traders.

Besides the above governmental organizations, some private and non-governmental organizations provide market information and general agricultural information including weather condition. For instance, ATA provides market information through its 6077 free call and general agricultural information through its hotline 8022. Most staff members from the agriculture office subscribed to these platforms and access the information which they will in turn cascade it to the lower structure under them including farmers through training or briefing. One such case is phone contact addresses of development agents at each kebele in the Arsi zone being collected and provided to ATA, and subscribed to ATA's 8022 hotline.

Cooperatives also provide some training and market information for their members. However, these services are limited and dependent on financial assistance from other sources like non-governmental organizations.

<Box 2-6> Constraints in Extension Service

- Logistics problem in providing the necessary services. These include budget shortage, car/motor shortage, lack of internet access etc.
- Development agents are not providing advisory service to their capacity due to absence of appropriate working environment such as housing and associated utilities at kebele level. As a result, they are forced to reside in cities far from the farmer thereby affecting their service. Besides, there is few or no refresher training to update them on the recent developments in agricultural best practices and technologies.
- Auditing capacity of cooperative promotion agency is weak. Moreover, in case there are audit findings, enforcement is also weak.
- Political interference. The government organizations providing supporting functions are also stretched to perform political functions like campaigning which distract them from providing the regular support to the supply chain actors.
- There is a time lag in ATA's 6077 market information from the real time market information.

Source: Authors.

2) Agricultural Research Center

The agricultural research center mainly mandated to release new varieties and promote adoption of these technologies through demonstration and providing training, thereby supporting agricultural production and productivity growth. The Kulumsa Agricultural Research Center is one of the research institutes of the Ethiopian Institute of Agricultural Research. It is located in the wheat belt area of the Arsi zone in the Oromia region and is an excellence center for wheat research.

<Box 2-7> Constraints in Agricultural Research

- Short shelf life (3-5 years) of newly released varieties. Mostly, they are affected by disease and climate change. Therefore, it requires long-term investment in breeding research.
- Lower adoption of newly released variety by farmers. Most farmers will adopt after its performance is demonstrated on model farmers' fields.
- Newly released variety might not reach the farmers on time.

Source: Authors.

3) Access to Finance

Access to finance is a critical supporting function in any supply chain. However, the actors in the supply chain do not have equal access to finance. In the wheat supply chain, traders and processors are in an advantageous position to access credit from formal banks due to the fact that they have collateral such as warehouses, machineries, plants, and etc. Cooperative unions also have this advantage to some degree as they are better off in their capital position. Contrarily, the majority of primary cooperatives and farmers do not have collateral and are excluded from formal bank credit. Primary cooperatives mainly access loans from their umbrella organization union while farmers mainly access loans via microfinance institutions through group lending schemes.

<Box 2-8> Constraints in Access to Finance

- Credit distribution that does not favor producers and their organizations due to lack of collateral. They are treated in a similar way like other businesses even though they are established to serve members and non-members without focusing on profit making only.
- High interest payment for loan accessed from microfinance institutions
- Collateral requirement to access loan. Usually, the collateral required is proportionally higher than the loan requested.
- Delay in processing loans and disbursement

Source: Authors.

4) Early Warning System

An early warning system in the Ethiopian agriculture sector is provided by different institutions including ministry of agriculture, Ethiopian National Meteorology Agency, and non-governmental organizations (like GIZ, FAO). This information is cascaded to farmers through the agricultural and rural development offices at different levels of the government structure from region to kebele. Some of the typical early warning information provided include precipitation forecasts and occurrence of floods, locust swarm incidences and

movements, and occurrence of crop disease outbreak.

5) Transport Service

Transport services are mostly mentioned to be available except the recent increase in price. This service is mainly provided via cooperatives to their members and traders.

3.2.6. Regulation and Policy Environment of the Standard and Certification

In Ethiopia, quality standards and certification are not given attention except the limited effort at the food processing level. The awareness of quality and standard is very limited upward in the supply chain of wheat. Most farmers judge the quality of wheat traditionally by rubbing the grain by hand or by breaking it with teeth. In the Arsi zone, due to the improved production technologies use in wheat production, the quality of wheat is better and preferred by most food processing factories like flour, pasta and macaroni, and biscuits factories across the country. Yet, the awareness of the standard quality parameters for wheat at the farmers' level should be improved.

On the other hand, most food processing industries have their own laboratories to test the quality of wheat grain and test samples before purchasing the grain. However, due to the absence of confirmation by a third-party independent quality testing service provider, suppliers complain about the mischief of buyers and brokers with regards to the grade and quality of wheat. This created distrust in the market for wheat and lowers incentive to maintain quality. Independent quality testing institutions are also limited in number and have less geographical reach.

<Box 2-9> Constraints in Quality Management

- Adulteration of higher quality wheat with lower quality wheat or foreign materials due to the lack of awareness about standards or deliberately act as the market for wheat does not always give incentive for quality product.
- Weak awareness at the farmer level
- Lack of integration of stakeholders responsible to ensure quality and standards including Ethiopian Standard Agency.
- Weak control on conformity of processed food supplied to the local market by food processing industries. This led the processing industries to not give attention to quality food supply in the local market. If there is any, conformity assessment is also vulnerable of bribery.

Source: Authors.

<Box 2-10> Other Constraints Related to the Regulatory Environment

- Absence of a regulatory framework for enforcing contract farming. Although there are several private and non-governmental organization initiatives to implement contract farming, most of those contracts fail due mainly to a lack of legal support for contract farming enforcement. There is work done to draft contract farming legislation by the ATA, and this regulation is yet expected to be approved by law makers.
- Cooperative regulation limited market channels for cooperatives transaction of agricultural inputs, services and outputs. For instance, they have to sell agricultural produce or purchase agricultural inputs and services in a bid unlike traders who have different options. This also eliminates the need for cooperatives to be competitive, and instead, benefit from the market. Similarly, cooperative unions which have food processing industries cannot sale their products to traders or other market channels except consumer associations and members as well as non-members in their own shop. This also negatively affected their competition in the market for wheat finished products. Private food processing industries can sell their product to traders or other channels.
- Weak enforcement of regulations. For instance, even though it is illegal for traders to collect wheat products from farm gates to regulate the market, most traders go down to the farm and purchase without any consequence. Trading at the farm gate is less traceable and makes it difficult for the government to know the volume marketed and collect appropriate tax returns.

Source: Authors.

3.2.7. Infrastructure (Integration of Wheat Supply Chain with Bulbula IAIP)

Infrastructure availability is one of the critical factors for supply chain upgrading. Ethiopian government investment in infrastructure, particularly in roads, were substantial in the past decade and contributed to the fast economic growth registered. However, there are still constraints in coverage and capacity. Some of the constraints in relation to infrastructure are listed below.

<Box 2-11> Constraints in Infrastructure

- Routine electricity outage for food processing industries
- Skilled manpower shortage
- Problem with land allocation for expansion supply in the local market. If there is any, conformity assessment is also vulnerable to bribery.

Source: Authors.

The wheat supply chain in the Oromia region is yet to be integrated with Bulbula Integrated Agro Industry (IAIP). The industry park by itself was recently inaugurated on May 8, 2021. It has a total land size of 271 hectares and three constructed sample shades along with residential houses and other amenities. The construction status is estimated to

reach 90%. Bulbula IAIP will use the following agricultural produce as inputs: wheat, barley, haricot bean, fava bean, tomato, potato, fruits and vegetables, dairy, fish, poultry, honey and meat. To date, one honey processing factory started operation in one of the shades and an oil processing factory is expected to start operation soon.

Moreover, Bulbula IAIP will have six rural transformation centers (RTCs) that are currently under construction. The RTCs will supply semi-processed agricultural raw inputs. The RTCs are located within 100 kilometers radius from the industry park. The six RTCs' locations are Eteya, Meki, Wolenchiti, Shashemene, Dodola, and Bale Robe. The RTCs will have bulk storage, livestock receiving center, milk storing, testing and grading facility, fruits and vegetables washer and drying etc. Likewise, different types of agro processing industries are expected to be operating in the industry park. These industries include poultry, dairy, meat processing, coffee, cereal processing, and fruits and vegetables.

<Box 2-12> Constraints in Integration of Wheat Supply Chain with Bulbula IAIP

- No electricity and water supply. These critical utilities are already planned to be constructed in a short time.
- Very limited awareness by key supply chain actors and supporting function stakeholders about the IAIP and its mode of operation. Oromia Cooperative Promotion Agency and Federal Cooperative Agency provided awareness for cooperatives a couple of times about the linkage expected between cooperatives and the industries that will operate in the IAIP.
- Weak preparation and lack of clarity about how the supply chain for the IAIP will be organized. For instance, the roles of farmers, cooperatives, traders, RTC, and industries operating in the IAIP are not clear.

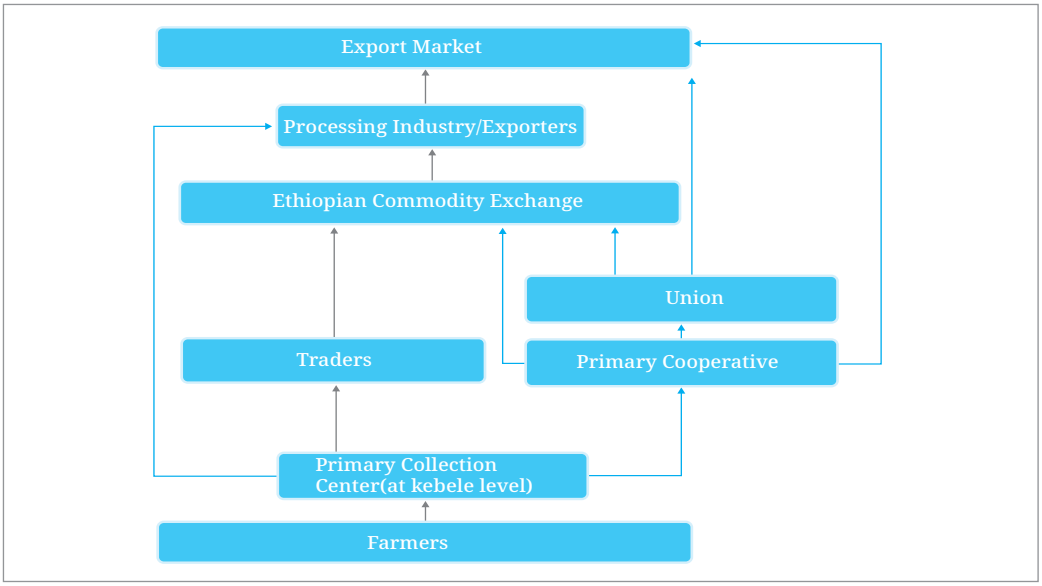
Source: Authors.

3.3. Sesame Supply Chain

Similarly, we also reviewed literature and conducted field surveys in Amhara to map the supply chain of sesame and identify constraints at each level of the supply chain and associated supporting functions and regulatory environment. From the supply chain mapping exercise, the following sesame supply chain map and market channels were identified (See Figure 2-6). Accordingly, the main market channels for sesame which roughly accounts for 99% of the market share include:

- Farmers → Primary Collection Center → Traders → Ethiopian Commodity Exchange → Processing Industry/Exporters → Export Market
- Farmers → Primary Collection Center → Primary Cooperative → Union → Ethiopian Commodity Exchange → Processing Industry/Exporters → Export Market

[Figure 2-6] Supply Chain Map for Sesame



Source: Authors.

3.3.1. Input Supply

1) Fertilizer

Fertilizer application in sesame production in Ethiopia is very limited. Most smallholder farmers as well as large scale sesame producers do not apply fertilizer. According to CSA (2020), the total volume of all fertilizer used in sesame production was 2,199 MT which is 15% of the total volume of fertilizer used in oilseed subsector and 0.001% of the total volume of all fertilizer used nationally. On the other hand, as per Gonder Agricultural Research Center, those who apply fertilizer also do not apply it properly. From past experience, farmers fear that due to the wrong application of fertilizer, their crop might discontinue its growth and become damaged. During the field assessment, it was implied that there is conflicting recommendation by the research center and agriculture office with regards to the fertilizer application rate. Urea and NPS are the main fertilizers used in sesame production.

2) Improved Seed

In northwest Ethiopia, there are few improved varieties of sesame released and used. In 2019/20 production year, from the total 375,120 hectares of cultivated area of sesame only 2% was covered by improved seed (CSA, 2020). Currently, depending on the agro-ecology, there are seven varieties of sesame in use among farmers which are Abasina, Gonder-1, and Gonder-2, Humera-1, Setit-1, Setiti-2, and Setit-3 (Schrader *et al.*, 2020). The source

of improved seeds in the case of sesame are Gonder Agricultural Research Center, seed producer cooperatives (SPC), farmers to farmers' exchange, and private seed producers. However, except for the research center, the seeds produced by others are not inspected and certified by the responsible authority (Schrader *et al.*, 2020).

3) Pesticide

In sesame production in Ethiopia, the most common disease includes bacterial blight, phyllody and wilt, and insect pests include webworm, gall midge, sesame bug and termites (Schrader *et al.*, 2020). These diseases and insects threaten sesame production in the country. Therefore, farmers use different chemicals to treat them. Chemicals are also used to kill weeds. The source of the chemicals are cooperatives and agro dealers. Yet, according to the farmers, there is shortage of chemical supply.

4) Agricultural Machinery

Concerning agricultural machineries usage in sesame production, most farmers including large-scale farmers use either small machineries or old machineries contrary to the land holding size and expected use of machineries. However, there are efforts to promote the use of modern machineries by government and non-governmental organizations. As an illustration, under a project called the Sesame Business Network in collaboration with research centers and agriculture offices, tractors, ploughs, row planters, disc harrows, levelers, ridge makers, cultivators and other machineries were tested and introduced to farmers. However, due to inaccessibility and unaffordability of the machineries for most farmers, the adoption rate was low (Schrader *et al.*, 2020).

<Box 2-13> Constraints in Inputs

- Absence of harsh conditions, and resistant and productive variety. The current improved varieties only give 0.4-0.5 tons/ha on the farmer field.
- Few improved varieties released and there is shortage in their supply. The released varieties are also location specific.
- Limited fertilizer use and in instances where fertilizer is used, it is not properly applied. There is also lack of know-how on proper application rate and conflicting recommendation.
- Chemical supply shortage
- Agricultural machinery shortage especially raw planters due to its high price

Source: Authors.

3.3.2. Sesame Production

Sesame is an economically important cash crop for Ethiopia. It shares 30% of the total oilseed production and oilseeds including sesame export, and is the second in generating hard currency next to coffee (USDA and GAIN, 2020). However, in the last decade, even if the area cultivated by sesame increased slightly by 2% from 637,813 hectares to 649,831 hectares, the production volume of sesame decreased from approximately 0.6 to 0.5 million metric tons with a 21% decrease[4] (See Figure 2-7). Moreover, the yield on peasant holding also decreased from 0.85 MT in 2010/11 to 0.7 MT in 2019/20 production year which is a decrease of 18%. The national average yield for sesame is 2 metric tons per hectare (See Table 2-11). On the other hand, based on primary information from GARC, the yield between 0.7-0.8 ton per hectare is obtained on a research field when all condition is satisfied. The actual productivity on a farmer field is lower than this and ranges from 0.4-0.5 ton per hectare. There are several factors contributing to the decrease in supply. The supply side factors include lower productivity, pests and disease, climate change, and poor access to modern technology (USDA and GAIN, 2020).

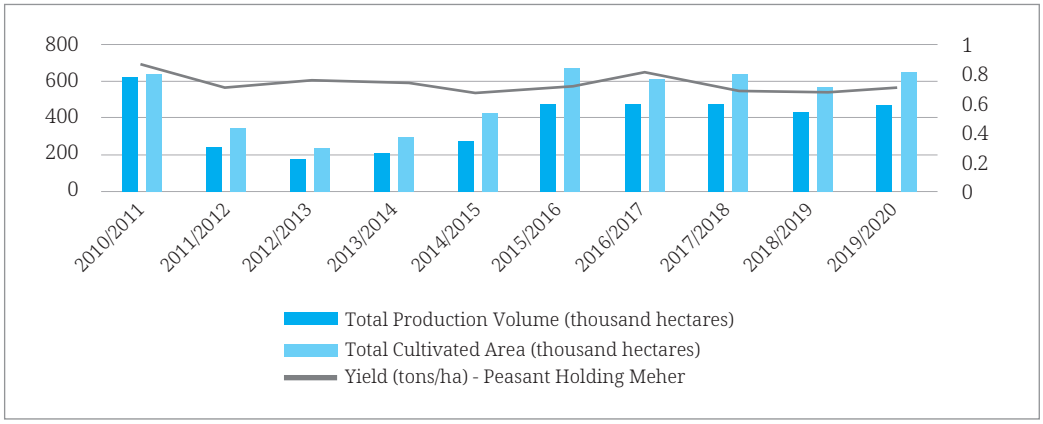
Besides, sesame production requires proper application of agricultural practices from land preparation to post-harvest to achieve better production. As a result, farmers incur high costs of production. For instance, harvesting sesame requires a large number of labors which is expensive in peak season. Almost all farmers also harvest sesame at the same time since it cannot be left in the field for long before it shatters. On the other hand, there are high losses of sesame during harvest and post-harvest season, estimated around 12.7% of the total harvest (Schrader *et al.*, 2020). According to the author, the main cause of loss is shattering before harvest while losses also occur while being transported home or the market, and during the cleaning and processing stages.

Moreover, sesame is produced by both smallholder and commercial farmers.[5] Their share of production volume and cultivated area are approximately equal. With yield continuing to decrease, the high cost of production, and climate change, most supply chain actors and stakeholders interviewed fear that sesame production will be replaced by other alternative crops including soya bean and its economic importance might decrease.

4 The figures for total production volume and total cultivated area are only for Meher (main production season and extends from June-September) excluding Belg season (short rainy season from March-April) production as it is insignificant.

5 As per information from agriculture office and GARC, smallholder producers on average have 10 hectares and below land holding and large-scale producers have on average 100 and more hectares of land holding.

[Figure 2-7] Sesame Production Volume, Cultivated Area and Yield



Note: Data for total volume and cultivated area of large-scale commercial farms for 2011/12-2014/15 is not available due to discontinued survey.

Source: CSA Agricultural Sample Survey for multiple years (2020).

In terms of the main cultivating areas for sesame (See Table 2-11), the Amhara region produces half of the total production volume of the country followed by the Tigray (30%) and Oromia (10%) regions. The share of cultivated area and number of households among the regions are also the same as the share for the production volume. The Amhara and Tigray regions combined cover approximately 80% of the national sesame production volume, cultivation area, and sesame producing households. Furthermore, there are over half a million smallholder sesame producers in Ethiopia.

<Table 2-11> Sesame Production, Cultivated Area and Yield by Region – Peasant Holding Meher Season

Region	Number of Holders	Area Cultivated (ha)	Production in Metric Tons	Yield (tons/ha)
Tigray	145,151	108,291.46	81,104.30	0.75
Amhara	239,756	200,253.31	136,099.84	0.68
Oromia	89,168	36,492.24	24,713.43	0.68
Share of Tigray	-	29%	31%	-
Share of Amhara	-	54%	52%	-
Total	517,528	371,554	261,203	0.5

Source: CSA Agricultural Sample Survey for 2019/20 (2020).

<Box 2-14> Constraints in Sesame Production

- Lower productivity, pests and disease, climate change, and poor access to modern technology resulted in production decrease and shift to alternative crops such as soya bean. This in turn raises question on the sustainability of sesame production, let alone growth.
- Even though domestic price of sesame is high, production cost is also high for sesame and coupled with decreasing productivity makes it unprofitable particularly for smallholder producers with limited access to finance.
- Insecurity is causing challenges on production and procuring labor at peak harvest season. Sesame by nature is labor intensive and if labor supply at harvest time is not sufficient, the crop will dry and shatter and then damage. Most laborers come from outside the production area and the demand is seasonal.
- Agronomy practice by farmers is not as per the recommendation. For instance, even if they have to plough the farm field three times including for planting (1st – just after harvest, 2nd – for fertilizer application, and 3rd- to plant the seed), they only plough one time.
- Large-scale producers of sesame including those through investment license do not hire professionals to manage the farm and to provide technical support. As a result, lower adoption rate and application of best agronomic practices and technology in sesame production. By default, the large-scale producers are excluded from extension system assuming they are self-sufficient.
- Variation of recommendation on best practices between the research center and agriculture office resulted in mistrust by farmers. Site specific recommendation is also needed.

Source: Authors.

3.3.3. Aggregation, Processing and Marketing

Sesame is a mandatory crop,[6] which means that it is only allowed to be traded via Ethiopian Commodity Exchange. After harvest, farmers will sell sesame only at primary market center located in every kebele. The main aggregators of sesame in primary market centers are primary cooperatives and traders. In contrast, even though, processors are allowed to purchase from farmers directly in primary collection centers, they prefer to buy from ECX as it is cost effective. The majority share of sesame is traded via traders. Amhara regional Trade and Marketing Development Office estimates the share of traders around 98% and the remaining is the cooperatives' share.

In addition, traders trade the sesame they aggregated directly in the ECX platform. Likewise, primary cooperatives either can supply to the union, which in turn trade the sesame in the ECX platform or can directly trade themselves through the ECX. Then, the sesame traded in the ECX platform will be exported by exporters after it is cleaned and packed. Those primary cooperatives and unions which have the capacity and license can

6 Mandatory crop means the crop is only allowed by regulation to be traded in the ECX trade platform. Most mandatory crops are export crops and have economic importance.

also directly export sesame.

Furthermore, the majority of sesame produced in Ethiopia is exported. According to the Amhara region trade office, more than 90% of sesame produced is exported to different countries. Similarly, USDA and GAIN (2020) oilseed annual report for Ethiopia indicates that 83% of the sesame produced is destined for the export market. As per <Table 2-12>, in 2017, Ethiopia exported a total volume of 333,578 metric tons and earned over 0.38 million dollars. Over half of the sesame is exported to China. Even though the volume is insignificant and decreasing over time, the Republic of Korea is also one export destination country for Ethiopian sesame. With value addition and improving traceability of sesame, there could be an opportunity for export growth to the Republic of Korea. Furthermore, in the past, there were illegal cross border sesame trade to Sudan but not at present. However, like the supply side, there are also constraints on the demand side. According to USDA and GAIN (2020), these constraints are higher domestic price, easy entry of unexperienced traders and market distortion, contract default in export sales, international price instability, and stiff competition in the international market.

Currently, there are few firms mainly based in Addis Ababa which clean, sort and pack the sesame and export it to the developed market. However, it is expected that domestic consumption will increase as a result of demand created from industries that will operate in integrated agro industry parks. For instance, as per the information from the regional trade office, significant volume of sesame was supplied to a local industry called Richland Agro Processing this year to add value on sesame.

<Table 2-12> Export Volume of Sesame – Top 10 Importing Countries and to Republic of Korea

(Unit: tons)

Importers	2013	2014	2015	2016	2017
	Exported Quantity	Exported Quantity	Exported Quantity	Exported Quantity	Exported Quantity
Total	222,294	284,488	288,356	411,542	333,578
China	124,657	179,145	168,635	279,171	175,299
Israel	41,383	47,709	51,933	51,924	56,485
United Arab Emirates	285	1,805	2,767	7,410	21,783
Turkey	20,591	15,173	13,444	9,689	19,327
Vietnam	190	1,368	498	6,325	13,620
Saudi Arabia	4,300	5,772	3,733	5,788	8,620
Singapore	-	95	6,422	4,940	7,421
Japan	4,820	3,508	3,781	6,422	5,662
Greece	4,142	3,914	2,641	3,933	5,016
Jordan	9,236	8,807	10,072	8,482	4,249
Korea, Republic of	2,700	4,655	8,012	4,197	720

Source: ITC Trade map (n.d.).

It was difficult to collect price information because the consistency of price data presented in various sources was insufficient, and to reflect changes in exchange rates. However, according to Gebremedhn *et al.* (2019), the gross margin that the farmer gets from the sale of sesame is about 38%, which has the highest margin with the processor in the sesame supply chain. The Ministry of Trade and Industry (MoTI) has taken actions to adjust the domestic price of sesame to the international price (Schrader *et al.*, 2020). The government policy on the price and the fluctuation of the price apparently affects the sesame supply chain.

<Box 2-15> Constraints in Sesame Production

- Decrease in supply over time. There is high demand for Ethiopia's sesame but the supply decreases from time to time.
- Higher domestic price
- Easy entry of inexperienced traders and market distortion
- Contract default in export sales
- International price instability
- Stiff competition in the international market
- Limited value addition on sesame within the country
- Lack of transparency in ECX grading. Same product might get different grades and prices as a result of inducement.
- Quality-related problems due to adulteration with foreign materials
- Lower membership of farmers in cooperatives. In some instances, farmers' membership is mainly to get agricultural inputs and consumer goods. If there is a shortage of these products, membership will significantly decrease. In general, this is contrary to the essence of cooperative society formation.

Source: Authors.

3.3.4. Supporting Service Provision

1) Ethiopian Commodity Exchange

The sesame supply chain is supported by different stakeholders. One of the key supporting organizations is the Ethiopian Commodity Exchange. Sesame is also among the mandatory cash crops which have to be traded only on the ECX platform. It started trading on the ECX platform starting from 2014. The main function of the ECX in the sesame supply chain include grading and certification (grade range from Grade 1 to 3 and under grade), handling and storage, and provide market linkage facilitation between buyers and suppliers. The ECX also provides market information, particularly price information, through SMS and electronic billboard at primary collection centers. The ECX has branches in different parts

of the country and the Gonder branch in the Amhara region is one of it. The branch has an electronic trading platform and sesame is one of the commodities traded in the platform. The electronic trading platform enhanced efficiency and minimized costs for traders as it reduces transaction costs by cutting the need to travel to Addis Ababa or have an agent to trade their sesame. In general, even though the ECX platform brought some positive changes in favor of the supplier by creating transparency and shortening the market chain, it also has weaknesses as indicated in the constraints.

2) Other Service Providers

The other key supporting stakeholder is the Trade and Market Development Office. The office controls the quality of sesame traded in primary markets and provides a certificate of quality and pass for the sesame to be traded in the ECX platform. Color and purity are the main quality parameters used. On the other hand, the Cooperative Promotion Agency and Agriculture and Rural Development offices have similar functions like in the case of the wheat supply chain. Moreover, likewise, any research center in Ethiopia, the onder Agricultural Research Center located in the Amhara region is mainly mandated to release new varieties and promote adoption of these technology through demonstration and providing training thereby contributing to agricultural productivity. Sesame is one of the focus crops of the research center.

Even though large capital is required for sesame production, smallholder farmers do not have access to sufficient loans from formal financial institutions which lead them to borrow from the informal sector where interest is high. Mostly, traders provide them loans in exchange for sesame at harvest. Similarly, most cooperatives also do not have enough access to finance, although those which have the required collateral have access. Therefore, access to finance diminishes as we go upstream in sesame supply chain.

Similar to other agricultural produce, the quality of sesame is mainly known through traditional ways when we go upstream in the supply chain. For instance, a farmer judges the quality of sesame before harvest and good quality sesame is said to have no leaf, has weight, white color, and uniformity in maturity. However, there are some attempts by exporters (like Tradin Organic) to become aware about organic production and quality of sesame for producing farmers through contract farming.

<Box 2-16> Constraints in Supporting Services

- Access to finance is a challenge for primary cooperatives and farmers. The application requirement, such as collateral, business licenses, and business plans by formal banks are not met by most farmers. Some farmers also do not want group lending scheme by microfinance institutions due to lack of trust in members.
- Delay in clearing trucks loaded with sesame at the ECX warehouse resulting in additional cost.
- Extension agents are not incentivized to perform well, and the presence of security issues hinder their continuous service.
- Internet connectivity problem in the Gonder ECX electronic trading platform

Source: Authors.

3.3.5. Regulation and Policy Environment

The following are the main constraints identified with regards to enabling environment for sesame supply chain.

<Box 2-17> Constraints in Regulation and Policy Environment

- Weak implementation of land management regulation. Land management practice in sesame production is an issue and the more the land holding size, the less management practices applied. Even if the land management regulation requires every land holder to manage the land properly and otherwise the land could be expropriated, this regulation is not implemented on the ground.
- Similar to the wheat supply chain, cooperatives in the sesame supply chain also complained that cooperative marketing regulation restricted their marketing channels in contrast to regulation for traders and processors which exacerbated their already weak competitiveness.

Source: Authors.

3.3.6. Infrastructure (Integration of Sesame Supply Chain with Bure IAIP)

In the sesame supply chain, infrastructure was less of a concern as per the actors' responses. However, some have mentioned the inaccessibility of some sesame production locations by road as a challenge.

Bure IAIP is located in southwest Amhara. It has a total of 264 hectares of land size. The first phase of its construction is finalized and second and third phase will follow, taking the lessons from the first phase. So far, the government has built four shades. Land is also available for investors to construct their own shades. The Bure IAIP targets agricultural products such as sorghum, sesame, fruits and vegetables, dairy, meat and other animal products. To date, six investors got investment licenses while only one started operation.

The firm that started manufacturing in the Bure IAIP (Richland Agro Processing) uses soya bean and maize agricultural commodities which, however, are not in the list of target commodities.

Moreover, the Bure IAIP will have seven RTCs. The RTCs are located in Mota, Amanuel, Finoteselam, Merawe, Injibara, Dangila, and Jawi. The RTC in Mota is completed and the rest are expected to be completed this year.

<Box 2-18> Constraints in Integration of Sesame Supply Chain with the Bure IAIP

- The production volume does not satisfy industry demand volume. For instance, Richland Agro Processing Industry in the Bure IAIP is already facing a shortage of maize and soya bean supply. The supporting government stakeholders also fear that when additional firms start operating in the industry, the shortage of supply might worsen. Therefore, agricultural production and productivity should be given priority to tackle the problem.
- Weak preparation and lack of clarity about how the supply chain for the IAIP will be organized. For instance, there is no clarity around how the RTC and primary collection centers will be integrated as well as the role of the ECX. As an illustration, there was instance in the past where a processor tried to have direct contract with cooperatives or traders, but since mandatory commodities have to be traded via the ECX, conflict arose and the contract failed.
- Electricity substation and waste treatment plant still have to be constructed.
- Lack of skilled manpower for the industry operating in the IAIPs.

Source: Authors.

4. Constraints and Practical Solutions

4.1. Major Constraints

Examining the limitations identified in the literature review and mainly field surveys reveals that some constraints are the cause or effect of other problems and that one problem can affect many places.

As a result of analyzing the constraints, causes, and related stakeholders in the supply chain of each crop, the stakeholders with the greatest number of constraints were farmers and primary cooperatives (See Table 2-13 and Table 2-14). The most constrained steps are mainly input, especially improved seed supply and production. The 1st stakeholder means the actors who are directly affected by constraints and the 2nd stakeholders are the actors who play their role in the sectors that cause the identified constraints. Therefore, the 2nd

stakeholders can support the 1st stakeholders on the limitations.

4.1.1. Prioritized Constraints in Wheat Supply Chain

We analyzed the constraints and stakeholders in the wheat supply chain to figure out the main actors to solve the constraints (See Table 2-13). Major constraints are observed in improved seed supply, such as the shortage of improved seed variety, short life span (3-5 years) of a new released variety before they are susceptible to disease and harsh environment, shortage of row planters, and the lack of integration of all stakeholders in the seed sectors. The main issues in production are the incidence of pests and disease, which are related to resistant varieties, agricultural standard technology, and other inputs like pesticides. Wheat (raw material) supply shortage to processors, shortage of standard warehouses, lower membership and farmers' trust in cooperatives, and an unregulated market with several players hoarding produce are significant in aggregation and trading.

On the other hand, the major constraints of the supporting functions and business environment in the wheat supply chain are listed below.

- Credit distribution that does not favor producers and their organizations due to lack of collateral
- Adulteration of higher quality wheat with lower quality wheat or foreign materials due to lack of awareness about standards or deliberately act because the market for wheat does not always give incentive for quality product.
- Weak awareness about quality at the farmer level
- Lack of integration of stakeholders responsible to ensure quality and standards including the Ethiopian Standard Agency
- Absence of a regulatory framework for enforcing contract farming
- Inconsistency in the regulatory environment for transaction of inputs, outputs and services for cooperatives and other actors in the same level of the supply chain

As for the IAIP, very limited awareness by key supply chain actors and supporting function stakeholders about the IAIP and its mode of operation and weak preparation and lack of clarity about how the supply chain for the IAIP will be organized. For instance, the roles of farmers, cooperatives, traders, RTC, and industries operating in the IAIP are not clear.

<Table 2-13> Analysis of Constraints and Related Stakeholders in the Wheat Supply Chain

Step	Result	Constraints	Causes	Intervention Points	1st Stakeholder	2nd Stakeholder
Improved seed supply	Low quality of newly, released variety's seed	Short life span (3-5 years) of new released variety	Climate change	-	Farmer	Breeder, researcher
			No varieties resistant to disease	Weak in R&D	Farmer	Breeder, researcher
			Low quality seeds	Weak in R&D, no quality management	Farmer	Breeder, researcher
	Shortage in improved/ certified seed supply	Shortage of improved seed variety	Shortage and delay to access pre-basic and basic seed for multiplication	Ineffective certified seed supply system	Farmer, breeder, seed producer, SPCs	Breeder, seed producer, SPCs
			Limited access to land for seed multiplications	Limited budget, no proper system of government	Farmer	Farmer, researcher
			Seed cleaning machine shortage	Limited budget	Breeder, seed producer	Related institutes
	Low efficiency	Limited/absent private sector participation in seed multiplication	Limited/absent incentive package to attract private sector	Unfavorable environment for investment	All actors	Government
	Shortage in seed supply, low quality	Lack of integration of all stakeholders in seed sector	No proper governance or cooperation between the stakeholders	Ineffective certified seed supply system	All actors	Government
Pesticide supply	Low productivity	Wrong recommendation results in damage on crops and human health	Unethical & unprofessional chemical distributors in local	Not proper or no training	Farmer	DA, trainer, PC, regulation body, distributor
Agricultural machinery supply	No access to machinery services	Limited maintenance service providers in proximity	Shortage of farm mechanization centers	Unfavorable environment for investment	Machinery owner, user (farmer)	Machinery supplier, supporting public officials
		Shortage of spare parts	Shortage of farm mechanization centers	Unfavorable environment for investment	Machinery owner, user (farmer)	Machinery supplier, supporting public officials
Wheat production	Low productivity	Wheat rust disease (yellow rust & stem rust)	No resistant varieties	Weak in R&D	Farmer	Research institute, DA
			No proper practices - apply pesticides, drainage etc.	Not enough training or extension service for farmers	Farmer	Research institute, DA
			Shortage of pesticides supply	No budget for pesticides purchasing	Farmer	Research institute, DA, financial institute, PC

<Table 2-13> Continued

Step	Result	Constraints	Causes	Intervention Points	1st Stakeholder	2nd Stakeholder
Wheat production	Low productivity	Wasting seeds	Shortage of raw planter	Shortage of farm mechanization centers	Farmer	Machinery supplier, supporting public officials
		Lack of incentive mechanism for farmers	Various constraints in marketing	-	Farmer	-
		Lack of production planning and farm budget analysis to identify the profitability of farm activities	Not enough capability of farmers	Not enough training or extension service for farmers	Farmer	DA, trainers, PC
		No crop insurance	No interest in crop insurance of financial institute	High risk	Farmer	Farmer, trader
Aggregation, processing and marketing	No full capacity operation of processing industry	Wheat supply shortage	Not enough production quantity & quality	Overall constraints in input, production, marketing steps	Processor	Farmer, trader
			Hoarding produce by traders	-	Farmer, processor	Trader, regulation body
	Low productivity & low quality	Lower margin for producers discourages productivity and quality	Lack of legal framework for contract farming	Not properly functioning of regulations & systems	Farmer, PC	Government
			Unregulated wheat market-illegal player	Not properly functioning of regulations & systems	Farmer, PC	Government
			Hoarding produce by traders	Not properly functioning of regulations & systems	Farmer, PC	Government
				No awareness of sound trade and its ecosystem	Farmer, PC	Government, trader
	Lower bargaining power of farmers	Lower membership and trust of farmers in cooperatives	Bad governance	Low capacity of cooperative managers (operating members)	Farmer, PC	Related public officials, CPA, training institute

<Table 2-13> Continued

Step	Result	Constraints	Causes	Intervention Points	1st Stakeholder	2nd Stakeholder
Aggregation, processing and marketing	Low productivity & low quality	Shortage of standard warehouses esp. in primary cooperatives and farmer level	No budget & land	-	Farmer, PC	Financial institute
		Absence of appropriate technologies esp. for processing industries	Lack of R&D, low budget	Unfavorable environment for investment	Processor	Research institute
		Shortage of spare parts for machineries installed in food processing industries	Not enough backup industry for the food processing machinery & equipment	Unfavorable environment for investment	Processor	Machinery supplier, supporting public officials
Extension services	Farmers don't get enough extension services	Logistics problem to provide the necessary services	Not enough budget	-	DA, farmer	Government
		DA not providing advisory service to their full capacity	Absence of appropriate working environment-	-	Farmer, DA	Related institutes
			No refresher training for updated agricultural practices & technologies	-	Farmer, DA	Related institutes
			Political interference, doing other activities like campaigning	-	Farmer, DA	Related institutes
	No improvement of cooperative	Auditing capacity of cooperative promotion agency is weak, enforcement is weak	Not properly functioning of regulations & systems, low capacity of CPA	-	PC, farmers	CPA, related institutes
	Farmers don't get market information timely	Time lag in ATA's 6077 market information	Not efficient market information system	-	Farmers, PC	ATA, DA
R&D	Low quality of newly released variety's seed	Short shelf life (3-5 years) of newly released varieties.	Low research capacity, lack of manpower (quality & quantity)	Not enough long-term investment in breeding research	Farmer	Research institute
	Shortage in improved/ certified seed supply	Lower adoption of newly release variety by farmers	Low farmer's awareness	Short life of newly released varieties	Farmer	Research institute, extensionist
		Newly released variety might not reach the farmers on time	Ineffective certified seed supply system	-	Farmer, breeder, SPCs	Research institute, extensionist

<Table 2-13> Continued

Step	Result	Constraints	Causes	Intervention Points	1st Stakeholder	2nd Stakeholder
Access to finance	Farmers can't invest to their farm, not enough money to purchase inputs or use services	High interest payment for loan accessed from microfinance institutes	No proper financial system for farmer	Farmer, breeder, SPCs	Farmer, PC	Banker, regulation body
		Credit distribution doesn't favor producers - lack of collateral			Farmer, PC	Banker, regulation body
		Collateral requirement to access loans			Farmer, PC	Banker, regulation body
	No timely service	Delay in processing loan and disbursement	No efficiency	-	Farmer, PC	Banker, regulation body
Standard & Certification	Low quality of wheat product	Adulteration of higher quality wheat with lower quality wheat or foreign materials	Due to lack of awareness about standard	No promotion or training	Farmer, processor, trader	Regulation body
		Weak awareness at farmer level	-	No promotion or training	Farmer	DA, training institutes
		Lack of integration of stakeholders responsible to ensure quality and standards including Ethiopian Standard Agency	-	-	Farmer, processor, trader	Related institute
		Weak control on conformity of processed food supplied to the local market by food processing industries.	Vulnerable of bribery, no attention to quality food, lack of integration of stakeholders	Lack of awareness of food quality, not proper regulation & monitoring	Farmer, processor, trader, consumer	Farmer, processor, trader, consumer, related institute, ESA
Other regulatory environment	*	Absence of regulatory framework for enforcing contact farming	ATA is working on draft contract farming legislation	*	PC, farmer	Policy makers,
	To make cooperative less competitive compared to other stakeholders	Cooperative regulation limited market channel for cooperatives transaction	Low capacity of cooperatives	No promotion or training	PC, farmer	CPA, related institutes
			Need to improve related regulations	Insufficient monitoring system of related public office	PC, farmer	CPA, related institutes

<Table 2-13> Continued

Step	Result	Constraints	Causes	Intervention Points	1st Stakeholder	2nd Stakeholder
Other regulatory environment	To make cooperative less competitive compared to other stakeholders	Weak enforcement of regulations, illegal transaction of traders	Lack of awareness of sound trading, not proper implementing regulation	Insufficient monitoring system of related public office	PC, farmers	Regulation body
		No working incentives for cooperatives	No proper implementing regulation	Insufficient monitoring system of related public office	PC, farmer	Regulation body
Infrastructure	Basic constraints	Routine electricity outage for food processing industries	Not enough infrastructure	Low investment, low budget	All actors	Government
		Skilled manpower shortage	No proper training program	-	All actors	Government
		Problem with land allocation for expansion	-	-	All actors	Government
IAIPs	*	No electricity and water supply	Will be constructed in short time	*	*	*
	Not proper functioning	Very limited awareness by key supply chain actors and supporting function stakeholders about the IAIP and its mode of operation.	No chance to promote or gather all the related stakeholders	No strategy	Farmer, processors, traders	IAIP, related public officers
	Not properly functioning	Weak preparation and lack of clarity about how the supply chain for IAIP will be organized.	No strategy to include the existing chain actors	No strategy	IAIP	IAIP, related public officers

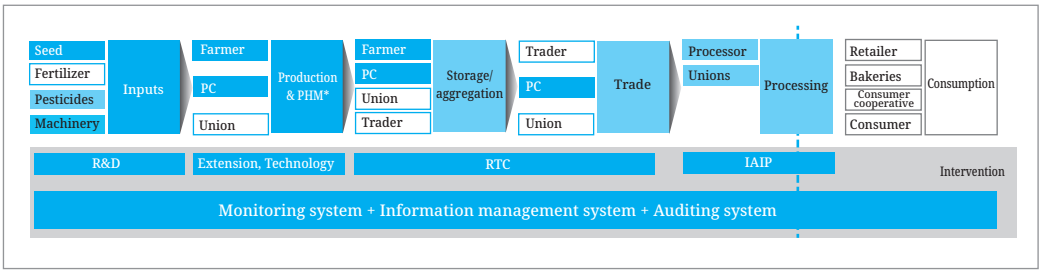
Note: * The Government of Ethiopia already had taken actions on that constraint. Some intervention points described in the Table can be immediate starting points of problem solving and others can be caused to further analyze.

Source: Authors.

To visualize the prioritized constraints and stakeholders, the wheat supply chain is presented in different shades of color (See Figure 2-8). Farmers and primary cooperatives are the most constrained actors in the wheat supply chain, as mentioned above. There are several reasons for the supply shortage of raw material wheat, but the input of agricultural materials such as the supply of improved seeds and agricultural production technology are the key parts. Supporting services and other environments by the government play an important role to overcome the obstacles. The government can intervene at each stage of the chain; research on varieties, technology development and dissemination of technology in input and production; and the management of the RTC and IAIP in marketing and processing. We will discuss the intervention (problem solving) part in the next practical solution section.

As a result of performing a SWOT analysis of the wheat supply chain according to field surveys and stakeholder interviews, the improvement of seeds and technology in inputs was derived as an important strategy (See Appendix 1).

[Figure 2-8] Major Constraints & Possible Intervention Points in the Wheat Supply Chain



Source: Authors.

4.1.2. Prioritized Constraints in the Sesame Supply Chain

We analyzed the constraints and stakeholders in sesame supply chain in the same way as wheat (See Table 2-14). The most constrained actors are farmers and primary cooperatives of sesame chain like the wheat supply chain. In the case of sesame, harvest and post-harvest loss are more significant compared to wheat. Low productivity is a critical issue in sesame. The major causes of low productivity are listed below.

- Absence of harsh conditions, resistant and productive improved sesame varieties, few improved varieties released, and there is critical shortage in their supply
- Lack of know-how and willingness to use fertilizers and large modern machineries
- Shortage of pesticide supply
- Pests and disease, climate change, and poor access to modern technology
- High cost of production
- Insecurity is causing challenge on production and procuring labor at peak harvest season.
- High product loss during harvest and post-harvest seasons

Limited value addition on sesame within the country, higher domestic price, lower membership of farmers in cooperatives are the main constraints in marketing. As for exporting, contract default in export sales, international price instability and stiff competition in the international market are the main pressures.

The major constraints of the supporting functions and business environment in the sesame supply chain are highlighted below.

- Access to finance is a challenge for primary cooperatives and farmers
- Delay in clearing trucks loaded with sesame at the ECX warehouse resulting in additional costs
- Extension agents are not incentivized to perform well, and the presence of security issues hinder their continuous service
- Weak implementation of land management regulation. Land management practice in sesame production is an issue and the more the land holding size, the less management practices applied.
- Cooperatives in the sesame supply chain also complained that cooperative marketing regulations restricted their marketing channels in contrast to regulations for traders and processors which exacerbated their already weak competitiveness.

As in the wheat chain, similar constraints were found in the IAIP for sesame.

- The production volume does not satisfy IAIP industries' demand volume
- Weak preparation and lack of clarity about how the supply chain for the IAIP will be organized. For instance, there is no clarity around how the RTC and primary collection centers will be integrated as well as the role of the ECX.
- Lack of skilled manpower for the industries operating in the IAIPs

<Table 2-14> Analysis of Constraints and Related Stakeholders in the Sesame Supply Chain

Supply Chain Stages	Result	Constraints	Causes	Intervention Point	1st Stakeholder	2nd Stakeholder
Certified seed supply	Shortage of improved seed supply	Absence of disease-resistant & productive variety	Don't have varieties resistant to disease	Weak in R&D	Farmer	Breeder, research institute
			Low quality seeds of new released varieties	Weak in R&D, no quality management	Farmer	Breeder, research institute
		Shortage of certified seed supply	Ineffective certified seed supply system	Ineffective certified seed supply system	All actors	Breeder, SPCs, seed producers, research institute
		Released varieties are location specific	Low diversity in seed varieties	Weak in R&D	All actors	Government
Fertilizer supply	No proper fertilizer application (quantity & applying method)	Limited fertilizer use	No budget for purchasing	No access to financial service	Farmer, PC	Financial institute

<Table 2-14> Continued

Supply Chain Stages	Result	Constraints	Causes	Intervention Point	1st Stakeholder	2nd Stakeholder
Fertilizer supply	No proper fertilizer application (quantity & applying method)	Limited fertilizer use	Shortage of fertilizer supply	Not effective pesticides supply chain	Farmer, PC	Related industry, government
		Not proper application of fertilizer	No application standard for sesame	Weak in R&D	Farmer, PC	Research institute, DA
		Lack of know-how on proper application rate and conflicting recommendation	No application standard for different region	Weak in R&D	Farmer, DA	Research institute, DA
Pesticide supply	Low productivity	Limited usage	Shortage of supply	Not effective pesticide supply chain	Farmer, PC	DA, trainers, PC, regulation body
			No budget for purchasing	No access to financial service	Farmer, PC	Financial institute
Agricultural machinery supply	No access to machinery services	Machinery shortage, esp. raw planter	Expensive price, shortage in machinery service	Not effective machinery service system or strategy	Farmer, PC	Machinery supplier, supporting public officials
		Only small machinery used even in a large field	Expensive price, shortage in machinery service	Not effective machinery service system or strategy	Farmer	Machinery supplier, supporting public officials
Sesame production	Decrease in production	Low productivity	Pest & disease	Weak in R&D	Farmer, PC	Research institute, DA
			Climate change	-	Farmer	-
			Poor access to modern technology	Lack of training farmers & extension service	Farmer, PC	Research institute, DA
			Heavy labor demand in season	Low mechanization	Farmer, PC	Government, related industry
			Farmers don't apply the cultivation standard practices	Lack of training farmers, not proper extension service, weak in R&D	Farmer	Research institute, DA, trainers
		No trust on the recommended practice by extensions	Absence of region specific practice	Lack of training farmers, not proper extension service, weak in R&D	Farmer	Research institute, DA, trainers

<Table 2-14> Continued

Supply Chain Stages	Result	Constraints	Causes	Intervention Point	1st Stakeholder	2nd Stakeholder
Sesame production	Decrease in production	Unprofitable	Production cost is high	Various constraints in input & marketing	Farmer, PC	DA, financial institute, government
			Seasonal heavy labor demand	Low mechanization	Farmer, PC	Government, related industry
		Difficulties in large scale farmers	No proper practices, low technology	Excluded from extension system of government	Farmer	Government, related industry
			Lack of knowledge, access to technology	Not enough training or extension service for farmers	Farmer	DA, trainers, PC
		Post-harvest loss	Difficulties in post-harvest management	No proper practice, technology, knowledge	Farmer, PC	DA, trainers, PC
			Low mechanization	No budget, no access to machinery services	Farmer, PC	government, related industry, financial institute
Aggregation, processing and marketing	Decrease in supply & not constant quality	Decrease in supply over time	Decrease in production	Overall constraints in input, production, marketing steps	Exporter	Farmers, traders
		Higher domestic price	High production price, shortage of supply	Not proper functioning of regulations & systems	Farmer, PC	Government
		Easy entry of unexperienced traders and market distortion	Insufficient monitoring system of related public office	-	Farmer, PC	Government
	Low compactivity in international market	Contract default in export sale	No proper regulation	-	All stakeholders	Government
		International price instability	-	-		-
		Stiff competition in the international market	-	-		-

<Table 2-14> Continued

Supply Chain Stages	Result	Constraints	Causes	Intervention Point	1st Stakeholder	2nd Stakeholder
Aggregation, processing and marketing	Decrease in supply & not constant quality	Limited value addition on sesame within the country	High production price, shortage of supply	Sesame produced to export	Farmer, processor	-
		Lack of transparency in ECX grading	Lack of awareness of grading & quality management	no promotion or training	ECX, farmer, PC, union, trader exporter	Related industry, government
			No efficient quality management system	No efficient quality management system		
		Quality problem	Adulteration with foreign materials	Lack of equipment, not proper post-harvest management		
		Weak membership of cooperatives	Mistrust, low capacity of cooperatives	Lack of operation capacity of cooperative	Farmer, PC	CPA, related institutes
ECX	-	Additional cost	Delay in clearing trucks in ECX	Lack of efficient in-and-out storage system	Farmer, PC, union, trader	Government, ECX
Extension services	Farmers don't get proper extension service	Low performance	Security issues, no incentive	Low budget	-	Government,
Access to finance	Farmers can't invest to their farm, not enough money to purchase inputs or use services	High interest payment for loan accessed from microfinance institutions	No proper financial system for farmer	-	Farmer, PC	banker, regulation body
Other regulatory environment	To make cooperative less competitive compared to other stakeholders	Cooperative regulation limited market channel for cooperatives transaction	Low capacity of cooperatives	No promotion or training	PC, farmer	CPA, related institutes
			Need to improve related regulations	Insufficient monitoring system of related public office	PC, farmer	CPA, related institutes
		Weak enforcement of regulations, illegal transaction of traders	Lack of awareness of sound trading, not proper implementing regulation	Insufficient monitoring system of related public office	PC, farmer	Regulation body

<Table 2-14> Continued

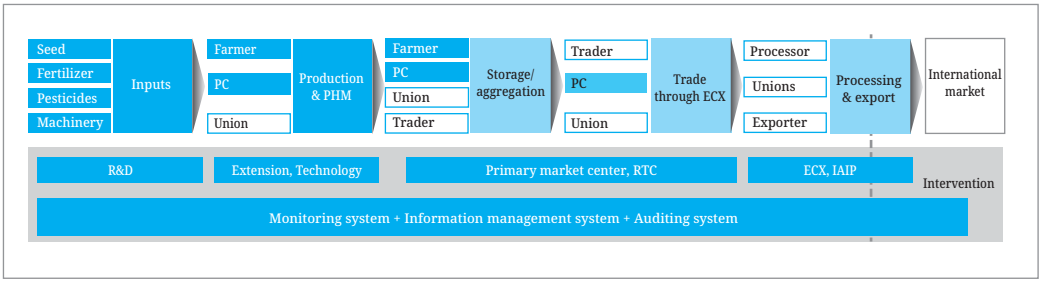
Supply Chain Stages	Result	Constraints	Causes	Intervention Point	1st Stakeholder	2nd Stakeholder
Other regulatory environment	No proper land management	Weak implementation of land management regulation	Insufficient monitoring system of related public office	Insufficient monitoring system of related public office	PC, farmer	Regulation body
Infrastructure	Basic constraints	Road	Low investment, low budget	-	All actors	Government
IAIP	Supply shortage	The production volume does not satisfy industry demand volume.	No chance to promote or gather all the related stakeholders ,shortage of raw material supply	No strategy	Farmer, processor, trader, exporter	IAIP, related public officers
	Not proper functioning	Weak preparation and lack of clarity about how the supply chain for IAIP will be organized.	No strategy to include the existing chain actors, lack of coordination between ECX and IAIP	No strategy	Farmer, processor, traders, exporter	IAIP, related public officers
	Not proper functioning	Lack of skilled manpower for the industry operating in the IAIPs	Not enough promotion, low budget,	No strategy, no training program	IAIP	IAIP, related public officers

Note: Some intervention points described in the Table can be immediate starting points of problem solving and others can be caused to further analyze.
Source: Authors.

To visualize the prioritized constraints and stakeholders, the sesame supply chain is presented in different shades of color (See Figure 2-9). Farmers and primary cooperatives are the most constrained actors in the sesame supply chain like in the wheat chain. In sesame, overall inputs are serious obstacles. The supply of improved seeds is also an important issue like in wheat. Productivity was troubled with harvest and post-harvest losses as well as the lack of production technology. The government can intervene at each stage of the chain; research on varieties, technology development and dissemination of technology in input and production; and management of the RTC, IAIP, primary market center and ECX in marketing. We will discuss the intervention later.

As a result of performing a SWOT analysis of the sesame supply chain according to the field survey and stakeholder interviews, the production potential and market potential were identified (See Appendix 1). However, diverse investment support is required to improve the sesame chain in Ethiopia.

[Figure 2-9] Major Constraints & Possible Intervention Points in the Sesame Supply Chain



Source: Authors.

4.2. Practical Solutions

Even though producing quality agricultural products in enough amounts is the basic solution for most problems, it is also the most difficult objective to reach. To achieve this, both technical and marketing approaches are important. We suggest an implementing solution and other general strategic recommendations.

1) Practical Solution Regarding Cooperation with Korea

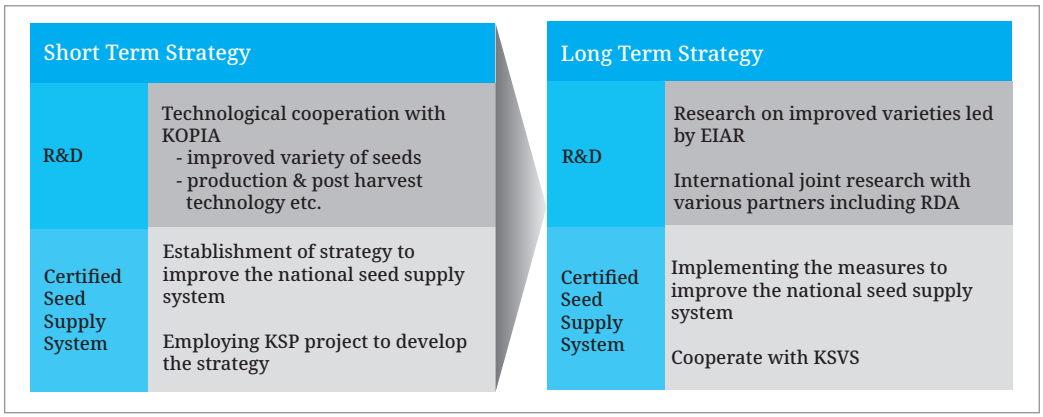
The improved seed supply system requires long-term research investment to foster high-yielding varieties that are resistant to climate change and various pests. In addition, the cultivation technology needs to be adjusted according to the agro-ecological characteristics of the cultivated area, and the technology must be distributed to the farmers along with the seeds. It is very important to develop and disseminate standard cultivation methods and post-harvest management techniques according to the types of crops, varieties, soil and climatic characteristics of the cultivation area.

Considering the feasibility aspect, cooperation with Korea can be arranged on improved variety seeds development, as well as the establishment and dissemination of cultivation technology. The Rural Development Administration (RDA), Korea's national agricultural research institute, which has the largest number of researchers in Korea, is already implementing the "Korea Program for International Cooperation in Agriculture Technology (KOPIA)" in Ethiopia as an overseas technology dissemination project. The KOPIA program consists of three phases; to develop a package of tailored technologies to local needs, to conduct on-farm trials and develop a village-level pilot, to scale up the success village model (KOPIA, 2021). The basis for R&D can be created in wheat and sesame through technical cooperation with KOPIA in improved seeds, cultivation technology, agricultural machinery use, pest control, and post-harvest management as a technical package. However, a mutual agreement between the Ethiopia KOPIA Center and the Ethiopian counterpart (EIAR) must

precede in implementing the cooperation.

From a mid- to long-term perspective, it is necessary to research varieties of major crops, including sesame and wheat, led by the EIAR cooperating with other countries. In addition, the national certified seed supply system can be improved by sharing experience with the Korea Seed & Variety Service (KSVS), a government organization in charge of the production, distribution and certification of major seeds in Korea (Korea Seed & Variety Service, 2021). The overall scheme is presented in the figure below (See Figure 2-10).

[Figure 2-10] Short and Long Term Strategy to Overcome the Main Constraints



Source: Authors.

2) Monitoring & Information Management System

There were also restrictions on the process of distributing agricultural products by farmers and cooperatives. This part also has complex causes and is difficult to simply solve. Cooperatives have a restriction on the bidding method for the purchase of agricultural materials and the sale of agricultural products by the cooperative law, which can be used well and if the ecosystem is healthy, good quality agricultural materials can be purchased reasonably cheaply through competition between bidders when purchasing agricultural materials. It may act as a constraint in the sale of agricultural products because the bidding process takes time and cannot be sold to customers who do not match the transaction method. However, the government maintains these restrictions because the farmer's cooperative lacks the capacity to fulfill its responsibilities for sound trade. In addition, from the government's point of view, it is necessary to be able to trace transactions in order to impose appropriate taxes, and to accurately predict supply and demand by knowing the production, inventory, and distribution of agricultural products and agricultural materials, it is possible to establish strategies and prepare countermeasures accordingly. Therefore,

to monitor and manage information flow through the whole supply chain, using digitalized system needs to be considered. The Ethiopian government already has recognized the importance and promotes digitization. In the context of digitizing and the management system of data and information, it is believed that cooperation for sharing of Korea's excellent ICT technology is possible.

3) Overall Recommendations

The following are recommendations suggested to tackle the major constraints in both the wheat and sesame supply chains.

<Box 2-19> Strategic Solution in the Wheat Supply Chain

- Improve the supply chain of wheat by making the market organized and shortening the supply chain as well as enhancing the capacity of regulating body to better monitor, particularly by using digital technologies.

Source: Authors.

<Box 2-20> Strategic Solution in the Sesame Supply Chain

- Create awareness on the importance and use of modern agricultural inputs as well as improve accessibility and affordability of those technologies including post-harvest technology

Source: Authors.

Even if there is only one problem at one stage of the agricultural supply chain, the entire supply chain will not function to its full capacity, however, it is impossible to deal with every single constraint identified in a supply chain. Nevertheless, it is realistic to focus on a few more fundamental issues. The cross-cutting strategic solutions are listed in the <Box 2-21> and among the solutions, R&D capacity improvement, empowerment of farmers' cooperatives and enhancement of sound business environment by creating uniform regulation for farmers' cooperatives can be considered more important. It is essential to develop a roadmap, implementation plan, and the necessary regulations and policies regarding IAIPs' operation and integration to the already existing supply chains to ensure the IAIP's success in its role.

<Box 2-21> Cross-Cutting Strategic Solutions

- Improve the focus and research and development capacity of research and higher institutions to continuously generate new practices and technologies that will tackle constraints within the supply chain of priority and economically important agricultural commodities.
- Strengthen producers' cooperative society to be critical players in output marketing and benefit their members by paying timely dividends.
- Improve professionalism in cooperatives leadership and business management.
- Improve the regulatory environment for contract farming and enforcement to enhance long-term supply chain relationship and trust.
- Create uniform regulations with regards to trading and equal playing field for cooperative society and traders to enhance competition and healthy business environment.
- Promote and incentive the use of modern agricultural machineries as well as associated maintenance services.
- Empower farmers by transforming them in to business men and women through capacitating them and developing their business orientation and skill. This will unlock different opportunity for them including access to finance from commercial banks.
- Promote and provide incentive for private sector to participate in breeding and improved seed production, distribution and supply.
- Enhance financial access for farmers and their association by developing new financial products and special due diligence requirement.
- Provide crop insurance, particularly for risky crops production like sesame production.
- Improve control system for investment land management by the regulating body.
- Create awareness on quality and standards up to the farmer level and lay a foundation for traceability system to enhance product competitiveness and fetch good prices.
- Produce quality and the right skilled labor based on the demand of industries in the IAIP.
- Preparing a roadmap, implementation plan, and the necessary regulations and policies regarding IAIPs' operation and integration to the already existing supply chains.

Source: Authors.

5. Conclusion

This study combined desk reviews and field assessments of the supply chain of prioritized wheat and sesame agricultural commodities with the aim to investigate the local supply chain and identify constraints hindering upgrading. Wheat supply assessment conducted in the Oromia region by interviewing each actor and key informants from supporting functions and regulatory bodies, while for sesame, the same assessment was conducted in the Amhara region. In total, 30 key informants participated in the assessment and the participants were purposely selected to get the right information about the level/ stakeholder the key informant represented.

Accordingly, the results of the wheat supply chain assessment revealed that the major market channel for wheat is the channel through farmers to traders and the consumers after processed in food processing industries. This covers for roughly 85% of the market share. The cooperative channel is the second market option for farmers even though their share is insufficient (10%). The major constraints identified for the wheat supply chain are the shortage of improved seed and row planter, high incidence of disease, unregulated and large players in the wheat market, high supply gaps, lack of a legal framework for contract enforcement, lack of access to finance for farmers and primary cooperatives, and limited preparation and lack of clarity around the integration of the IAIPs with the existing supply chain.

Likewise, the results of the sesame supply chain assessment showed that the major market channel for sesame is the channel through farmers to traders and exporters. This covers roughly 98% of the market share with cooperatives' participation and share in the market is insignificant. The major constraints identified for sesame supply chain are shortage of productive improved seed and accessible and affordable modern agricultural machineries, lack of awareness and limited agricultural inputs use, limited farm management practices, high risk of production associated with erratic weather conditions and incidence of new diseases and insects, high loss (12.7%) during harvest and post-harvest seasons, and a decrease in production over time, market distortion by unexperienced traders, uncompetitive price in international market, and lack of domestic value addition. On the other hand, lack of access to finance for farmers and primary cooperatives, lack of enforcement of land management regulation on investment land provided for sesame production, and limited preparation and lack of clarity around the integration of the IAIPs with the existing supply chain are some of the constraints in relation to support service provision and the regulatory environment.

In general, in order to improve the supply chain of priority agricultural commodities, such study unearths the constraints along each level of the supply chain and supporting and regulating functions, thereby drawing attention to critical upgrading opportunities for better performance of the supply chain. Therefore, in order to improve the wheat and sesame supply chains and their integration with the IAIPs, a focus on the major constraints identified around provision of agricultural inputs, production and post-harvest should be given priority. Side by side, the government should be forward-looking to enhance the supply chain through better organizing the supply chains through contract farming as well as strengthening forward and backward linkages. Besides, as the country is heading in the right direction with regards to digitizing the economy, tapping the potential of digital technologies and platform such as E-commerce and automation of the supply chain

transactions to facilitate market efficiency should be also given close attention. Moreover, cross-cutting services and regulations, such as access to finance, independent quality testing, ensuring food safety and quality, as well as infrastructure, should be strengthened to promote competitiveness and a transparent and sustainable business relationship.

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Appendix

Data Collection Tools for Agricultural Supply Chain Analysis

[Appendix Table 2-1] Key Informant / Stakeholder /Actor Interview Guide

Region	
Interviewer	
Date of interview	
Organization Name	
Principal product or service	
Contact Person	
Position	
Telephone	
Email	

#	Questions	Issues
1	• Which are the most important suppliers of seed, fertilizer, pesticides and machinery service for wheat/sesame/ in this region? • Which of these are the leading firm/inputs suppliers? • Is there enough/shortage of inputs supply from year to year? • What are the strengths and weaknesses of the inputs system?	Input supply
2	• What pesticides/fertilizers do you use, and how many times do you apply them? • What are the major varieties? • Do you have cultivation standards for each crop? • Do the farmers know the standard cultivation technique or do they practice it? • If you find a plant disease that you don't know, to whom do you ask the problem? • How do you harvest the crops, manually or using machinery? If you said machinery, what's the type of it? • How do you dry and keep/store the harvested crops? • Where do you get information to affect the decision for wheat cultivation? Newspapers, radio, DA or neighbor, another member of cooperative • Are you going to cultivate wheat/sesame again? Why do you cultivate the crops (profitable, having cultivation technique and knowledge etc.)? • What are the strengths and weaknesses of sesame/wheat production system?	Production
3	• Are there individuals or institutions where one can get information of wheat/ sesame production/ processing/ marketing? • Which institutions provide extension services for wheat/sesame? • Who provides business development services? • How do you get information that you need? • Do you use the Agricultural Information Hotline? • How do the farmers get climate information (weather report) for short and long period? • Do you have pest & disease monitoring system or early warning system? • What are the strengths and weaknesses regarding information provision in sesame/ wheat sector?	Existence & effectiveness of extension/ technical services/ training/ information

#	Questions	Issues
4	• Where do you store the product? • Do you have enough warehouses for storage? • What are the strengths and weaknesses in storage?	Storage
5	• Who aggregates wheat/sesame/? from farmers? • Where do they sale the aggregated produce? • What is the farmgate price? • What are the strengths and weaknesses in aggregation?	Aggregation activities
6	• Who is doing processing? • What local processing activities do you think are possible with wheat/sesame? • What's the quality and capacity of the facilities, equipment and storage in the wheat/sesame processor factories? • What are the strengths and weaknesses in wheat/sesame processing?	Processing activities and enablers/ obstacles
7	• How are goods generally transported from the farms/the district? • Who owns the means of transport used? • Do you think commodity transport costs are high/low/affordable? • Which directions do commodities go from the farm/local/region? • Have you noticed any cross-border trade in raw wheat/sesame? • Who buys most of the wheat/sesames in your area? Do you know of domestic or export market opportunities for wheat/sesame? • Do you know who these traders are (middle men or final users of the product)? • Do you know who the final users of the raw beans are (small scale/community level processors or large commercial processors)? • How's the distribution process of sesame/wheat through ECX? • What are the strengths and weaknesses in transportation and marketing of sesame/ wheat?	Distribution, access to transportation and possible destination/markets
8	• Are processed wheat/sesame products available in local markets (shops)? • Do you think wheat/sesame products have a good market in the export market (*e.g.*, Korean market)? • What are the strengths and weaknesses in sesame/wheat product consumption?	Consumption
9	• Is the industry/trade sector represented by national or local business associations? If so, please name them. • What are the primary functions and benefits of these associations? • What additional services should they provide? • Are you a member of a cooperative? If yes, how much do you pay for the cooperative's membership? • As for the farmers' cooperatives, are they developed from traditional kebele's organization, or newly organized for the crop cultivation? • What are the strengths and weaknesses of theses associations?	Business membership organizations (including farmers' cooperatives)
10	• What standards or certification requirements do the products need to conform to? • Who sets these standards and requirements? • Who helps the VC actors to conform to these standards and requirements? • Do the main VC actors recognize the standards or requirements? • What are the strengths and weaknesses in meeting the standards/regulations?	Standard and certification
11	• Is the current equipment or machinery an impediment to growth? Explain. If so, what kind of equipment or machinery could improve the business? • Is the current level of workers training holding back growth? If so, what additional training do they need? • What are the strengths and weaknesses in product development and manufacturing?	Technology

#	Questions	Issues
12	• Where do agribusiness actors go when they need money for their business (formal or informal) and what are the key problems of the source, if any? • Do they get credit from input suppliers? What are the terms? • Do they get production financing from their buyers? What are the terms? • Which agri-business actors do you think find it easiest/most difficult to access finance? • Do you have agricultural insurance for climate disaster, pest or disease? • What are the strengths and weaknesses regarding access to finance in sesame/ wheat sector?	Access to finance
13	• What government policies/regulations benefit wheat/sesame business (registrations, inspections, subsidies, incentives, etc.)? • What government policies/regulations are obstacles to growing wheat/sesame business?	Government policy/enabling environment
14	• What are the most important infrastructure constraints affecting wheat/sesame industry/business' growth and profitability (road/transport conditions, information communication technology, electric supply, storage, etc.)? • What are the opportunities in your industry in relation to infrastructure?	Infrastructure

Source: Authors.

[Appendix Table 2-2] Questionnaire on the IAIP

Region	
Interviewer	
Date of interview	
Organization Name	
Principal product or service	
Contact Person	
Position	
Telephone	
Email	

S. No.	Questions	Response
	General Information	
1	When was the IAIP established?	
2	What is the status of its construction?	
3	What is the size of the area coverage?	
4	How many firms are currently operating in the IAIP?	
5	What is the number of employment opportunity created as a result of the IAIP establishment - disaggregated by sex? Permanent Temporary Causal	
6	Which agricultural commodities does the IAIP focuses on?	

S. No.	Questions	Response
7	Are the rural transformation centers (RTCs) operational? 1 yes 2 no	
8	Do you have any incentive or support program for the companies in the IAIP?	
9	How much rent or lease will tenants (companies) pay?	
	Sesame/wheat	
10	Are there agro-processing industries which started operation and use sesame/wheat as inputs? 1. Yes 2. no	
11	What are the strength and weakness around the supply chain of agricultural commodities (sesame/wheat) that the IAIP faces?	
12	What's your expectation, how many wheat/sesame processor or industries will join the IAIP? Are there any companies to show intention to move in the IAIPs?	
	Service provision	
13	Which stakeholders are providing support functions for the IAIP? and what kind of services?	
14	What are the services provided by actors operating within the IAIP for other value chain actors?	
	Infrastructure	
15	What are the challenges around infrastructure for the IAIP? General infrastructure Electricity, water, road, communication, drainage and sewerage, waste management, housing etc. Specialized infrastructure Cold storage units, quarantine facilities, quality control labs, quality certification centers, raw material storage and central processing centers, RTCs etc.	

Source: Author.

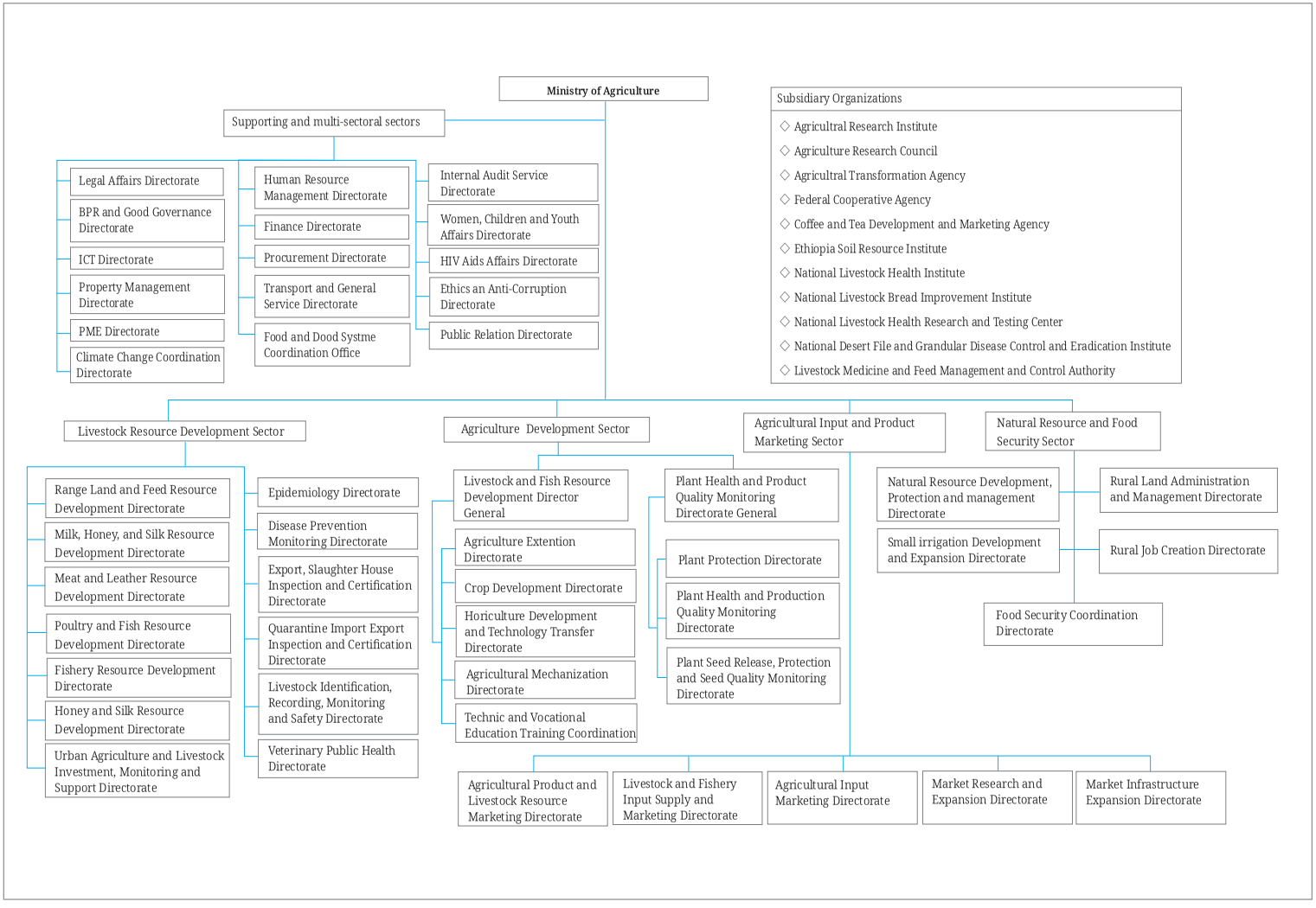
[Appendix Table 2-3] List of Key Informants

Name	Region	Zone/District	Organization	Position
Netsanet Tesfaye	Addis Ababa	-	Ethiopian Commodity Exchange	Director of Communication
Daniel Yilkal	Addis Ababa	-	International Finance Corporation	Consultant
Mustefa Hussen	Oromia	Arsi Zone	Arsi Zone Agriculture and Natural Resource Office	Deputy Head
Sheko Sherte	Oromia	Arsi Zone	Arsi Zone Agriculture and Natural Resource Office	Value Chain Expert
Kedir Nura	Oromia	Hitosa Woreda, Eteya City	Eteya Farm Service Center	Agronomist and Deputy Manager
Dima	Oromia	Eteya City	Rural Transformation Center	Construction Manager
Sintayehu Abebe	Oromia	Assela City	Kulumsa Agricultural Research Center	Research Extension and Communication Team Leader
Kemal Edeo	Oromia	Hitosa Woreda	Shakishala Multipurpose Primary Cooperative	Chair Person
Feyisa Buta	Oromia	Hitosa Woreda, Buchie Habe Kebele	Farmer	-
Abi Atlaw	Oromia	Hitosa Woreda, Buchie Habe Kebele	Farmer	-
Dr. Wogayehu	Oromia	Assela City	Agronomist	Kulumsa Agricultural Research Center
Tilahun Awoke	Oromia	Assela City	Extension Team Leader	Arsi Zone Agriculture and Rural Development Office
Geresu Tuji	Oromia	Hitosa Town	General Manager	Hitosa Farmers' Cooperative Union
Aman Worema	Oromia	Hitosa Town	Chair person	Hitosa Farmers' Cooperative Union
Biruk Belayneh	Oromia	Hitosa Town	Trader	-
Tesfaye Reta	Oromia	Assela City	Sodere Flour Factory	Deputy Manager
Etefa Fufa	Oromia	Assela City	Oromia Seed Enterprise	Assela Branch Manager
Kemal Dedefo	Oromia	Assela City	Arsi Zone Cooperative Promotion Agency	Input Leader
Tamiru Urgessa	Oromia	Bulbula	Bulbula Integrated Agro Industry Park	Resident Engineer
Awoke Demise	Oromia	Dugda Woreda	Bore Dembel Farmers' Cooperative Union	Marketing Expert

Name	Region	Zone/District	Organization	Position
Seyoum Zewide	Amhara	Bahirdar	Trade and Market Development Office	Oilseed Marketing Officer
Zinaw Lingerew	Amhara	Bahirdar	Amhara IAIP Market Linkage Service Directorate	Directorate Director
Dagnachew Asres	Amhara	Bure	Bure IAIP	General Manager
Fentahun Biset	Amhara	Gonder	Gonder Agricultural Research Center	Pulse, oil and fiber crop researcher
Tesfahun	Amhara	Gonder	Centeral Gonder Zone Cooperative Promotion Agency	Deputy Head
Yihunie Dagnew	Amhara	Gonder	Tsehay Union	Manager
Bayelegn Zerah	Amhara	Gonder	Gonder ECX Branch	Electronic Trading Platform Manager
Gebresillasie Adane	Amhara	Sanja Town, Armachio District, Central Gonder Zone	Sanja Farmers' Multipurpose Cooperative	Secretary
Eshetu Asamineh	Amhara	Sanja Town	-	Sesame Farmer
Abiye Adibaru	Amhara	Sanja Town	-	Sesame Trader

Source: Author.

[Appendix Table 2-4] Organizational Structure of MoA



Source: MoA homepage.

03

CHAPTER

Policy Recommendations for Improving Supply Chain of Strategic Commodities

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Keywords
Ethiopia, Agriculture, Strategic Commodity, Supply Chain, Korea Agricultural Development Experience, Agricultural Cooperative, Development Finance Institution (DFI), Foreign Direct Investment (FDI), Private Sector Development (PSD)

Policy Recommendations for Improving Supply Chain of Strategic Commodities

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Summary

Chapter 3 identifies prioritized interventions and provides policy recommendations for addressing the obstacles identified in the preceding chapter, based on a parallel approach. This chapter begins with recognition of the importance of strategic commodities, which offer multiple/dimensional values. The supply chains of these target commodities are of vital importance as they serve to maintain the nation's socio-political stability as well as contribute to securing/accumulating invaluable foreign exchange through food import substitution or export expansion. Thus, it makes sense that the Ethiopian government needs to prepare a strategic plan with action plans/programs on each strategic crop, thereby integrating all stakeholders involved in the supply chain into the integrated framework. The enhancement of the supply chain of strategic crops also has the potential of boosting development in the private sector. This leads to the creation of value-added products, income growth for farmers, and further industrialization through the establishment of a manufacturing base.

Supply chain mapping of strategic crops reveals that cash crops are relatively structured, whereas staple crops are unstructured. Fragmentation is evident within the supply chain of wheat because the crop does not have active transactions and consequently have low connectivity with their markets.

The majority of the policy recommendations presented in this study, though not all, are based on Korea's successful agricultural development experiences. To be more specific, this study identifies Korea's policy efforts for developing agricultural supply chains, drawing from them relevant lessons for Ethiopia. Prior to that, this study identifies priority areas of the supply chain where relevant stakeholders, especially the government, is recommended to intervene or create policies.

Interventions to ensure an effective supply chain necessitate a thoughtful prioritizing and sequencing of activities by dividing them into short-term, medium-term and long-term. Short-term interventions include the development of an inputs demand forecasting model, establishment of a platform for improving the seed system, promoting leasing models, and the like. In the medium term, special attention needs to be placed on strengthening institutions so that productivity can continue to rise, while pioneering domestic/international markets.

This includes interventions such as improvement of the distribution structure, development of modalities for inputs credits, strengthening product quality control, diversifying export markets, establishment of an agro-machinery maintenance system, and the like. The emphasis in the long term needs to be more focused on addressing systematic challenges which are less immediately implementable under the given conditions but have significant potential impact. Long-term interventions include activities such as attaining self-sufficiency of fertilizers, attracting foreign direct investment, private sector development, capacity building of cooperatives, and the like.

For Ethiopia, which urgently needs to address its food insecurity issue and enter the industrialization stage, the implications of Korea's experience in agro-transformation should not be underestimated. The daunting challenges facing the Ethiopian agricultural sector today are not much different from those of Korea in the 1960s. Given that Korea and Ethiopia have different initial conditions such as their farming systems, soil, and climate, and that there is a time gap of more than 60 years, there are many Korean experiences that are not appropriate to share with Ethiopia. Moreover, considering that a large portion of Korea's agricultural transformation was led and driven by a strong central government, certain areas among the Korean policy experiences are less relevant to the Ethiopian picture. However, on the other hand, it is also true that Korea has a wealth of agricultural development experiences which are applicable to Ethiopia. This research explored what Korean policy experiences could be shared with Ethiopia through literature reviews as well as group discussions with experts in both Ethiopia and Korea. The result is that Korea has a variety of policy experiences that can be shared with Ethiopia throughout the supply chain, especially in terms of seeds, fertilizers, agricultural machinery, storage/processing/distribution, post-harvest management, agricultural product quality management, and cooperatives.

This study pays special attention to the following topics for the supply chain development of target commodities: capacity building of co-ops, attracting foreign direct investment (FDI), private sector development (PSD), and strengthening institutional capacities for effective

implementation of policy tasks.

This study presents a multi-purpose agricultural cooperative scheme, firmly believing that conventional approaches such as partial subsidies fall far short of strengthening co-op's capabilities, and therefore, more fundamental alternatives should be sought anew. Another key policy recommendation proposed from this research is to attract foreign direct investment using development finance institutions (DFI) as leverage. The Ethiopian government has made various policy efforts to attract foreign investment in the agricultural sector, but has failed to produce tangible results. Considering this, the Ethiopian government needs to seek new ways to use DFIs as leverage to attract investment. DFIs serve as catalysts or levers to encourage private capital participation in the business by either offering loans or engagement as a first-mover and risk-taker.

Lastly, this study presents private sector development (PSD) as an additional policy option for supply chain development. Public investment in the agricultural sector is bound to be limited, and agricultural development must be sought through private investment. In order for the Agricultural Development-Led Industrialization (ADLI) strategy to bear fruit, it is central that various types of private businesses are created, thereby upgrading agricultural supply chains. In the past, the production stage of crops for self-consumption was greatly emphasized in the supply chain, but recently, market demand for processed agricultural products has been rapidly expanding due to income growth and urbanization. As a result, supply chains that entail agro-processing, packaging, transportation and distribution are being developed, and the role of the private sector is becoming important in the supply chains.

1. Introduction

1.1. Assessing the Significance of the Selected Strategic Commodities

As stated earlier, the aim of this research is to contribute to transforming the Ethiopian agricultural sector through the promotion of its strategic crops among others. To achieve this objective, the research focused on the following three dimensions:

(1) Prioritizing agricultural strategic crops and selection of the top-two prioritized commodities from the perspectives of agricultural and national economic development, especially focusing on the IAIPs supporting the GoE's national

agricultural development policy (Chapter 1): wheat and sesame were selected the prioritized commodities for further investigation in this study.

(2) Identifying constraints of the selected prioritized agricultural commodities, wheat and sesame, in each supply chain step (Chapter 2).

(3) Drawing prioritized interventions and providing policy recommendations for addressing the obstacles identified in the preceding chapter, based on a parallel approach (Chapter 3).

Chapter 3 starts with recognition of the importance of strategic commodities. Selecting which supply chains of commodities should be promoted over others (in other words, commodity supply chain prioritization) is a crucial task in agricultural policy formulation, especially considering the Ethiopian government's budget constraints and its limited capacity.

The policy recommendations in this study are essentially based on parallel research approaches, finding effective solutions to each of the challenges identified in Chapters 2. In this process, the study detailed how Korea addressed each of the challenges facing Ethiopian agriculture today.

The strategic commodities, wheat and sesame selected as prioritized strategic crops from Chapter 1, offer multiple/dimensional values as shown in the table below. The supply chains of the strategic commodities are of vital importance as they comprise a great part of Ethiopia's agriculture sector as well as its economy.

<Table 3-1> The Multiple Values of the Selected Strategic Commodities

Dimensional Values	Descriptions	Eligible Commodities
Importance for national economy	• Population involved across the supply chains (employment/income generation)	Wheat
	• Food security	Wheat
	• Earners of foreign exchange	Sesame
Possibility of attracting domestic/foreign investment	• Attractiveness to domestic/foreign investment • Potential for revenue model generation	Sesame
Easiness of upgrading supply chain	• Continued increase in domestic or international market demand • Attaining significant improvements of supply chain in a relatively short period of time	Sesame, Wheat

Note: Other commodities such as maize, barley or honey are representative strategic crops that can be involved in each value, but only the selected prioritized crops in Chapter 1, wheat and sesame, were discussed in this study.
Source: Authors.

As shown in Chapter 1, these selected prioritized commodities serve to maintain the nation's socio-political stability as well as to contribute to securing/accumulating invaluable foreign exchange through food import substitution or export expansion. Thus, it makes sense that the Ethiopian government needs to prepare a strategic plan with action plans/programs on each strategic crop, thereby integrating all stakeholders along the supply chain into the integrated framework. This strategy paper needs to include a framework for monitoring and evaluation for tracking implementation progress and collecting feedback to improve performance. The enhancement of the supply chain of the selected strategic crops has the potential of boosting the development of the private sector (mostly composed by MSMEs), which leads to the creation of value-added products, income growth for farmers, and further industrialization through the establishment of a manufacturing base.

Against this backdrop, the significance of the individual strategic crops are introduced as follows. Sesame has a smaller number of workers (smallholders) than any other crop, but considering that it has already formed a supply chain to some extent and has high export potential, private companies (especially SMEs) are likely to participate in its supply chain. In Ethiopia, sesame is currently the second most important source of foreign currency after coffee, and Ethiopia is the world's fifth-largest producer of sesame. Sesame has been exported through the ECX, which has been in operation since 2008, and are recognized as brand products in the international market. Sesame was also considered a major crop in GTP I (2010-2015) and GTP II (2015-2020). Although it has been primarily cultivated through contract farming scheme, productivity remains very low and the extraction methods for producing sesame oil are also mainly traditional.

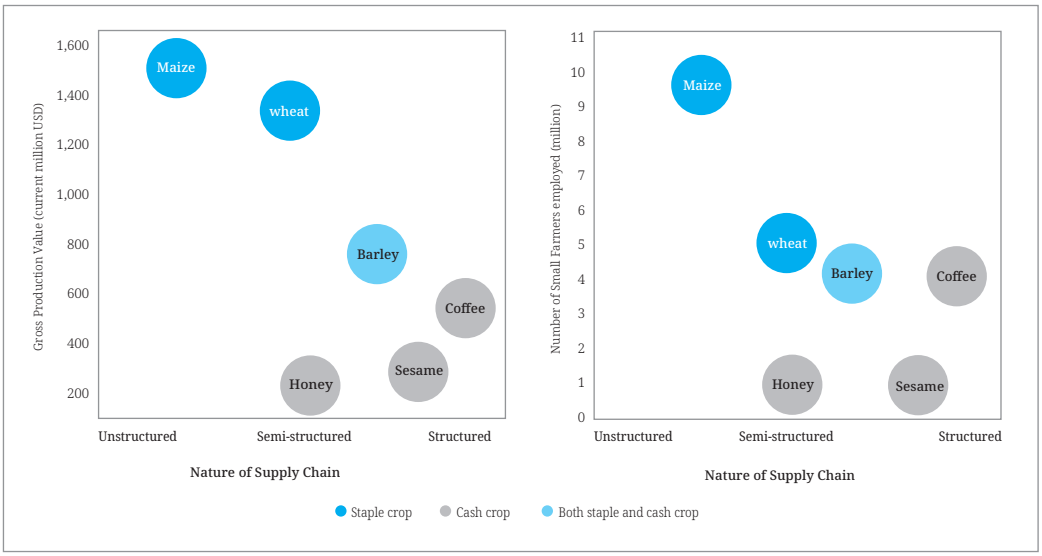
By participating in the contract farming agreement, farmers could be provided with technical support such as education and training from the companies concerned and also receive higher prices than if they were to sell their agricultural products directly to the market. The emphasis in this study on contract farming scheme of sesame is that there are more potential opportunities for contract farming in the crop than any other crop. Contract farming is observed to contribute greatly to farmers' income growth, however, in the long-term perspective, collective farming and marketing with the primary cooperative/cooperative unions needs to be considered as well in Ethiopia.

Wheat is Ethiopia's food security crop, treated as a strategic crop by the GTP I and GTP II. Small farmers account for more than 80% of total wheat production, and the wheat production volume of Ethiopia is second only to South Africa in Africa (Saharan Africa) (World Bank, 2012). Given the growing population, urbanization, and increased sales of flour products (bread, macaroni, pasta) in Ethiopia, the demand for wheat is expected to grow

rapidly. Ethiopia currently has 180 bread factories and nine spaghetti/macaroni factories (World Bank, 2012). Wheat production has more than doubled over the past 20 years, but it has been relying on imports from abroad, including Russia, the United States, and Italy, as it has failed to meet domestic demand. It is a strategic commodity that can replace imports and reduce foreign currency expenditure by expanding production and forming a supply chain.

The figure below portrays the supply chain mapping of strategic crops, which reveals that cash crops are structured whereas staple crops are unstructured. Sesame as a cash crop forms a relatively structured supply chain, while staple crops such as wheat and maize reveal a low level of supply chain development (unstructured/semi-structured term). The fragmentation of the supply chain of staple crops is evident when considering the lack of active transactions and consequent low connectivity with their markets. One of the main reasons is that their cooperatives are not functioning well enough. In addition, wheat has a relatively great gap between consumption and production. This indicates the potential investment demand in the sector, thereby expanding its supply chain.

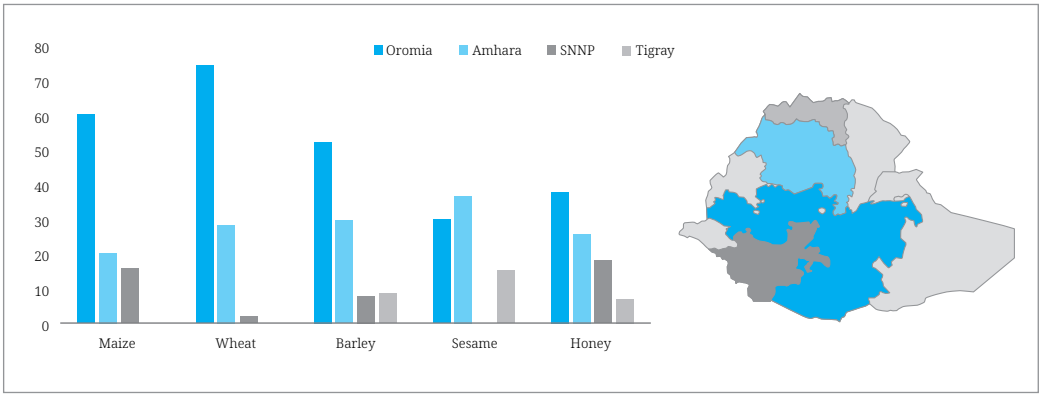
[Figure 3-1] Supply Chains of Strategic Crops and Employment and Gross Production Value



Sources: Mercy Corps. (2019) and FAOSTAT (n.d.).

The figure below illustrates the potential regional impact from developing the supply chain of strategic commodities including wheat and sesame. This indicates that the Oromia region among others will benefit the most except for Amhara from sesame.

[Figure 3-2] Regional Potential Impact by Developing Supply Chain of Strategic Crops



Note: Potential impact represents a production ratio of each strategic crop.
Source: Mercy Corps. (2019).

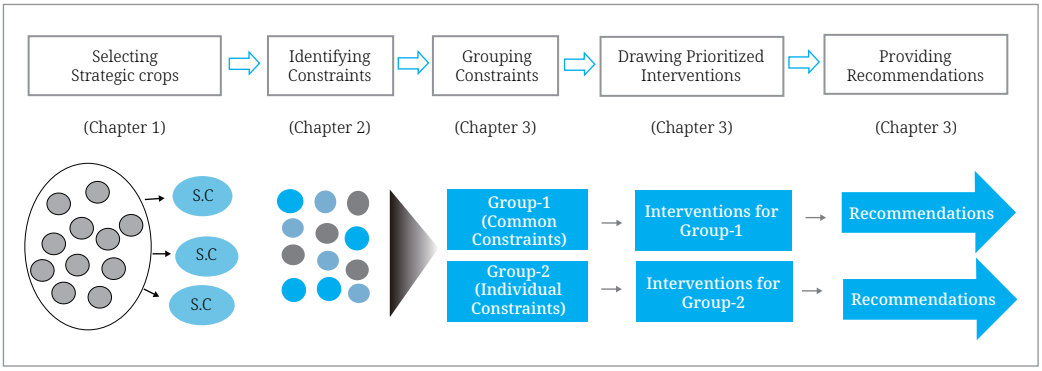
1.2. Selecting Priority Interventions by Supply Chain Step

1.2.1. Priority Intervention Drawing Process

The primary objective of this study is to propose relevant polices, and thereby to assist in developing an effective commodity supply chain in Ethiopia, with the intent to help transform the agricultural sector. The majority of policy recommendations presented within this study, though not all, are based on Korea's successful agricultural development experiences. To be more specific, this study identifies Korea's policy efforts for developing agricultural supply chains, also drawing from them relevant lessons that can help Ethiopia address the challenges in its supply chains.

Prior to that, this study identified priority areas of the supply chain where relevant stakeholders, especially the Ethiopian government, is recommended to intervene or formulate policies. Drawing prioritized intervention was based on literature studies/desk reviews, key informant interviews, and the knowledge of the authors as well as close collaboration with experts in agricultural value chain, local consultants/experts who have a close relationship with relevant stakeholders in the supply chain of the strategic commodities, including the Ethiopia Agricultural Transformation Agency (ATA).

[Figure 3-3] Flow Chart of Drawing Prioritized Policy Recommendations



Note: S.C (Strategic Crop); Group-1 (Common constraints across all strategic crops); Group-2 (Individual constraints of specific strategic crop).
Source: Authors.

This study prioritized potential interventions in accordance with the aforementioned classifications and the results are shown in the table below. While the Ethiopian agricultural sector is hindered by infrastructural, institutional, organizational and technical factors, this research highlights mainly the government's roles as a key stakeholder as well as a coordinator in the supply chain. Chapter 2 identified a number of factors as major constraints in developing supply chains of strategic crops, which includes poor R&D conditions, unfriendly investment environment, budget constraints, poor institution, weak agricultural organizations, lack of education and training, and the like. Chapter 3 seeks to provide policy proposals to address these obstacles individually or comprehensively.

<Table 3-2> Policy Interventions for Improving Supply Chain of Strategic Crops

Supply Chain Tier		Intervention No.	Intervention Descriptions	Relevant Strategic Crops
Inputs	Seed & Fertilizer	(1)	Improvement of inputs marketing/ distribution system	All
		(2)	Establishment of inputs credit purchase schemes	All
		(3)	Developing inputs demand forecasting model	All
	Seed	(4)	Establishment of a platform for improving the seed system	All
	Fertilizer	(5)	Attaining self-sufficiency of fertilizers	All
Production	Agro-mechanization	(6)	Establishing agro-machinery production base	All
		(7)	Strengthening agro-machinery maintenance system	All

<Table 3-2> Continued

Supply Chain Tier		Intervention No.	Intervention Descriptions	Relevant Strategic Crops
Production	On-farm production	(8)	Strengthening contracting farming scheme	Malt barley, Sesame
	Extension services	(9)	Establishment of systematic education and training systems	All
Processing	Aggregation and storage	(10)	Establishment of well-organized collection and storage system	All
	Processing	(11)	Establishment of one-stop-processing scheme	All
Marketing	Agro-product quality management	(12)	Quality control of agro-products	All
		(13)	Standardization of agro-products	All
	Market diversification	(14)	Diversifying export markets	Sesame
Cross-cutting issues	Cooperatives	(15)	Capacity building of cooperatives	All
	Agricultural investment	(16)	Attracting foreign direct investment (FDI)	All
		(17)	Private sector development (PSD)	All
	e-Agriculture	(18)	Harnessing ICT to improve agricultural supply chain	All
	Institution	(19)	Strengthening institutional capacities for implementation	All

Source: Authors.

1.2.2. Sequencing of Priority Interventions

The intervention for an effective achievement of the supply chain necessitates thoughtful prioritizing and sequencing of activities by dividing them into the short-term, medium-term and long-term. In the short term, it is necessary to focus on areas where implementation of policies is relatively easy and the impact is expected to occur immediately. This includes interventions such as developing an inputs demand forecasting model, establishment of a platform for improving the seed system, and promoting leasing models. In the medium term, attention needs to be placed on strengthening institutions so that productivity can continue to rise, while pioneering domestic/international markets. This includes interventions such as the improvement of the distribution structure, development of modalities for inputs credits, strengthening product quality control, diversifying export markets, establishment of an agro-machinery maintenance system, and expansion of the contract farming scheme. As previously observed, the Ethiopian agricultural sector faces multiple obstacles across the supply chain. The expansion of the contract farming scheme is one of the options

addressing the challenges which is highly recommended for malt barley and sesame. As a contract farming scheme allows smallholders to access key inputs such as improved seeds and fertilizers as well as to secure a stable sales network, this scheme surely would contribute to enhancing agro-productivity and avoiding high market uncertainty. The emphasis in the long term needs to be more focused on addressing systematic challenges which are less immediately implementable under the given conditions but have significant potential impact. Long-term interventions include activities such as attaining self-sufficiency of fertilizers, attracting foreign direct investment, private sector development, capacity building of cooperatives, and the like.

<Table 3-3> Sequencing of Priority Interventions

Short-term	Medium-term	Mid- to Long-term
(1) Improvement of inputs marketing/ distribution system (3) Developing inputs demand forecasting model (4) Establishment of a platform for improving the seed system (8) Strengthening contracting farming scheme (9) Establishment of systematic education and training systems (18) Harnessing ICT to improve agricultural supply chain	(2) Establishment of inputs credit purchase schemes (7) Strengthening agro-machinery maintenance system (10) Establishment of well-organized collection and storage system (11) Establishment of one-stop-processing scheme (12) Quality control of agro-products (13) Standardization of agro-products (14) Diversifying export markets (15) Capacity building of cooperatives	(5) Attaining self-sufficiency of fertilizers (6) Establishing agro-machinery production base (16) Attracting foreign direct investment (FDI) (17) Private sector development (PSD) (19) Strengthening institutional capacities for implementation

Source: Authors.

1.3. Korea's Agricultural Development Experience and Its Shareability with Ethiopia

1.3.1. Overview of Korea's Agricultural Transformation

Korea's agricultural sector traditionally suffered from low productivity, which left the Korean people in poverty. However, in the 1960s, the Korean government pushed ahead with its strategy for agricultural transformation, which successfully led to the country's economic development. Agricultural transformation in Korea was achieved through the government's leading role and of course its integrated collaboration with private sector stakeholders and farmers. Korea's agricultural development path has three chronological stages, as shown in the table below.

The first phase, which was focused on staple food self-sufficiency, was attained due to its comprehensive and integrated approach. The central government, local governments, private sector, and farmers all united to achieve the goal of food self-sufficiency. Indeed,

food self-sufficiency was a long-cherished desire of the Korean people. At that time, international trade was not as active as it is today, thus expanding domestic food production was a central goal in Korea' agricultural policies. Finally, Korea succeeded in achieving food self-sufficiency in 1977 as the result of various efforts such as the development/nation-wide dissemination of high-yielding varieties, attainment of self-sufficiency for fertilizers, agro-mechanization, and agricultural water development. Above all, the productivity of a new rice variety (called 'Tong-il' rice) was more than 30% higher than that of the traditional variety (Japonica), which dramatically increased rice production and also significant improvements in farm household incomes. In 1964, the Korean government dispatched a small group of breeding experts to the International Rice Research Institute (IRRI) in the Philippines, where they succeeded in developing a new high-yielding rice variety. In order to boost the production of Tong-il type rice, the government adopted a two-tier price policy, which resulted in remarkable increases of rice production and rural income, supporting the real income of urban households, and stabilizing its price, among other things. As such, the achievement of the Green Revolution in Korea was largely attributed to the combination of various factors such as the development and dissemination of high-yielding varieties across the country, access to other accompanying inputs, extension services, and enabling policy environments.

The second phase – the post-Green Revolution (rice self-sufficiency) period – was characterized by an acceleration of agricultural transformation through the creation of the added value of agro-products and value chain upgrading while generating income and employment of rural communities. During this stage, diverse agricultural initiatives such as large-scale storage facilities, agro-processing complexes, wholesale markets, and quality management systems were successfully implemented. These issues will be mentioned in detail later. Policy efforts to improve the rice varieties continued. In the 1980s and 1990s, rice production rose rapidly far beyond the self-sufficiency level, resulting in a rapid increase in the government's rice inventory.

The third phase – where Korea is currently located – is characterized by the enhancement of global competitiveness against the era of the opening of agricultural markets since the WTO was launched in 1995. Korea has been obliged to import rice since 1995 under the Minimum Market Access (MMA) rule in the Uruguay Round Agreement on Agriculture. This led Korea's agriculture to enter the competition on the international stage, which initiated the new rules of the game in the agricultural sector. During this period, significant structural changes were characterized by a decrease in rice consumption and at the same time an increase in the nation's rice inventory level coupled with the MMA imports. This inevitably led to a fall in rice prices, which in turn adversely affected rural income. In order

to address these challenges, the government policies largely focused on enhancing value-added through strengthening research and development (R&D), vinyl greenhouse farming, and process manufacturing (rice cake, cooked rice, rice wine, and the like). The ultimate objective of agricultural R&D activities was undoubtedly to develop high-quality varieties, thereby increasing added value as well as catering/appealing to the needs of the consumers. To respond to changes in consumer preferences, the government policies shifted from quantity to quality through the development of various varieties such as functional rice and colored rice.

Amid rising disposable income levels of consumers, fresh vegetables and fruits, and horticulture have actively been grown in vinyl greenhouses, which are now a new main vehicle for raising rural income. In addition, with the rapid development of ICT and digital technologies, the competitiveness of Korea's agricultural sector has largely improved thanks to the emergence of smart farming as well as improved access to market information.

<Table 3-4> Korea's Agricultural Development in Three Chronological Stages

Phase	Period	Policy Goals	Policy Tools
1st Phase	1962-1977	Attainment of food security (Rice self-sufficiency & overcoming poverty)	• Development of a new rice variety (called Tong-il type) by Korean researchers dispatched to IRRI in Philippines • Wide distribution of new rice variety throughout the country • Fertilizer subsidy policies & establishment of local fertilizer production plants • Provision of long-term loans for the purchase of agro-machinery • Development of 5-year economic development strategies with specific agriculture sector policies • Systematic extension services by both cooperatives and Saemaul Undong (SMU) Movement • SMU movement launched as Korea's comprehensive rural development campaign to reform the mindset of villagers in concert with development of the agricultural sector
2nd Phase	1978-1994	Value chain development (Addressing income inequality between urban and rural areas)	• Development of agricultural policies to meet consumer demand • Improvement of quality management and distribution channels by establishing RPCs in the rural space * RPCs provided one-stop services for drying, storing and processing crops after harvest, thereby contributing to significantly reduce PHL • Promotion of agro-mechanization • Establishment of agro-industrial complexes
3rd Phase	1995-present	Enhancement of global competitiveness	• Continued efforts to strengthen agro-value chain activities • Expansion of vinyl greenhouses to meet the demand for fresh produce • Expansion accessibility of market information through ICT • Introduction of GAP scheme

Note: International Rice Research Institute (IRRI); Rice Processing Complexes (RPCs); Post-Harvest Loss (PHL); Good Agricultural Practices (GAP).
Source: Park *et al.* (2018).

1.3.2. The Shareability of Korea's Agricultural Development Experiences with Ethiopia

Today, Korea has developed into one of the world's top 10 economies based on its exports of manufactured products with a GDP per capita of US$30,000, but only 60 years ago, it had to rely on foreign food aid as a poverty-ravaged and small agriculture-based economy. While Korea's extraordinary economic development has been portrayed from various perspectives, many studies claim that Korea's industrialization was able to start on the basis of agricultural development, especially the achievement of self-sufficiency in the staple food (rice). The dramatic expansion of rice supply and its continued stable price served as the basis for industrialization by increasing the real income of industrial workers in urban areas.

For Ethiopia, which urgently needs to address its food insecurity issue and enter the industrialization stage, the implications of Korea's experience in agricultural transformation could not be underestimated. The daunting challenges facing the Ethiopian agricultural sector today are not much different from those of Korea in the 1960s. In the early 1960s, more than 70% of the Korean population was engaged in the agricultural sector, as is the case in Ethiopia today, and due to lack of food production, it was unable to escape the vicious cycle of poverty while relying on foreign food aid. Many of the Korean people had to endure hunger during the spring season (April, May) of each year, during which the stock of rice (staple crop) harvested in the fall (September, October) of previous year was exhausted and the autumn barley (alternative staple crop) was not yet ripe for harvest. This was called the 'barley bump,' which symbolically represents the history of poverty in Korea.

Dependency on imported food was high; food imports were at $126 million whilst merchandise exports were at $87 million in 1961, which significantly deteriorated the nation's balance of payment position and the government's coffers (Park, 2018). Like Ethiopia today, Korean farmers were mostly smallholder farmers who barely produced at subsistence levels. While population grew at a rapid pace with its annual 3% growth during the post-war period (1955-1960), most farmers relied on small-sized land plots with extremely low productivity. In the 1960s, the average arable land per farm household in Korea was about 1 ha. And Korea's agricultural sector, like Ethiopia today, seriously lacked in public finance and investment.

<Table 3-5> Comparison of Agricultural Initial Conditions between Korea and Ethiopia

Condition	Korea (early 1960s)	Ethiopia (today)
Limited availability of arable lands	Arable land as a share of land area was only 20.7% (1962)	Arable land as a share of land area is 15.1% (as of today)
Unfavorable climate conditions	- Generally unfavorable weather conditions with a relatively long and harsh winter - Drought & flood often leading to crop failures	- High rainfall variability across space and time - Increase in temperature - Recurrent droughts across different locations
Rapid population growth	Annual population growth of 3% (1955-1960)	- Annual population growth of 2.6% (as of 2019)
Predominance of smallholders with low productivity	Most farmers were smallholders relying on small farmlands with extremely low productivity	- Most farmers are smallholder farmers and produce their crops on less than one hectare of land
Lack of agricultural infrastructure	Most farmlands were rain-fed having no access to an irrigation system (rain-fed agriculture)	- Agricultural production highly dependent on rainfall - Limited access to irrigation schemes (untapped irrigation potential)
Lack of public finance and investment	Agricultural sector had almost no source of public finance and/or investment	- Insignificant amount of public expenditure and investment on agriculture and rural development

Sources: Park, *et al.* (2018) and Knoema (n.d.).

Given that Korea and Ethiopia have different initial conditions in terms of their farming systems, soil, and climate, and that there is a time gap of more than 60 years, there are many Korean experiences that are not appropriate to share with Ethiopia. Moreover, considering that a large portion of Korea's agricultural transformation was led and driven by a strong central government, certain areas among the Korean policy experiences are less relevant to the Ethiopian picture. For example, Korea's land reform experience is difficult to be shared with Ethiopia, given the fact that the ownership of all land property in Ethiopia belongs to its government.

However, on the other hand, it is also true that Korea has a wealth of agricultural development experiences which are applicable to Ethiopia. This research team explored what Korean policy experiences could be shared with Ethiopia through literature reviews as well as group discussions with agricultural experts in both Ethiopia and Korea. The result is that Korea has a variety of policy experiences that can be shared with Ethiopia throughout the supply chain, especially in terms of seeds, fertilizers, agricultural machinery, storage/processing/distribution, post-harvest management, agricultural product quality management, and cooperatives (See Table 3-6).

<Table 3-6> Summary of Ethiopia's Challenges and Korea's Addressing Experiences in the Relevant Areas

Supply Chain Tier		Ethiopia's Challenges	Korea's Experiences to Address the Challenges
Pre-Production	Agro-Inputs	- Fertilizers not locally produced - High price and late arrival of fertilizers due to weak delivery systems - Low availability of improved/hybrid seeds to meet needs of farmers and markets - Lack of seed multiplication capacity	• Construction of fertilizer plants using foreign loans and foreign investments • Sale of fertilizers on credit • Achieved the Green Revolution through development of high-yielding seeds (Tong-il rice varieties)
On-Farm Production	Agro-machinery	- Limited access to agro-machinery credit - Lack of skilled manpower (mechanics) for maintenance and limited access to spare parts - High cost of farm machinery	• Long-term and low-interest loans, joint-use of agro-machinery, establishment of systematic after-sale-service network for machinery
	Extension services	- Weak linkage between extension service providers (public/private/NGO) - Limited linkage between extension service providers and R&D centers	• Systematic extension services rendered by NACF and SMU
Post-Production & marketing	Agro-product storage & processing	- Lack of crop storage facilities leading to PHL - Lack of agro-processing knowledge - Lack of agro-processing equipment	• Minimized PHL and improved the quality of staple food (rice) by building RPC • Increased the added value of agro-products by establishing APC
	Agro-product quality management	- No quality grading scheme before marketing - Marketing different quality grades at same prices or vice versa	• Met the demand of consumers by instituting quality management practices such as GAP, agro-product standardization, a certificate of origin for agro-products
	Market development	- Poor infrastructure increases transaction costs - Lack of market information - Weak function of farmers cooperatives - Selling agro-products individually rather than in groups which leads to low bargaining power	• Reduced transaction costs for farmers and linked suppliers and retailers directly by improving the distribution channel • Improved distribution structure by establishing public wholesale markets consulted by UNDP, World Bank
Cross-cutting issues	Organization of cooperatives	- Lack of leadership and management capacity - Lack of transparency of management bodies - Absence of fully fledged cooperative promotion package and extension system	• NACF, a multi-purpose co-op, led the agricultural development through joint purchase/sales, credit programs, and extension services

<Table 3-6> Continued

Supply Chain Tier		Ethiopia's Challenges	Korea's Experiences to Address the Challenges
Cross-cutting issues	Agricultural financing	- Lending practices based on higher collateral, which is a primary reason for limited access to credit - Low incentives for financial institutions to serve the rural sector - Weak regulatory environment for rural financial institutions	• Provided agricultural policy loans at long-term & low interest rates • Mutual credit system NACF played a key role in agricultural finance
	Institutions & governance	- Weak institutional capacities and social capital - Inability to integrate indigenous institutions into formal ones - Lack of credible, transparent, accountable and well-functioning institutional setup	• Institutional capacities and social capital built through SMU spirits (self-help, diligence, cooperation)

Note: The National Agricultural Cooperative Federation (NACF) is called NongHyup (NH); Saemaul Movement Undong (SMU); Post-Harvest Loss (PHL); Rice Processing Complex (RPC); Agricultural Products Processing Center (APC); Good Agricultural Practices (GAP).
Source: Authors.

2. Policy Recommendations by Supply Chain Step

2.1. Inputs

This study highlights the inputs of seed and fertilizer with special interest, among others, as the most daunting challenges facing Ethiopia's agro-sector, while introducing Korea's experiences with the intention to draw relevant lessons or implications from them. As stated above, even though Korea's agricultural transformation, especially including the Green Revolution, took place nearly half a century ago, it still renders invaluable lessons for Ethiopia that has long been eager to achieve food self-sufficiency and foster agricultural-based manufacturing through the Agriculture-Led Development Industrialization (ALDI).

This research study reveals that, in Ethiopia, the greatest daunting challenge in production dimension is the farmers' limited access to modern inputs due to lack of supplies, and moreover those inputs are often not supplied on time for the farming season due to inefficiency in distribution channels. In Ethiopia, the increase in crop production is mainly attributed to area expansion rather than modern inputs, and thus a considerable improvement of these inputs is greatly needed for sustainable agricultural intensification.

2.1.1. Seed and Fertilizer

1) Improvement of Agro-Inputs Marketing and Distribution System

As revealed in the preceding chapter, one of the daunting challenges facing the agro-inputs sector is not only the lack of key inputs such as improved seeds and fertilizers, but also that they are not being supplied timely in sufficient quantities. While the supply chains of formal agro-inputs are managed by government bodies, there have been frequent delivery delays in supplying inputs for farmers. This leads to late planting, which is the main culprit for lowering their productivity.

In the seed system, an equally important task as developing new seed varieties is providing for their prevalence through the multiplication and wide dissemination to farmers. The seed system refers to the full range of activities over the supply chain (developing, producing, and distributing to farmers). However, this study observes that there is a great inefficiency in the distribution of new approved/certified varieties in Ethiopia. As a result, the use of the improved varieties in Ethiopia is far below the sub-Saharan African average. The improved seeds could become meaningful only when they are widely and timely distributed to farmers with accompanying new techniques for their successful cultivations, thereby meeting anticipated productivity levels. The use of improved varieties undoubtedly requires different farming techniques for their cultivations from those for traditional seeds. This includes seedling, water management, fertilizer application, and the like. The success of the Green Revolution in Korea is obviously attributed to the availability of higher-yielding varieties, as well as the systematic dissemination/distribution of them throughout the country. Despite the high growth in the demand for the strategic commodities selected in this study, the farmers could not have sufficiently boosted their productivity enough to meet the demand and thereby to improve their supply chains.

Fertilizers are imported by the Agricultural Input Supply Enterprise (AISE), which is a quasi-governmental organization exclusively tasked with importing chemical fertilizers. These fertilizers are then sold to farmers through mainly the co-ops (unions and their members, primary cooperatives) and other channels such as wholesaler, retailer and small shops. Unfortunately, there also have been frequent delivery delays, adversely affecting farming activities. It makes sense that top priority intervention in the agro-inputs service sector should be placed on addressing the inefficiencies in the inputs supply system.

The most crucial factors to bear in mind for the improvement of marketing and distribution system for agro-inputs are timeliness, quantity, quality, and price. This study

observes that multiple seeds producers in the private and public sectors are interested in marketing their seeds directly, as they lack effective channels to market and distribute their seeds. In this regard, it is necessary to further strengthen the Direct Seed Marketing (DSM) scheme, a novel experiment introduced in 2011, which is designed to encourage private and public seed producers to sell their seeds directly to farmers rather than through the state-owned enterprises. As revealed in Chapter 2, Ethiopian Seed Enterprise and regional Seed Enterprises outsource the distribution of seeds to Direct Seed Marketing (DSM) youth groups through commission payment, currently taking the lion share market for improved seed supply for wheat in Ethiopia. This direct seed marketing scheme has multiple advantages such as timeliness, better choice of varieties through competition, reduced cost of seed distribution for the government, higher quality seeds, and the like. However, from the long-term perspective, the DSM may deteriorate the quality of commercial seeds, thus in the case of sesame in Ethiopia, a nationally important strategic export crop, it is necessary for the government to manage systematically the original seeds of certified seeds through the governmental system for distribution of the certified seeds. In Korea, the governmental seed supply system has been managed for key food crops, rice, barley, etc., and soybean as a strategic crop (Korea Seed & Variety Service, n.d.).

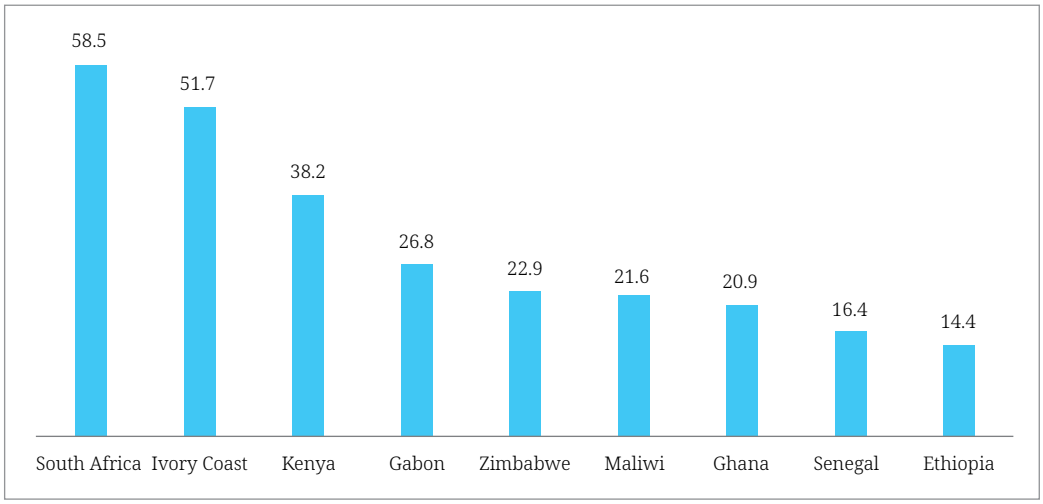
2) Expansion of Inputs Credit Purchase Scheme

Ethiopian farmers' access to modern inputs lags far behind other African countries. As shown in the table below, the application of fertilizer (kg per ha of arable land) in Ethiopia is significantly lower than in many African other countries, and is far below the average of 41.3 kg in 34 African countries. The fertilizer usage in Ethiopia has increased only marginally over the years, which can be, in part, explained by limited access to input credit.

In this regard, it is largely recommendable for the government to put more significant efforts into improving the inputs credit system, through which farmers can purchase modern inputs such as improved seed varieties, fertilizers, agro-chemicals, agricultural machinery, and irrigation facilities on credit. The majority of farmers do not have the cash at the time of inputs delivery in the early season of farming as they usually secure the cash after harvest. Thus, credit availability is the key to supporting farmers to have access to agro-inputs, which can address this time gap that hinders adoption of the inputs.

[Figure 3-4] Comparison of Fertilizer Application in African Countries

(Unit: kg/ha)



Note: Fertilizer use (kg per ha of arable land, as of 2016).
Source: The Global Economy (n.d.).

This situation makes it more necessary to increase farmers' access to credit through government guarantee schemes. While nearly half of Ethiopia's credit guarantee for input is given to the very poor farmers, some credit guarantee schemes provided to them have proven very successful with realizing a high repayment rate (ATA, 2017).

In Korea in the early 1960s, fertilizers were traded principally on cash, which limited to farmers' access to fertilizers. However, the Korean government provided an inputs credit scheme through the co-ops in order to facilitate farmers' access to fertilizers. This is a transaction of a promissory note stating that farmers would pay back fertilizers purchased on credit with ago-products after harvest. In 1965, this credit purchase system was institutionalized through the legislation of the Law on the Exchange of Cereals with Fertilizer. The exchange (swap) rate between grain and fertilizer was set annually through government cabinet meetings and subsequent parliamentary approval. The swap rate was determined by taking into account government budget situations, supply/demand status of grain, farmers' income level and the like. As the interest rates applied to the purchase of fertilizer on credit remained low, fertilizer transaction on credit accounted for 80% of its total transaction in 1961. This credit-based input purchase scheme was highly welcomed among farmers, and contributed greatly to increased agricultural productivity.

3) Strengthen Inputs Demand Estimation and Market Assessment

This study observes that one of the significant challenges in the seed sector is in effectively anticipating and fulfilling farmers' demand in terms of both volume and variety. The Ethiopian Ministry of Agriculture has been conducting bottom-up demand assessments, with inputs from districts (woredas), development agents (DAs) and individual farmers. And the government allocates seed supply proportionally to the cooperatives based on these demand forecasts.

However, this does not fully reflect changes in farmers' preferences and market demand, which requires a more precise methodology for predicting the types and quantities of seeds in each region. The current demand assessment/forecasting scheme does not have a close partnership with the cooperatives, which are the primary modes of inputs distribution. Seed producers do not have tangible market intelligence data needed to plan the following year's production, as they often do not know the exact needs of their customers. This limits the marketing and distributing activities of seed producers.

To respond to this challenge, several measures need to be taken to allow a more sophisticated assessment and estimation of seed demand. First of all, there could be activities to assess and estimate the demand through a collaboration with seed producers, which are eager to produce the correct quantity of seeds for preferred varieties. In the longer-term, the government needs to play a leading role in forecasting demand on the basis of current market conditions by building a collaborative relationship with stakeholders across the seed value chain. This includes research institutes, seed producers and cooperatives.

The same is true of fertilizers. In order to facilitate the supply of fertilizers, the government primarily needs to conduct a systematic supply and demand analysis, and thereby establish a supply plan for each type of fertilizer by region.

2.1.2. Seed: Establishing the Platform for Modernizing Seed Development System

As is well known, the seed challenge is among the greatest daunting constraints holding back the enhancement of productivity in three ways: insufficient volume available, low quality, and delivery delays of improved varieties. The researchers, breeders, and seed producers have not succeeded in developing higher-yielding varieties suitable for market needs, which makes farmers traditionally continue to rely on lower-yielding varieties. As the Ethiopian seed market is not well developed, and government agencies do not sufficiently supply improved seeds, the majority of farmers inevitably have no choice but to

use recycled seeds (farmer-saved seeds). While government-owned enterprises and small-scale private producers including farmer cooperatives handle seed production, the supply of seeds from the formal seed system is less than 20% of the seeds used by farmers (Ministry of Agriculture, 2019).

As a result, the proportion of high-quality seed varieties used by Ethiopian farmers is the lowest in the world. For example, in the barley sector, only 0.6% of its growers use modern seed varieties (UKaid, 2018). The certified seeds of improved varieties cannot be easily procured through either co-ops or contract farming schemes.

In this regard, the Ethiopian government needs to organize/build the overarching seed platform composed of public and private sector stakeholders involved in the supply chain of strategic commodities. Through this platform, the government needs to develop a roadmap/action plan on how to increase the efficiency of the seed system in order to supply high-quality seeds to farmers in a timely manner. This needs to entail a clarified framework for domestic development and importation of modern varieties, which should be done in coordination with the Ministry of Agriculture and Agricultural Transformation Agency (ATA). This platform could facilitate coordination among stakeholders, and also expand into wider issues such as establishment of framework and rules for contract farming scheme.

As revealed earlier, Korea succeeded in achieving food self-sufficiency in 1977 through the development (called 'Tong-il byeo' rice), the productivity of which was more than 30% higher than that of the traditional variety. In 1964, the Korean government dispatched a small group of breeding experts to the International Rice Research Institute (IRRI) in the Philippines, where they succeeded in developing a new high-yielding rice variety.

In addition, it is necessary for the government to systematically manage the original seeds of certified seeds in the food crops or national economically important crops like sesame through the governmental system for distribution of the certified seeds like the Korea Seed & Variety Service under the Ministry of Agriculture, Food and Rural Affairs (MAFRA).

2.1.3. Fertilizer: Attaining Self-Sufficiency

Many researches reveal that the majority of Ethiopian smallholders apply very little to no fertilizer to their crop plots. The reason is that the prices of fertilizers are largely expensive for farm income levels. Since most Ethiopian farmers rely on small-sized lands in remote areas far from urban areas, high transportation costs are inevitably incurred through

complicated processes, ranging from imports to domestic distribution to farms, which is a structural factor in raising fertilizer prices. Imports are made through the port of Djibouti, which is quite congested, resulting in customs clearance taking up to one month. This leads to a rise in import transaction costs, which is inevitably added to the price of imported goods.

Ethiopia has relied entirely on imports for fertilizers because it does not have its own production plants, and the market prices of fertilizers are reported to be much higher than that of Thailand, an importer of the same fertilizer. In this context, it makes sense that Ethiopia should establish its own production base in order to secure and supply fertilizers in a stable manner, thereby dramatically boosting agricultural productivity.

A few years ago, the construction of a chemical fertilizer plant in Ethiopia was planned through attracting foreign investment as follows: Morocco's Office Cherifien des Phosphates (OCP), the world's largest phosphate exporter, signed a contract with state-run Ethiopian Chemical Industries Corporation (CIC) in November 2016 to build a USD 3.7 billion fertilizer production plant in the town of Dire Dawa in eastern Ethiopia (Reuters, 2016). According to the Reuters (2016), it was planned that OCP would ship its own phosphoric acid to the plant, while potash would be transported from large reserves in the northeastern Ethiopia. The Ethiopia has been actively pushing for mineral development, including potash, to attract foreign investment from large-scale miners. Norwegian fertilizer company Yara has the greatest interest in developing potash mineral in Ethiopia among foreign companies. At that time, it was reported that the investment for the project would be raised through equity investments and loans. Unfortunately, however, this project is no longer being pushed forward due to various constraints, including financial mobilization.

Korea was able to achieve agricultural transformation by establishing a fertilizer production system in the 1960s. This introduction is as follows. As Korea is in large part composed of unfarmable mountainous terrains, the weight of agricultural policies has always been centered on the ability to maximize productivity in the given limited arable land size. To this end, Korea has established fertilizer production plants through loans and foreign capital. In the 1950s, Korea had relied entirely on foreign aid and imports for fertilizers, as is the case in Ethiopia today. At that time, fertilizer plants were concentrated in North Korea, and small fertilizer plants in the South Korea were mostly destroyed during the Korean War (1950-1953). This led to an excessive dependence on imported fertilizers, which caused an outflow of a small foreign exchange reserve as well as increased input costs for farmers.

To address this challenge, Korea's government decided to build fertilizer factories in major regional areas with the goal of attaining fertilizer self-sufficiency. In 1961, the Chungju Fertilizer Plant was constructed with a tied loan from the United States Agency for International Development (USAID) for the first time and Honam Fertilizer Plant was established with government funds. In addition, the 3rd (Yeongnam Chemical) and 4th (Jinhae Chemical) fertilizer factories were consecutively completed in 1967, as their production volume still fell far short of domestic demand. While the 3rd factory was constructed with a USAID loan, the 4th factory was established with an investment of the Gulf Oil Corporation and a USAID loan. Subsequently, the 5th fertilizer factory (Hankook Fertilizer) was built through a joint-venture between the Samsung (Korea) and Mitsui (Japan) groups, which was the world's largest fertilizer company as a single element fertilizer plant at the time.

The expansion of Korea's fertilizer production capacity continued as the 6th factory (Gyeonggi Chemistry) and 7th factory (Pungnong Fertilizer) were built with concessional loans and domestic investment. Concurrently, the fertilizer plants established earlier continued to increase their production capacities through the modernization of existing facilities and the expansion of production lines. Finally, self-sufficiency of fertilizer was attained in 1975 with the total supply exceeding the total demand.

The total production capacity of fertilizer increased rapidly, as the 8th fertilizer factory (Namhae Chemical), a subsidiary of the National Agricultural Cooperative Federation (NH), which was the largest fertilizer production facility in Korea, began its operations in 1977. In the late 1970s, the total fertilizer production capacity in Korea expanded to more than three million tons per annum, which greatly exceeded domestic demand.

<Table 3-7> Korea's Fertilizer Factories Established in the 1960s

Year Built	Manufacturer	Product Type	Funding Source
1961	Chungju Fertilizer	Urea	USAID loan
1963	Honam Fertilizer	Urea	Foreign loan, Domestic investment
	Chosun Fertilizer	Composite	-
1966	Gyonggi Chemical	Fused phosphate	Domestic and foreign investment
1967	Youngnam Chemical	Urea, Composite	USAID loan, Domestic investment
	Jinhae Chemical	Urea, Composite	Gulf oil, USAID loan
	Hankook Fertilizer	Urea	Commercial loan
	Poongnong Fertilizer	Fused phosphate	Japanese investment
1968	Chobi Fertilizer	Composite	-

Source: Park *et al.* (2018).

2.2. Production

2.2.1. Agro-Mechanization

1) Building Agro-Machinery Production Plants

Considering the fact that it is almost impossible to improve productivity with traditional farming methods, the Ethiopian government needs to make greater policy efforts for remarkably expanding its capacity to supply agro-machinery and farm equipment. As a great part of the farming works depends almost entirely on human and animal power, Ethiopian farmers have extremely low use of agro-machinery. Ethiopia has 2.24 tractors per 100 square kilometers, which is much lower than those of neighboring countries such as Sudan and Kenya, where 9.6 and 26.3 tractors are available per 100 square kilometers, respectively.

This research team witnessed that almost all the strategic crops were cultivated using animal traction, with an extremely small portion of farmland being cultivated by tractor. In this regard, this study proposes, from a mid- to long-term perspective, the establishment of the production base for agro-machinery through domestic or foreign investment. The Ethiopian agricultural sector is characterized by low level utilization of mechanical power, which leads to under-exploitation of agricultural potential and large post-harvest losses. In order to sustainably boost agricultural productivity, agro-mechanization with a production base is an inevitable policy option. The Ethiopian government is making efforts to support agro-mechanization through tariff exemptions for agricultural machinery imports, but a sustainable agro-mechanization scheme requires establishing its local manufacturing base.

Against this backdrop, Korea's experience is introduced as follows, with the intention to draw relevant lessons or implications for Ethiopia. Korea's farmers in the early 1960s, just like Ethiopia today, had a large shortage of agro-machinery, heavily relying on human and animal-powered plough, tillage, harvest, and thresh. The majority of Korean smallholders used to farm in the traditional way of relying on hoes (homi, Korean hand plow), pickaxes, cows and the like, as in the case of Ethiopia of today. However, the government's active and effective policies led to the successful agro-mechanization through domestic production of agricultural machineries such as rotary tillers, tractors, water pumps, pest control equipment, and threshing machines. The power tiller was domestically manufactured in 1962, which was a multi-purpose machine in farming activities, as it was widely used for tillage as well as for irrigation, agro-product transportation and the like.

With the supply of engine-equipped water pumps, it became possible for farmers to collect water at a depth of 7 to 8 meters, which allowed them to overcome the drought. In addition, the production and distribution of pest control equipment with power engines enabled the eradication of agro-pest in various areas in a short period of time. The rotary tillers, which were imported from Japan and Europe, started to be domestically produced in 1963 through a technology partnership with a Japanese company (Mitsubishi). In 1968, a technology partnership with Ford of USA led to domestic production of tractors.

Around this time, various agricultural machinery producers began to emerge, and the Korea Agricultural Machinery Industry Cooperative (KAMICO), which represented agricultural machinery producers, was established. In the 1970s, the demand for agro-mechanization increased further, as rural workers became scarce with the exodus from rural areas caused by rapid urbanization. To respond to the issue, the government's policies on agro-mechanization gained more momentum through the "5-year plan for agro-mechanization" that mainly focused on the localization of agro-machinery and, as a result, agricultural machinery such as rice transplanters, reaper-binders, combine harvesters, tractors, and the like were manufactured and spread throughout the country. Until the 1970s, most agricultural machinery (including parts) had been supplied through imports. In the 1980s, large-scale agro-machinery manufacturing firms emerged, leading to domestic production of agricultural machinery. About 100 agro-machinery manufacturers and 400 parts manufacturing plants were operating by the end of the 1980s. In the 1980s, the agro-mechanization rate in the rice sector exceeded 30%, and in the early 1990s, its rate reached an almost complete level at 90% (Park *et al.*, 2018).

The Korean government largely promoted the supply of agro-machinery through financial support (government subsidies, low-interest and long-term loans, tax exemptions) for farmers wishing to purchase machinery. For the purchase of the machinery in high demand, such as rotary tillers, water pumps, and irrigation atomizers, loans were provided up to 70% of the machine price with the condition of equal repayment terms over a five-year period. For machinery such as threshing machines, sowing machines, power-mowers and the like, the government provided loans up to 50% of the machine price on the condition of equal repayment over a two-year period. Along with its financial support for the purchase of agricultural machinery, the government strongly promoted the nationwide distribution of the machinery through supplying tax-exempted fuel for agro-machinery. In addition, agro-machinery sales networks were set up in each of the small regions so that farmers could easily visit and select their own machinery, where agro-machinery engineers were dispatched to be responsible for after-sales service (A/S) and parts supply. Entering into the 21st century, the introduction of automation machines, robot machines, and eco-friendly

precision machines is leading a new era of mechanization in Korea's agricultural sector.

2) Establishment of Systematic Agro-Machinery Maintenance System

Many researches reveal that most of the agro-machinery in Ethiopia are left unattended due to poor maintenance as well as parts procurement disruption. These challenges are the same for agro-machinery procured by international development aid as well as sold by machinery importers or distributors. Training and education on the operation and repair/maintenance of agro-machinery has not been sufficiently provided, which is also another factor that explains the low level of agro-machinery adoption. Agricultural machinery has been imported from different foreign countries including China, many of which are not operating properly due to lack of parts and maintenance technology. In achieving agro-mechanization, the establishment of an after-sale-service network is as important as the supply of the machinery. In this regard, this research selected the establishment of an agro-machinery maintenance system as a prioritized policy recommendation among others.

In Korea, the agro-machinery maintenance system was strengthened, in proportion to the spread of agricultural machinery. With the government's financial support, the Agricultural Machinery Repair Centers were expanded into small administrative units, where fuel stations were set up by government subsidies to help farmers easily purchase fuel for their agro-machinery. As the supply of high-performance complex agro-machinery increased, technical education on the operation and repair system of these machinery was further strengthened.

The Korean government actively supported agro-mechanization by expanding after-sale-service networks into a small administrative district, and operating a mobile machinery repair system, which has implications for Ethiopia. The cooperatives set up agro-machinery repair service centers in small administrative districts across the country, and operated mobile maintenance centers for rural areas excluded from them. Agro-machinery manufacturers provided after-sales service (A/S) through the maintenance/repair factories they had established in the local area. The government institutionalized the supply system of agro-machinery parts. According to this, it was mandatory for agro-machinery producers to set up their parts procurement centers to be responsible for supplying its parts up to two years after sales.

Another policy option for the efficient use of agricultural machinery is to establish a common utilization system in farm mechanization. As important as the distribution of agro-machinery is the efficient use of agricultural machinery, it is necessary to establish

a common use system for agricultural machinery through the establishment of a bank of agricultural machinery. In the 1970s, Korea has pursued the common use of agro-machinery as a key policy for agricultural mechanization because the Korean farmers were poor and the land area per farm was less than 1ha, making it difficult for farmers to own their individual farming machines. Even though farmers owned agricultural machinery, it was difficult to secure economic feasibility because of the small farming scale and the short period of use of agro-machinery. Recognizing the need for common purchase and use of agro-machinery, the Korean government pushed for the promotion of organizations for common use of agro-machinery in the early 1970s. The protocol was enacted to ensure efficient common use of agro-machinery, and the common use organization for agro-machinery was subdivided into farmers and agricultural organizations. The farmers-level common-use group was organized on a small scale (10-15 ha) by farmers, and operational management such as common purchase and lease of agro-machinery was carried out based on their own protocol. The common-use of agro-machinery at the level of agricultural organizations was led by primary cooperatives, taking charge of leasing agro-machinery to their members (farmers).

2.2.2. Extension Services

Ethiopia's agricultural extension services consist of the Development Agents (DAs), Farmer Training Centers (FTCs), and Agricultural Technical and Vocational Education and Training colleges (ATVETs). ATVETs produce DAs in different fields of specialization, most of whom are dispatched to FTCs in almost every region (Kebele, Woreda) in order to provide farmers with extension services. So far, Ethiopia has 62,764 DAs, 8,480 FTCs, and 25 ATVETs throughout the country, and they are mandated to provide extension advisory services and trainings at different levels. Ethiopia has the highest DA-to-farmer ratio in the world (ATA, 2017).

However, the efficiency and effectiveness of their extension services has been limited by multiple factors such as insufficient resources for FTCs, and lack of DAs' knowledge and experience. Although the government has been highly committed to provide modern agro-technologies, the extension services fell short of farmers' needs, not bringing the desired results.

As discussed in Chapter 1, the Ethiopia's agricultural development policy has been well targeted in the capacity building for human resources, especially young farmers as well as extension workers. However, the detailed implementation methodology is vague for achievement of the target.

In response to this challenge, it is of paramount importance to strengthen the capabilities of existing extension services, and thereby to establish a dynamic and proactive extension system to meet the needs of farmers. While Ethiopian agricultural education has a well-established institutional framework, it very often does not function properly in the fields. "Many of the FTCs have now either closed or failed to bring the desired outcome" (Nigussie, 2020).

Against this backdrop, this study proposes policy recommendations for capacity building of an extension system, as shown in the table below.

<Table 3-8> Policy Recommendations for Activating Extension Services

Extension System (3-tiers)	Core Policy Recommendations
ATVET	- Establishment of market-oriented and demand-driven extension system, focusing on supply chain and commercialization extension approach - Collaboration and harmonization with other complementary services including FTCs, and Research Institutes
FTC	- Establishment of basic infrastructure including educational facilities, accommodation for DAs - Improvement of communication skills with farmers and accumulation of market-oriented business minds - Strengthening field-oriented extension services tailored to farmers
DA	- Providing adequate incentives to motivate DAs, as low motivation leads to high turnover of them - Proactively nurturing DAs so that they play pivotal roles in agricultural transformation (Well-trained and passionate DAs have a positive impact on farmers' attitudes/behaviors, thereby contributing to agricultural development, as has been proven in Korea's agricultural development history.)

Source: Authors.

In addition, the Ethiopian government needs to actively find ways to adopt ICT and digital technology for extension services, and thereby to diversify the extension communication channels. Ethiopia's agricultural sector is characterized by poor utilization of ICT-based extension systems, limiting access to modern agricultural knowledge and information. The adoption of ICT in agricultural extension services currently lags far behind other Sub-Saharan African counties. In contrast, smallholder farmers in Kenya have easy access to market information for inputs and agro-products, as well as agro-knowledge through mobile phones or ICT kiosks (ATA, 2017).

Agricultural extension service plays a key role throughout the entire supply chain development of a commodity, covering input supplies, production, processing, and marketing. Input supplies and production stages include the dissemination of new varieties

and the repair/maintenance of agro-machinery respectively. It is no exaggeration to say that the dissemination of new varieties largely depends on extension systems, as farmers have to acquire new farming techniques in order to successfully cultivate the new varieties. To this end, the government agencies need to play a significant role in dissemination of the new varieties by mobilizing well-organized extension services. During the initial stages of the dissemination/distribution of new varieties, farmers may highly hesitate to adopt them, as they recognize that the risk of adopting a new type is very high. Thus, extension services should be tailored to farmers as much as possible, and extension workers need to meet farmers in person to provide practical education. Considering the high illiteracy rate of farmers in Ethiopia, face-to-face technical advice would be much more effective than any other type of education. In the case of Korea, the extension services were conducted at the village level through technical coaches, which were responsible for rendering technical advice to the farmers. The technical coaches mainly served as advisors of agro-techniques for rice and cereal cultivation.

A well-organized extension system is also essential to efficiently use agro-machinery. Above all, it is largely required to establish a systematic technical education system for on-site training on the operation and maintenance, along with basic theoretical training on the operating principles of agro-machinery. In Korea, as seen in table below, agro-machinery technology education evolved in 3-tier levels (central-province-district), led by the Rural Development Administration (RDA).

<Table 3-9> Agro-Machinery Education System in Korea

Central-level	- Provided education for nurturing professional instructors and advanced technology technicians in the maintenance of agro-machinery - These were deployed to province/district areas to provide training.
Province-level	- Provided technical training mainly on newly introduced or large-scale machinery - Provided training on operation, manipulation, inspection, repair, and the like was provided mainly to rural youth
District-level	- Provided technical education on manipulation and repair of the machinery provided to farmers - Provided touring technical education for remote rural villages

Source: Authors.

2.3. Processing

2.3.1. Establishment of Well-Organized Collection and Storage System

As described in the preceding chapters, the establishment of IAIPs is currently being spearheaded as a core agricultural development policy in Ethiopia. While the Ethiopian government decided to establish 17 Agro-Industrial Growth Corridors (AIGC) in nine regional states, four IAIPs are currently under construction in the first phase.

In order for the IAIP project to be successful, the collection and storage of agro-products should be systematically supported through the accompanying rural transformation centers (RTCs) among others. The functions of these RTCs, which are geographically located within the radius of the proposed IAIP site, are to collect agro-products from farmers or cooperatives, store and then transport them to IAIP site for processing and value-added creation.

Multiple prerequisites should be clearly addressed for the success of the RTC projects. Above all, it is of vital importance for the RTC to collect and secure sufficient quantities of agro-products for processing in the IAIP. The majority of Ethiopian farmers are smallholder farmers, with limited surplus agro-products being traded largely through unofficial marketing channels. According to the Ethiopian Central Statistics Agency (CSA), farm households are classified as smallholder farms and large commercial farms, with smallholders accounting for almost all (97.4%) of the total grain production. To respond to this issue, it is highly required for the RTCs to build collaborative relationships or business partnerships with farmers and the cooperative, through integrating them into the supply chain.

The establishment of both facilities and management systems in the RTCs is also essential for their successful and sustainable operations. To this end, the RTCs, among other things, need to prepare detailed operating guidelines, and establish collection transaction schemes as well as logistics systems of agro-products. The facilities are also preconditions for successful RTCs, including modern storage facilities, transportation equipment, and an ICT-based system, among others.

2.3.2. Establishment of One-Stop Processing Scheme

While the quality of ago-products is decisively determined by post-harvest management including storage and processing, most of these activities in Ethiopia are mainly carried

out by small-sized millers with aging facilities. To address this challenge, the Ethiopian government is strongly supporting the establishment of IAIPs equipped with modern technologies and facilities, as a policy choice to minimize crop loss and quality degradation caused by poor post-harvest management.

As detailed in Chapter 1, the multiple functions of the IAIPs include processing, storage, packaging, distributing and marketing, which were designed as part of a one-stop processing scheme or commercialization of the Ethiopian agricultural sector. The establishment of IAIPs was/is the core agribusiness policy of GPT-2 (2015-2020) as well as Homegrown Economic Reform Agenda (2020-2030), which was/is Ethiopia's national development strategies.

For the IAIPs to be implemented successfully and thereby effectively act as a catalyst for agricultural transformation, it is of vital importance to successfully attract domestic investment or foreign direct investment (FDI). To this end, above all, a groundbreaking improvement in the enabling investment is greatly required, as Ethiopia's investment environment, as described later, is estimated to be the lowest among 190 countries in the world.

Other critical success factors in the IAIP projects include well-developed infrastructure facilities (roads, water, electricity, etc.) and market accessibility (strategic locations), which have been among major challenges in fostering linkage between agriculture and agro-industry, and in facilitating agricultural commercialization.

Korea has the experience of failure in establishing agro-processing complex in the early 1970s, named Saemaul Undong (SMU) factories, due to lack of infrastructure and limited market access. Entering the 1970s, the Korean government pushed ahead with the construction of SMU factories, placing the ultimate objective on rural industrialization. To this end, the government supported the enterprises establishing their factories in rural areas through subsidies for construction costs, tax exemptions, business consulting, and the like. As a result, the number of SMU factories expanded dramatically. Unfortunately, however, only a small portion of SMU factories survived until the mid-1980s, and all the rest were shut down. The gravest problems, such as inadequate infrastructure and poor market access hampered the continued operation of the factories, which eventually led to their business closures. Seemingly, one of the most important lessons learned from this case is that any program for the establishment of agro-industrial parks ought to take infrastructure and market accessibility into consideration in the planning phase.

Vertical integration among RTCs-IAIPs-ECXs is essential for the IAIPs to serve as a one-

stop center scheme after crop harvest. Ethiopia Commodity Exchanges (ECXs), launched with a fanfare in 2008 to overhaul the agro-market system, function as crop-trading platforms/ organized market venues for significantly facilitating market access through electronic transactions, with currently 22 branches throughout the country.

In the case of Korea, Rice Processing Complexes (RPCs) established in the early 1990s played a pivotal role as a systematic complex in the rice sector through bringing in rice paddy (undried) immediately after harvest directly from farmers, and then managing the entire post-harvest process, covering drying, storage, processing, packaging, and marketing. Recognizing the importance of the RPCs, the Korean government actively encouraged the co-ops and private agribusiness corporations to build RPCs, supporting about 50% of the total construction cost.

2.4. Distribution and Quality Management

2.4.1. Agro-Products Quality Management

1) Ensuring the Quality and Safety of Agro-Products through Quality Certification

The quality certification consists of quality and safety certification of agro-products, which remains in a rudimentary state in Ethiopia. However, it is worth recalling that there has been a growing need to enforce regulations on the quality and safety of agro-products to promote value addition and safeguarding consumers. High economic growth and increased food wholesale and retails activities in large cities are raising public awareness of food safety and quality. In this regard, the Ethiopian government needs to make significant efforts to establish a quality assurance system through the development and implementation of quality certification programs. The existing law on quality certification is considered to be inadequate and incomprehensive in that it is scattered across different codes and legislations (Temesgen, 2015).

In the case of Korea, the adoption of the Good Agricultural Practices (GAP) in 2006 greatly increased confidence in the quality and safety of agro-products. The GAP system provides warranties of the quality and safety of agro-products through systematic management across the supply chain, including both on-farm and off-farm activities. Under the GAP scheme, agro-products can be traced from the field to the buyer, which inspires accountability of farmers while building consumer trust in local agro-products.

2) Standardization and Grading of Agro-Products

As previously revealed, the standardization and grading system of agro-products in Ethiopia is not well implemented/enforced, still remaining in a rudimentary state. The agricultural market is under-developed, and many small traders participate irregularly in the market, which has led to a lack of standardized, quality-grade agro-products. The Quality and Standard Authority of Ethiopia (QSAE) has made efforts to establish a standard and grading system, but has multiple shortcomings, which is hampering the growth of the agricultural markets. The market prices of agro-products are largely volatile, which is partly attributable to the lack of standardization.

However, it is worth noting that consumer needs for certified high quality agro-products are continuously growing, amid high economic growth and urbanization. The standards and grading system were established by the QSAE in the 1970s, but it is not functioning properly. In order to address this challenge, efforts should be taken to add high-priority crops to the ECX trading system, which will help to enforce and accelerate the existing standardization and grading system. The ECX is a marketplace where strict measures are taken on the quality and safety as well as standardization of agro-products.

In the case of Korea, agro-product market transactions were not transparent, largely due to a lack of quality standards, until the 1990s. In addition, some agro-dealers deceived consumers with exaggerated advertisements, which caused distrust in the agricultural trade. In response to this issue, the Korean government established quality standards for agro-products, which contributed greatly to gaining consumer trust in agricultural trade.

2.4.2. Export Market Diversification: Sesame

In Ethiopia, sesame is widely considered to be one of the most promising sectors for increasing exports and farm household income, as well as to be one of the most important foreign exchange earners. As will be explained later, Ethiopia has been struggling with a chronic shortage of foreign exchange reserves.

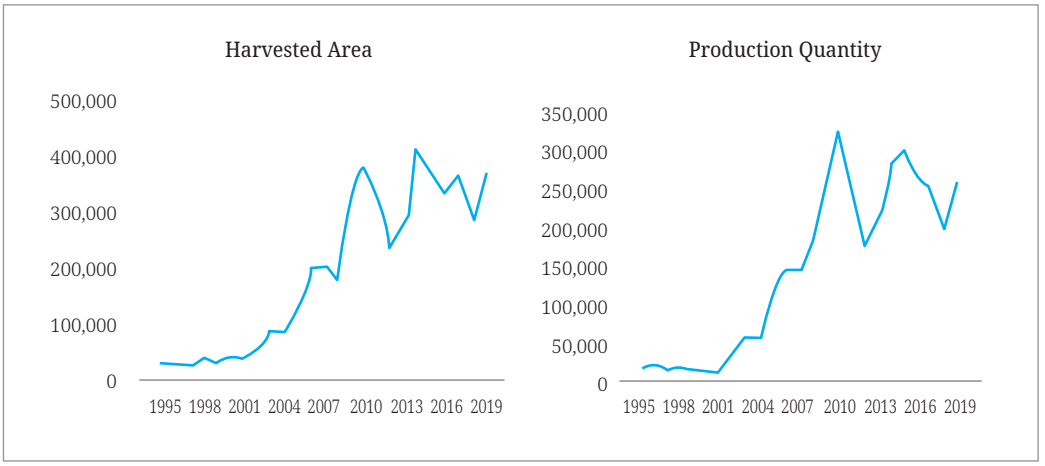
While the major producers of sesame in the world are mainly developing countries in Asia and Africa, Ethiopia's sesame production potential is recognized to be outstanding among them. As the world's seventh largest exporter of sesame, Ethiopia has a reputation for its high quality. Ethiopia produces two types of high-quality sesame: Humara and Wolledge. The Humara variety is in high demand in the international markets and has been appreciated for its aroma and sweet taste. This variety is well suitable for bakery products

as well as for tahini production. The competitive advantage of Wolledge variety is in its high oil content (48–56%), which is mainly used for sesame oil (Lehr, 2018).

As shown in the figure below, sesame production has been rapidly increasing with the expansion of cultivated land area. As a result, Ethiopia today is among the world's top 10 sesame producers, accounting for 7% of global sesame production. For Ethiopia, sesame is the second-largest earner of foreign exchange.

[Figure 3-5] Cultivation Land Size and Production Volume of Ethiopian Sesame

(Unit: ha, ton)



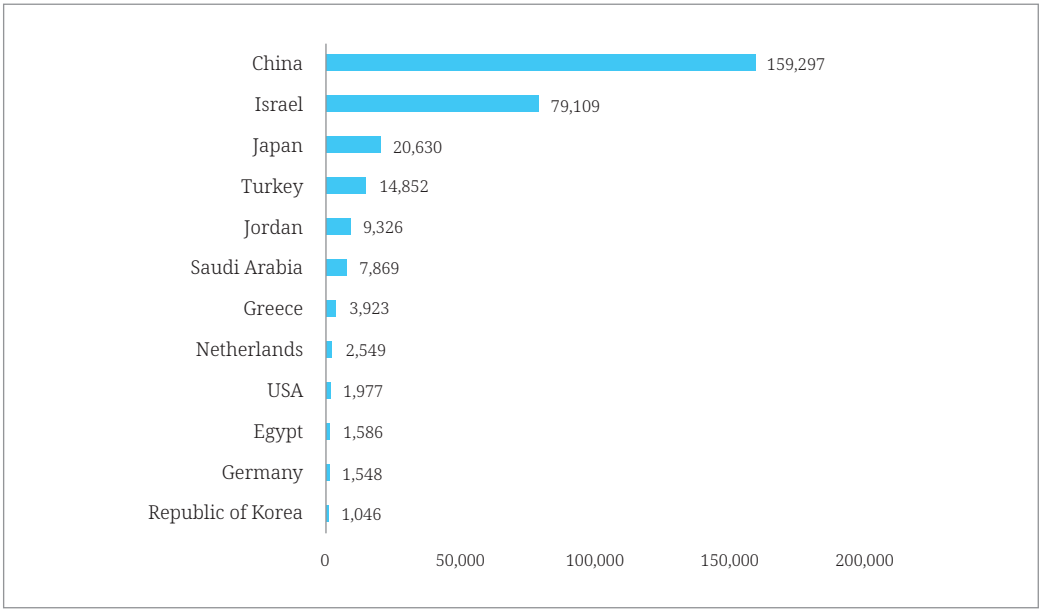
Source: FAOSATA (n.d.).

Nearly 90% of sesame production in Ethiopia is exported, with China and Israel being major importers. As shown in the figure below, Ethiopia's sesame export is currently highly focused on the Chinese market. China's imports have been rapidly increasing as its consumption of sesame (raw materials and processed goods) has soared due to the improvement of the national income level.

Ethiopia's large-scale export of sesame to China is largely characterized by a short-term export approach based on "hit-and-run" thinking, and is far from a long-term strategy based on quality-oriented approach (Lehr, 2018).

[Figure 3-6] Major Export Destinations of Sesame in Ethiopia as of 2019

(Unit: 1,000 USD)



Source: FAOSATA (n.d.).

In order for Ethiopia to create a higher profit margin, it is necessary to make efforts to diversify its export markets into Europe and other countries where the demand is far ahead of supply. The European sesame market is highly dominated by India, with a market share of nearly 50%. However, Indian sesame exports to Europe are forecasted to decline in the long run, due to the growing pressure on land and rising domestic consumption.

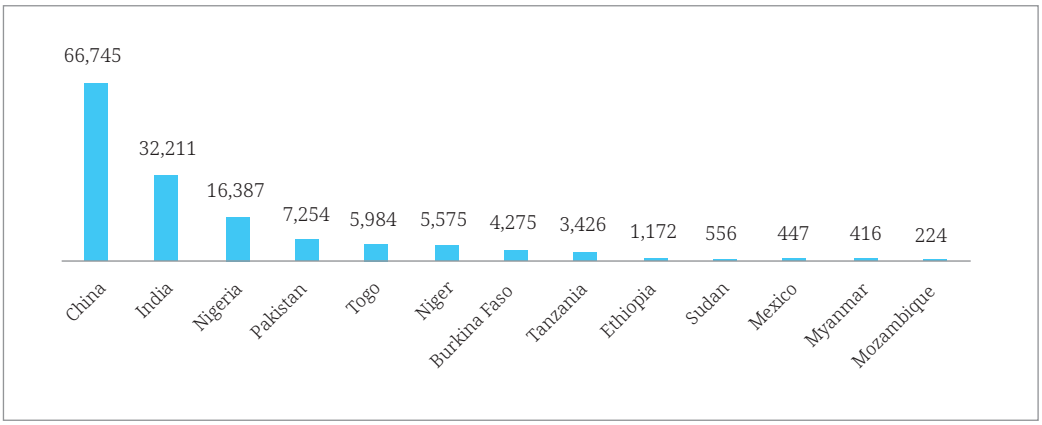
It is already being witnessed in the international market that sesame production has been shifting from China and India to Africa. This development is believed to serve as an opportunity for Ethiopian sesame to expand into the European market (Lehr, 2018). Ethiopia currently has a 4% share of the European sesame market, and given its quality, there is much room to expand its market share in Europe. Other major countries exporting sesame to Europe are Nigeria and Sudan, currently with 14% and 9% of the market share in Europe, respectively. As such, India and Nigeria have dominant positions in the European sesame market, but they face serious reputation problems and tighter control due to the risk of contaminated sesame.

Sesame is an essential ingredient in Korea's diet, but its cultivated area and production volume have continued to decrease due to increased production costs. Sesame farming is difficult to mechanize, so it has to largely rely on human labor, which leads to an increase in labor costs. As a result, Korea has relied on imports for a large portion of its sesame

consumption. It is not well known to Korea that Ethiopia is a major producer of sesame, so it is necessary to raise awareness of this fact through trade promotion activities. Korea has been importing a considerable amount of sesame from China, and there is a high possibility that Ethiopian sesame will expand its share in the Korean market. Korea's largest import partner in sesame is China, which accounts for nearly half of its total imports, followed by India. Korea has also been importing sesame from several African countries, including Nigeria, Togo, Niger, Burkina Faso, Tanzania, Ethiopia, Sudan and Mozambique.

[Figure 3-7] Korea's Imports of Sesame by Partner Countries as of 2019

(Unit: 1,000 USD)



Source: FAOSATA (n.d.).

As the growth of the global food market expands at a rapid pace, Korea has actively pioneered international agro-markets through overseas market development program, which is managed by the Korea Agro-Fisheries and Food Trade Corporation (aT). The program largely focuses on establishing export information infrastructure, supporting for export brands, building a network with foreign buyers, and the like. This program is supported by the government, largely consisting of the subsidy on the export logistics costs and establishment of export infrastructure. Thus, if the GoE's support is strengthened, the share of Ethiopian sesame in the global sesame market will be able to increase and various new markets will be developed.

2.5. Cross-cutting Issues[1]

2.5.1. Cooperative Sector Development

It is a well-known fact that cooperatives are crucial actors, serving as economic agents for their members as well as institutions for implementing the government's social reform. While cooperatives play pivotal roles in supplying inputs, purchasing crops, and marketing through negotiation power, it is observed that the cooperatives in Ethiopia are not fully functioning mainly due to their constrained capacity and limited capital. This leads to inefficiency in supplying inputs, aggregating and selling crops in a timely manner. According to UKaid (2018), the cooperatives in Ethiopia are less flexible to revise prices in response to prevailing market conditions, making them less attractive compared to private traders. Cooperatives in Ethiopia have not been able to fulfill their functions because they lack warehouse storage facilities, and also are limited in their purchasing volume of agro-products due to poor financial capacity. In addition, cooperatives in Ethiopia are unable to access bank credit to purchase crops, which makes it impossible for cooperatives to provide upfront payment for farmers. As a result, farmers often prefer to sell their produce to private traders rather than cooperatives.

It is no exaggeration to say that agricultural development decisively depends on the cooperatives, which is attributed to the peculiar nature of the agricultural sector. The agricultural sector, unlike other industries including manufacturing, is characterized by seasonality and high uncertainty/risk, and production activities are carried out by small farmers with weak market bargaining power. Therefore, the role of cooperatives to address these daunting challenges collectively is important. Cooperatives are a key engine for agricultural development, however, the role of cooperatives in Ethiopia is largely limited. Ethiopian farmers have been collectively purchasing inputs and selling their crops through cooperatives, but their trading volume is not large and they do not have enough market bargaining power. This study reveals that the cooperatives in Ethiopia are generally not successful and operating in an inefficient manner as the quality of the cooperatives' services falls far short of the needs of their members (farmers). This includes multiple challenges such as lack of leadership, inefficient organizational management, non-transparency, internal corruption, distrust among the members, and the like.

1 Foreign Direct Investment and Private Sector Development will be dealt in depth in the following separate sub-chapters, taking into account their importance.

<Table 3-10> The Results of the Evaluation on Ethiopian Cooperatives

Criteria	Evaluation Items	Detailed Evaluation Indicators	Evaluation Results
Organizational system	Information & communication	① Does the co-op provide information that members need on time?	Medium
		② Is there good communication between members and staff in the co-op?	Low
	Transparency	③ Are the decisions of the board and management staff being made transparently?	Medium
		④ Is information about the overall operation of the co-op transparently disclosed?	High
	Compensation	⑤ To what extent are the members satisfied with the benefits provided by the co-op?	Medium
	Strategy	⑥ Are the development goals and visions pursued by the co-op clearly presented?	Low
		⑦ To what extent does the co-op have innovative capabilities to realize its goal?	Low
Organizational atmosphere	Trust	⑧ To what extent is mutual trust and solidarity established within the co-op?	Low
	Leadership	⑨ To what extent does the board manage and lead the co-op?	Low
	Ownership	⑩ To what extent do the members perceive themselves as owners of the co-op?	Medium
Organizational performance	Satisfaction	⑪ To what extent do the members feel pride as members of the co-op?	Medium
		⑫ To what extent are the members satisfied with the policy established by the co-ops?	Low
	Sustainability	⑬ To what extent is the financial situation of the co-op in good condition?	Low
		⑭ To what extent does the co-op have the ability to survive as a business organization?	Low

Source: Authors.

Considering these challenges comprehensively, this study proposes prioritized policy recommendations/strategic interventions as shown in the table below. This study observes that partial reforms such as the improvement of governance or transparency alone are not sufficient in building the capacity of cooperatives, and that fundamental alternatives should be sought anew. To reiterate, agricultural cooperatives in Ethiopia are not functioning well in providing core services to their members: agro-inputs supply, extension services, agro-products marketing, and agricultural financing.

Cooperatives that are well organized and performing well, as seen in the case of Korea, have a tendency to provide all of these core services. These core services formulate a virtuous circle: Cooperatives' provision of input credit to farmers leads to increased production and improved quality of agro-products, while the cooperatives easily collect input credit repayments through marketing of these agro-products at reasonable prices.

In the case of Korea, cooperatives have successfully led agricultural development, playing a crucial role throughout the entire value chain, ranging from the purchase of agro-inputs to processing, distribution, marketing, extension services, and agricultural finance. Among others, Korea's agricultural cooperatives are obviously characterized by institutionalized agricultural finance, which clearly enables them to serve as powerful agricultural development institutions through their extensive lending activities to the farmers.

<Table 3-11> Policy Recommendations for Cooperative Sector Development

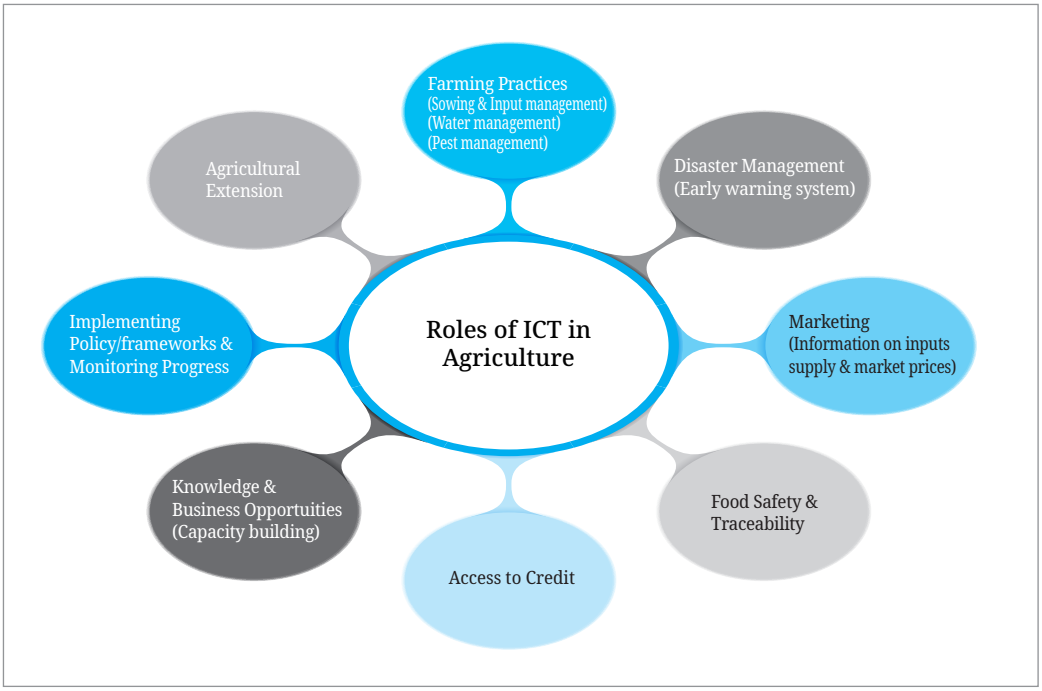
Policy Objective	Application	Bottlenecks	Corresponding Policy Recommendations
Cooperative function	Agro-inputs supply	- Limited capacity in input procurement and distribution services - Supply fertilizer at a high price, discouraging application	- Enhance co-ops' capacity for selling inputs on credit and demand estimation - Develop well-tailored credit products for farmers' purchase
	Extension services	- Lack of business incentive/ motivation to provide extension services to farmers (members)	- Provide motivations and benefits through improved marketing function
	Agro-products marketing	- Limited capacity in marketing services - Lack of access to finance to invest in market development	- Build co-ops' capacity to purchase agro-products with cash advances - Establish partnership between rural financial institutions and co-ops
Cooperative governance	Management and institution	- Limited capacity to implement co-ops' mandates and policies - Government regulation on the co-ops unclear	- Develop specific policy tools for building capacity of co-ops - Establish policy that clarifies the role of the government
Enabling environment	Financing for cooperatives	- Lack of clear mandates of financial institutions associated with co-ops - Lack of incentive to finance members (farmers)	- Encourage micro finance institutions (MFIs)/commercial bank (CBE) mandate to lend to co-ops - Develop a revolving fund which supplies capital to co-ops

Source: Authors.

2.5.2. Harnessing ICT to Improve Agro-Supply Chain

The application of ICT in agriculture, which is referred to as "e-agriculture" or "digital agriculture," serves as a catalyst for agro-innovation, thereby improving commodity supply chains. As shown in the figure below, ICT is widely used throughout the agricultural sector, including dissemination of agricultural knowledge, access to credit, and market access.

[Figure 3-8] Role of ICT in Agriculture



Source: FAO·OECD·IFPRI (2017).

The adoption of digital technology in the agricultural sector is spreading as mobile phone prices drop and internet connections are expanding, to which Africa is no exception. The table below shows the examples of ICT applications in the African agricultural sector, which provides meaningful implications for Ethiopian agricultural transformation.

As mentioned earlier, the adoption of ICT in the Ethiopian agricultural sector lags far behind the rest of the African counties, which is another factor that slows agricultural transformation. Given that ICT tools are enablers for agricultural development, the Ethiopian government needs to strengthen its policy efforts to foster ICT startup companies. In Ethiopia, agri-tech startup companies with innovative ideas are now gradually emerging throughout the agricultural supply chain, which includes cultivation techniques, R&D, extension services, transactions, market development, and the like.

<Table 3-12> Examples of ICT Application in Agricultural Supply Chain in Africa

Pre-production	- Providing various agro-information/knowledge via mobile phones, including crop selection, planting techniques and planting calendar, agro-materials use, pest control, water management, and the like - Analyzing soil data through satellite imagery technologies and, based on this, providing information on crop growth and planting conditions and the like - Digital technologies such geographic information system (GIS) and remote sensing (RS) are adopted for land registration, efficient use of land, and water management.
Production	- Boosting agro-productivity through ICT-based technology platforms which provide 'customized farming techniques' to farmers - Artificial Intelligence (AI) is being applied to developing a crop clinic platform that diagnoses crops disease. - Start-up companies in the precision-farming sector analyze soil information on soil nutrients and soil quality through digital technology and, provide them to farmers.
Post-production	- Reducing the asymmetry of price information by providing market intelligence acquired through ICT-based platforms to farmers - Developing e-commerce network platforms connecting farmers to middle-men via mobile phone text messaging - Establishing mobile platforms connecting farmers with consumers, through which mobile transactions take place

Source: Authors.

2.5.3. Strengthening Institutional Capacities for Policy Implementation

The Ethiopian government has publicly committed itself to agro-transformation through multiple national development strategies, but unfortunately has failed to produce tangible and sustainable outcomes, mainly due to its poor implementation capability. Line ministries have not been well coordinated/aligned, and there seem to be frequent contradictions between agricultural policies. Agricultural development strategies are very often presented in declarative and visionary documents, but lack specific action plans as to how to achieve the visions set by the strategies. Result-based management frameworks that monitor and evaluate the progress of policy implementation, and provide immediate feedback, are also not well established. As vision without action is just an illusion, only a vision that entails implementation can bring about breakthrough change and development.

Policy implementation is far more crucial than policy development, and effective policy implementation requires largely a competent government and strong leadership. Korean central/local agricultural officials frequently visited the site to monitor policy implementation, which played a crucial role in the successful implementation of agricultural development plans.

While the Ethiopian government has continuously and repeatedly emphasized the importance of foreign investment and private sector development, the legal guidance and

practical frameworks have not clearly mapped out how to ensure and implement them effectively. To achieve agricultural transformation in Ethiopia, foreign investment and private sector development are the most crucial elements, however, activities still remain largely constrained, hindering agribusiness development.

Given that the private sector in Ethiopia is less developed, the government needs to strengthen its role as a rule maker and market actor, as well as supporting service providers. In the early stages of agricultural development, the Korean government played a pivotal role in achieving remarkable agro-industry development by setting overarching strategic goals and formulating the policies to effectively implement them. The Korean government conducted widespread interventions throughout the supply chain, which included the promotion of R&D activities, the dissemination of new varieties to farmers along with provisions of cultivation techniques, nation-wide extension services, financial support, market access, and the like.

3. Attracting Foreign Investment using DFIs as Leverage

3.1. Features and Roles of DFIs

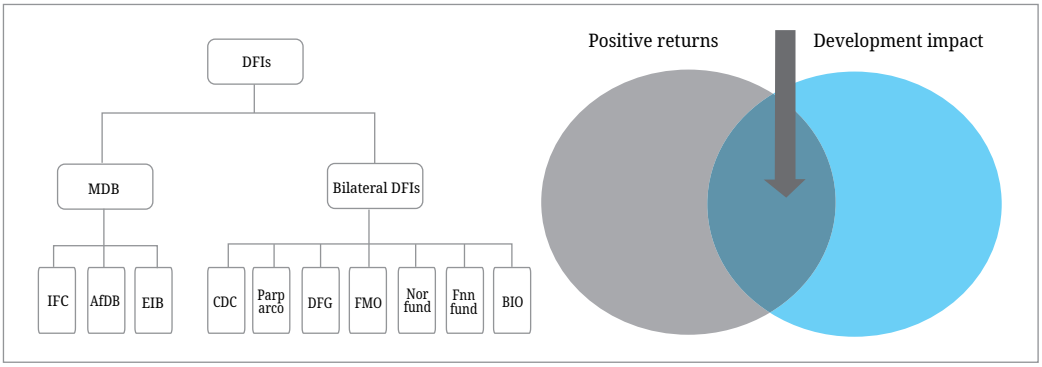
DFIs, or development finance institutions, are policy financial institutions that act as catalysts for attracting private investment by providing financing (loans, equity investments, and guarantees) for private businesses in developing countries. DFIs mainly arrange co-finance or syndicated loans with private investors and private financial institutions for the project. This provides potential investors or lenders with a sense of stability in their participation in the project, which contributes to raising additional funds from them. DFIs create favorable conditions for financing and foreign investment by mitigating the risks of investing in developing countries. As DFIs participate in the project, a stable platform is prepared, which contributes to reducing the risk of investment projects in developing countries. DFIs often act as a risk-taker and first mover, investing in the private sector in developing countries with both high development effects and investment returns. This encourages potential investors or other financial institutions to participate in the project by increasing the bankability of the project. From the perspective of foreign investors, there is a reluctance to invest in the Ethiopian agricultural sector which entails many risks and involving DFIs in the projects could ease the risks involved and secure business stability.

In addition, DFIs support profitability creation and development effectiveness through technical assistance (TA) for private investment projects. For example, in 2017 the World Bank's International Finance Corporation (IFC) launched a technology support project to expand local production of malt barley, which is supplied as raw material to Dutch beer producers (Heineken) in Ethiopia. Malt barley was grown and supplied by poor small farmers, but due to the lack of local production in Ethiopia the company has imported a large portion of the needed malt barley for beer production from France. Recently, beer demand has been increasing rapidly in Ethiopia, but the local production of malt barley has not been able to meet this demand.

Ethiopia has agro-ecological conditions suitable for barley cultivation, but its potential has not been realized due to lack of modern cultivation techniques and inputs. In 2017 the IFC provided agricultural technology education such as crop rotating to small barley farmers (38,000 people) through technology support projects launched in Ethiopia and distributed high-yielding varieties, resulting in a significant increase in barley production. The IFC contributed to the stable procurement of raw materials for the beer producers (Heineken) and successfully increased income of small farmers through this project (TechnoServe and UKaid, 2020).

This technical support from DFIs also has the effect of attracting other investment capital by reducing the risk of the business. In 2019, France's Soufflet, a world-renowned malt (malt barley processed grains) manufacturer, on the back of IFC investment of 20 million euros, established its production plant in Ethiopia with an annual production capacity of 110,000 tons. In addition, the company, with the support of another IFC technical assistance project to improve market access and increase productivity in the Ethiopian malt barley sector, plans to secure 55,000 tons of malt barley from its local producers over the next three years. The company (Heineken), thereby, plans to produce a large amount of malt and supply it to five breweries in Ethiopia (TechnoServe and UKaid, 2020).

[Figure 3-9] Investment Areas of DFIs



Source: Authors.

<Table 3-13> Roles of DFIs

Mobilization of Private Finance	• Leveraging private capital through leading investment or providing loans for projects that are expected to be profitable but entail risks • Mobilization of additional financial resources through co-financing with domestic/foreign investors, private financial institutions, or investment funds
Investment in a Business with Both Profitability and Development Effectiveness	• Investing in projects that both are profitable and sustainable under the premise that profitable businesses can lead to the sustainability of development projects • Contributing to job creation and income growth through investment in promising private sector businesses

Source: Authors.

DFIs, which have the characteristics of both public aid agencies and commercial banks, support job creation and economic development through their investments in private sector projects in Africa and other developing countries. Multilateral DFIs that are actively investing in private projects in African agricultural sector include the World Bank (IFC), EIB, AfDB, and bilateral DFIs include Proparco (France), CDC (UK), DEG (Germany), FMO (Netherlands), Norfund (Norway), Finnfund (Finland), and BIO (Belgium). They support job creation and economic growth by providing loans or investing in private sector development projects in developing countries. Although DFIs' investment in the energy, infrastructure, and financial sectors is significantly higher, they continue to provide support for the agricultural sector.

<Table 3-14> Agriculture Investment as Percentage of Total DFI Portfolio in 2018

(Unit: %)

DFIs	IFC	FMO	DEG	Proparco	CDC	EIB	Norfund	Finnfund	BIO
Agriculture investment	7	13	3	8	7	5	7	21	7

Note: Agriculture sector comprises businesses in primary agriculture, agro-forestry, fisheries, and food processing.
Source: TechnoServe and UKaid (2020).

3.1.1. Multilateral Development Finance Institutions

The World Bank Group's International Finance Corporation (IFC) is the world's largest development finance institution providing investment and finance to private businesses, thereby facilitating foreign direct investment (FDI) and supporting private sector development in developing countries. The IFC provides investment funds primarily in the form of co-financing with other development financial institutions, commercial banks and investment funds. It also participates as an equity investor in private projects in developing countries, which facilitates the inflow of private capital. The IFC is increasing its support for fragile countries, including underdeveloped countries in Africa, with a focus on four major sectors: electricity, transportation, agriculture and manufacturing. In addition, it supports small and medium-sized enterprises (SMEs) to enhance their capabilities by providing improved financial accessibility, management skills and advisory services.

Recently, the IFC has been actively supporting Ethiopian agricultural projects. For example, it will provide 50 million euros in loans to an Ethiopian beer production company's (Habesha Brewery) expansion project, which is expected to contribute to expanding barley production as well as increasing farm income by involving small barley farmers in the supply chain. Ethiopia currently relies on imports for nearly 90% of malt barley, which is used as a major ingredient of beer. The Netherlands' Development Bank (FMO) and private banks (ING Bank, Rabobank) will also provide loans to the Ethiopian beer company's expansion project. In addition to financial support, the IFC and FMO will provide small farmers with input such as improved seeds and fertilizers, and also deliver technical assistance on new farming methods and management skills. The Ethiopian brewery was founded in 2009 by domestic investors and is now owned by two Dutch companies (Royal Swinkels Family Brewers and Linssen Partisations) 60%, and 10% by Ethiopian nationals (8,000) (World-Grain, n.d.). The African Development Bank (AfDB) is a regional development bank that supports economic development in the African region, and provides development finance through loans, grants, investments (participation in equity) and guarantees. Among them, the proportion of loans is absolutely high, and AfDB supports large-scale projects in the form of co-finance with other DFIs or commercial banks. The AfDB allocates approximately 70% of its total development finance to the top five areas (The High 5s), including agriculture, electricity, industrialization, and regional integration, with 15% going to supporting the agricultural sector. The AfDB has established an Agricultural Value Chains Development (AVCD) policy as an action plan for supporting its Feed Africa Strategy (2016-2025), which focuses on improving agricultural productivity and value-added, fostering agro-business, developing agricultural infrastructure, and supporting agricultural finance. The Africa Fertilizer Financing Mechanism (AFFM) was established in the AfDB to assist the

improvement of agricultural productivity in African countries, mainly providing guarantees and loans for the production and/or trade of fertilizers.

3.1.2. Bilateral Development Finance Institutions

Among the bilateral development finance institutions, European DFIs are actively investing in Africa, most of which are owned by the governments. European DFIs support poverty alleviation and economic development through investments, loans and guarantees in private projects in developing countries. Through the European Financing Partners (EFP) program, European DFIs have established partnerships with the European Investment Bank (EIB) and other DFIs for providing co-finance or joint investment. European development banks are actively supporting African development projects, and they recognize that job creation in the private sector is the key to resolving poverty and have been leading the way in investing in private businesses with high potential for development.

The Commonwealth Development Corporation Group (CDC) is a British DFI owned by the Department for International Development (DfiD), a wholly owned subsidiary. The CDC is the oldest DFI in the world, established in 1948, and has accumulated a great deal of expertise and know-how in private investment projects in underdeveloped countries. The CDC's intensive investment areas are Sub-Saharan Africa and Southeast Asia, with operational guidelines specifying that Sub-Saharan Africa should account for more than 50% of its total investment. The CDC supports various sectors, including financial services, infrastructure, medical health, construction, agriculture, manufacturing, and education, primarily through equity investments or loan provision. Since investing in tea plantation development projects in Ethiopia in 1973, the CDC has been making pioneering investments in various fields including the agricultural sector over the last half century (CDC, n.d.). The CDC focuses on identifying projects with high development impact and attracting other investment capital through its leading or first-mover investment. Indeed, the CDC's additional financial resource mobilization, or leverage effect, is reported to be high. The CDC addresses the effectiveness of job creation as a key issue in the development impact, and it develops investment projects by providing detailed guidance for each sector. In the agricultural sector, the CDC invests largely in developing supply chains through increased productivity, post-harvest management, agro-business, fostering small and medium-sized enterprises, and agricultural finance.

Proparco is a private-sector support development finance institution of the AFD (French Development Agency), a French development aid agency, and supports poverty alleviation and sustainable economic development through investment promotion. Proparco supports

the financial, infrastructure, energy and agricultural sectors, mainly through provisions of equity investments and loans, and Africa is the region with its highest emphasis. As of 2019, the proportion of Proparco's investment and financial support in Africa was 52%, far above other regions such as Latin America (20%) and Asia (13%) (Proparco, n.d.).

DEG is a German development finance institution that has provided development finance to the private sector in developing countries for more than half a century. DEG's financial support, like other DFIs, accounts for most of the equity investment and loans, and the support areas are focused on finance, infrastructure, agriculture, small and medium-sized enterprises, and manufacturing. In the agricultural sector, DEG usually provides a mid- to long-term loan of six to ten years, taking into account the period from production to market sale. The size of DEG's financial support by region (as of 2019) is 2.9 billion euros for Asia, 2.7 billion euros for Latin America, and 2.1 billion euros for Africa. DEG has been providing financial services through co-finance and equity investment for several projects in the African agro-business sector. In recent years, DEG, along with the British Investment Group (Duet), is actively exploring Ethiopian businesses, and is seeking equity investments in the Dashen Brewery expansion project, which was established in 1996 in Gondar, 700 kilometers northwest of the capital Addis Ababa.

Currently, foreign breweries such as BGI Castel (France), Heineken (Germany), Diageo (Britain) and the Bavaria (Netherlands) are operating in Ethiopia, and demand for beer consumption is steadily increasing due to income growth and urbanization.

<Table 3-15> Key Features of European DFIs

DFI	Ownership Structure	Key Sectors	Instruments
CDC	Owned by UK government	I, F, A, SME	L, G, I
Proparco	Majority owned by AFD (64%), French development agency	D, I, A, S	E, Q-E, L
DEG	Owned by KfW, German development bank	A, F, I, M, SME	E, Q-E, L
Finnfund	Owned by Finnish government (93%)	F, I, A	E, Q-E, L
FMO	Owned by Dutch government (51%) and commercial banks, trade unions (49%)	F, I, A	E, Q-E, L, G
Norfund	Owned by Norwegian government	I, F, A	E, Q-E, L, G
BIO	Owned by Belgian government	F, SME, I	E, Q-E, L
Swedfund	Owned by Swedish government	F, I, A	E, Q-E, L, G

Note: Key sectors (I =Infrastructure, F=Financial services, A=Agribusiness, M=Manufacturing, S=Services); Instruments (L=Loan, E=Equity, Q-E=Quasi-equity, G=Guarantee, I=Insurance).

Source: CSIS (2016).

3.2. An Example of DFIs' Financial Support: Nigeria Indorama Fertilizer Production Project

The project of the Nigerian Indorama Eleme Fertilizer & Chemicals Ltd. (IEFCL) to build a fertilizer production plant is considered one of the most successful cases led by DFIs. This case study could be a valuable lesson for Ethiopia, which desperately needs to attract foreign investment to transform its agricultural sector. Multilateral development banks (IFC, AfDB) and European DFIs led the financing of the project in 2013, and succeeded in mobilizing investment funds from international commercial banks and local banks. DFIs have been able to successfully attract foreign investment by acting as a leverage. DFIs such as IFC, AfDB, FMO, DEG, CDC, and BIO participated in the project to provide loans, and Standard Chartered, the African Export-Import Bank, the Emerging Africa Infrastructure Fund (EAIF), four local banks in Nigeria also provided investment funds (See Table 4). Indorama Fertilizer Company is a subsidiary of Indorama Corporation, an Indonesian petrochemical group. The company is located in the Eleme petrochemical complex in Port Harcourt, near Nigeria's largest oil production area (Niger Delta), and produces the largest amount of fertilizer in Africa.

<Table 3-16> Nigeria Fertilizer Project (Indorama) Financed by DFIs

Corporation Name	Indorama Eleme Fertilizer & Chemicals Ltd. (IEFCL)
Total investment size	• $1.2 billion (signed February 2013) • Equity: $400 million • Debt: $800 million
Sponsors	• Indorama Group (82.5%), Nigerian National Petroleum Corporation (5%), Rivers State Government (5%), host communities (3.75%), Nigerian federal government (2.5%), employees (1.25%)
Lenders	• DFIs: IFC ($150 million), AfDB ($100 million), FMO ($30 million), DEG ($35 million), CDC ($40 million), BIO ($15 million) • African Export-Import Bank ($75 million) • International Commercial Bank ($60 million): Standard Chartered • Emerging Africa Infrastructure Fund ($30 million) • Four Nigerian local banks ($1.1 billion): Stanbic IBTC, Guaranty Trust Bank, Ecobank, Access Bank
Mandated lead arrangers	• IFC, Standard Chartered, Stanbic IBTC
Financial adviser	• Standard Chartered

Source: IJ Global (2013).

Since then, these DFIs have provided large-scale financing. IFC established a syndication with other DFIs, commercial banks, and investment funds, and provided 1 billion dollars in loan to the company's production facility (plant) expansion project in 2018. The syndication consisted of several European DFIs (Proparco, CDC, FMO, DEG, EIB), the African

Development Bank (AfDB), commercial banks (Standard Chartered Bank, Citibank), and the Emerging Africa Infrastructure Fund (EAIF). The IFC provided 100 million dollars in direct loans, while other DFIs and commercial banks provided $850 million in financing. The remaining 50 million dollars were filled with loans provided by the Managed Co-Lending Portfolio Program (MCPP) operated by IFC as a trust fund. AfDB offered 100 million dollars in senior loans, and CDC, which provided 40 million dollars in loans to build a new fertilizer production plant in 2013, supported 100 million dollars in funding for the expansion of its production facilities. The Emerging Africa Infrastructure Fund (EAIF) provided 35 million dollars in loans. The EAIF mainly supports financing of long-term loans for African infrastructure development projects, and in 2013 offered a 30 million-dollar loan for the fertilizer plant construction project by Indorama.

The Indorama fertilizer company plans to increase its annual fertilizer production capacity from 140,000 tons to 280,000 tons by expanding its production facilities as domestic demand and export demand for fertilizer rapidly expand. The Nigerian government has been pushing to achieve self-sufficiency in fertilizers as a key policy for agricultural development. Nigeria has several chemical fertilizer production plants and mixed fertilizer factories, but remains heavily dependent on imports because they cannot keep up with domestic demand due to poor management and lack of production facilities. Korea's Daewoo Engineering & Construction has signed a contract to participate in the fertilizer production facility expansion project (Plant No. 2) of Indorama Corporation. The Korean corporation also participated in the Indorama's fertilizer production plant project in 2012 (Plant No. 1).

3.3. Policy Recommendations

As is well known, it is not easy to attract foreign investment in the agricultural sector because the sector has a relatively higher investment risk than any other industry and it takes a long time to generate investment profitability. The Ethiopian government has made various efforts to attract foreign investment in the agricultural sector, but has failed to produce tangible results. Considering this, the Ethiopian government needs to find new ways to use DFIs as leverage. Participation of DFIs can ensure the stability of the project and reduce risks, thereby creating an environment favorable to private financing and attracting investment. As stated above, DFIs serve as catalysts or levers to encourage private capital participation in the business by either offering loans or engagement as a first-mover and risk-taker.

DFIs arrange co-financing or syndicated loans with private financial institutions, investment funds, etc., which secures stability of the project, thereby creating favorable

conditions for raising additional investment funds from other financial institutions or investors. While DFIs' supporting areas are mainly concentrated in infrastructure projects such as electricity and transportation, their financial provisions for the agricultural sector including agricultural processing and fertilizer production projects, have been steadily increasing.

First of all, the Ethiopian government needs to make efforts to identify promising businesses by establishing dialogue channels with DFIs such as the IFC Regional Hub located in Kenya or European financial advisors. As mentioned above, business sectors targeted by DFIs are private projects that have both high development impact and profitability. Financial advisors analyze risk factors in the preparation stage of the project and seek risk mitigation measures, while developing financing schemes. International commercial banks or investment banks are mainly in charge of financial advice, which increases bankability of the project. In Africa, mainly European commercial banks or investment banks are leading financial advisory services based on their abundant experience and know-how in international financing.

In the agricultural sector, promising sectors may include agro-business or fertilizer production, which have relatively higher job creation effects and higher profitability than any other agricultural sub-sectors. Considering the high domestic demand for fertilizer as well as the possibility of exporting fertilizer to neighboring countries such as Sudan and Uganda, the Ethiopian government needs to push for the construction of chemical fertilizer production plants by attracting foreign capital, as in the Nigerian case.

Korea also built several chemical fertilizer production plants by attracting foreign capital investment in the early stages of economic development, which dramatically boosted agricultural productivity. Currently, only 40% of Ethiopian farmers use fertilizer. This is because fertilizer prices are significantly higher than farm income. Fertilizer prices rise through a complicated import and distribution process, and the fertilizer prices currently used by Ethiopian farmers are two to three times the price in the international market. In Africa, Ethiopia, along with Kenya, Nigeria and Mali, is forecasted to record the fastest increase in fertilizer demand (USAID, 2019).

The Ethiopian government has been seeking an agricultural transformation through attracting foreign investment, and to realize this, drastic measures are much needed to improve the enabling environment. Ethiopia's agricultural infrastructure including rural road networks, irrigation, water supply, electricity, and telecommunications are poor, hindering domestic and foreign investment activities. For example, Italy's renewable energy

giant (Fri-El) carried out an investment project to develop a 30,000-hectare palm oil farm in southern Ethiopia in 2008, but was forced to reduce its development area by more than 30% due to water supply problems. The original plan to draw water from a nearby river has been disrupted. The company faced continuous difficulties and turned cultivated crops into cotton as part of its efforts to address the challenge, but the lack of electricity caused a major setback in the operation of the ginnery factory (The Economist, 2020).

Groundbreaking efforts are needed to improve the investment environment not only in physical infrastructure but also in institutional terms. Ethiopia has seen its investment environment being evaluated as very poor among Africa countries by international organizations. According to the World Bank's business environment report, Ethiopia ranks the lowest (159th) among 190 countries surveyed. Cheap electricity bills, low wage levels, and low land rent are attractive factors, but there are many other factors that hinder companies' investment activities in Ethiopia. Thus, in addition to the construction projects of the IAIPs funded from various DFIs, private tenant companies need to be invested from the DFIs under the supportive environment of the GoE for developing the supply chain connectivity of the strategic crops such as wheat and sesame.

4. Private Sector Development (PSD)

4.1. Agricultural Transformation and Private Sector Development

Ethiopia has seen remarkable economic growth of 9% (average annual growth rate) over the past decade. This growth was largely attributed to public investment in infrastructure (hydro-dam, roads, railways, industrial parks) through state-owned enterprises' external borrowing, and a large part of the Ethiopian population are still in absolute poverty and food shortage. In order to address these challenges, large-scale investment in the agricultural sector is required, but it not realistic to solve it with public investment; a solution to agricultural transformation through private sector development is urgently needed. The IMF also warns the Ethiopian government of excessive public debt, while strongly recommending that it shift from a public-sector-led growth strategy to a private-led growth strategy. Ethiopia's public debt (FY2018/19) is 57% of GDP, well above the IMF's debt manageable threshold level (40%). The excessive public debt is largely due to large-scale domestic and external capital borrowings for infrastructure investment, and the burden of debt repayment is expected to increase given the decrease in tax revenues and sluggish exports. In this regard, public investment in agricultural sector is bound to be limited, and agricultural development must be sought through foreign investment or domestic private investment.

<Table 3-17> Selected Economic Indicators of Ethiopia

Indicator	Unit	2015/16	2016/17	2017/18	2018/19
Public debt	% of GDP	54.2	56.2	59.5	56.8
- Domestic debt - External debt	% of GDP	25.6 28.7	28.3 28.2	29.2 30.4	28.6 28.2
Government Revenue	% of GDP	15.0	14.1	12.3	11.5
Gross domestic savings	% of GDP	21.0	22.4	24.1	22.3
- Public savings - Private savings	% of GDP	3.8 17.2	1.6 20.8	2.1 22.0	1.7 20.6
Gross official reserves	Months of imports	2.1	2.0	1.7	1.8

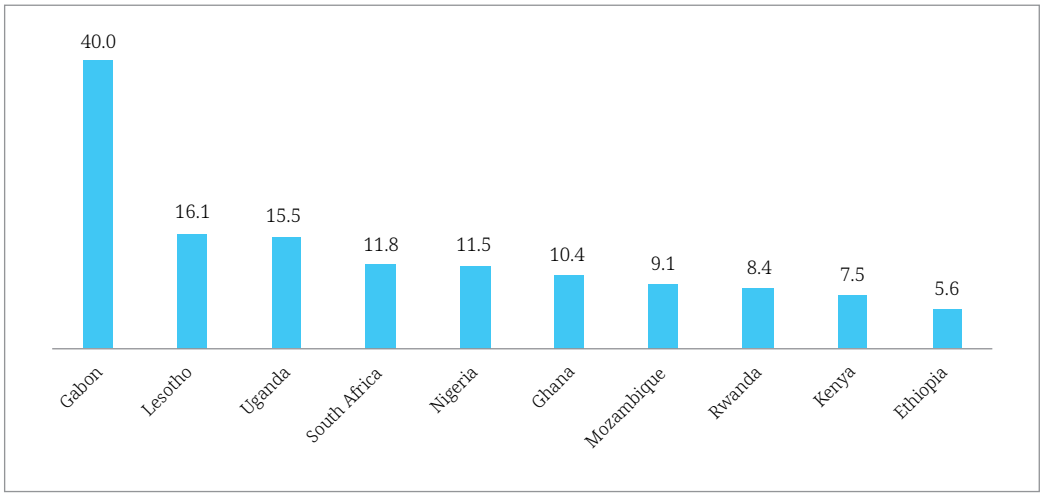
Source: IMF (2020).

In order for the agricultural industrialization strategy to bear fruit, it is crucial that various types of private business are created, thereby upgrading agricultural supply chains. In the past, the production stage of crops for self-consumption was greatly emphasized in the supply chain, but recently, market demand for processed agricultural products has been rapidly expanding due to income growth and urbanization. As a result, supply chains that entail agro-processing, packaging, transportation and distribution are being developed, and the role of the private sector is becoming important in the supply chains.

The agricultural supply chain is directly in line with the development of the national economy, as it includes service sectors such as transportation as well as manufacturing such as agro-processing activities. In Ethiopia's flagship industry, agriculture – which accounts for 35% of GDP, 70% of employment and 85% of exports – private sector development drives national development by contributing to economic growth and tax revenues, as well as job and income creation. One of Ethiopia's biggest challenges in the agricultural sector is that it is difficult to achieve Agricultural Transformation due to the weak industrial foundation to create added value by processing agricultural products. The Ethiopian government has been looking to the Agricultural Development-Led Industrialization (ADLI) strategy as part of its Growth and Transformation Plan (GPT), but has failed to achieve tangible results due to poor infrastructure and lack of technological manpower. As shown in [Figure 3-10] below, Ethiopia's manufacturing sector accounts for a percentage very low even among African countries.

[Figure 3-10] Share of Manufacturing in Ethiopia as of 2019

(Unit: % of GDP)



Source: The Global Economy (n.d.).

Since state-owned enterprises (SOEs) are insufficient to drive Ethiopia's agricultural development, strategies to seek agricultural transformation through fostering the private sector are required. Private companies (small and medium-sized companies, large companies) work throughout the supply chain, including input and equipment production, storage & processing, packaging, and transportation, thereby creating jobs and leading agricultural industrialization. The key players in the private sector are small and medium-sized enterprises (SMEs) or large enterprises, which are leading agricultural development through large-scale production of goods and services, establishment of an industrial base such as infrastructure, and technology development.

In addition, the revitalization of the private sector has the effect of lowering the prices of goods and services through production expansion and competition, which contributes to the improvement of the people's real effective income. Private sector development is a key policy that is directly related to the creation of jobs (especially among the youth population). According to Ethiopia's Federal Bureau of Statistics (CSA), Ethiopia's unemployment rate is now over 19%, which could threaten the safety of society.

4.2. Policy Recommendations

4.2.1. Improving the Business Environment

Ethiopia is considered to have the lowest activity of private companies in Africa. As a result, the private sector accounts for a small portion of Ethiopia's national economy, as well

as the agricultural sector. The proportion of Ethiopia's population which is currently running a business, or in the process of starting a business, is estimated to be 12%, far below Africa's average (28%) (GIZ, 2019). The Ethiopian government's National Entrepreneurship Strategy (NES), which focuses on deregulation, business education and technology development, technological innovation, financial access improvement, and start-up support, has yet to produce tangible results.

It might be understood that this result is related to the direction of the government's economic development policy. Until now, Ethiopia's national development strategy has mainly focused on building infrastructure such as hydroelectric dams (*e.g.* the Grand Ethiopian Renaissance Dam), roads, railways, and industrial complexes, and financial and policy support for private sector development has been pushed out of priority (TAK-Innovative Research Development Institution, 2016). While public investment and financial support have been concentrated on infrastructure development, the private sector has not developed due to various factors such as financial access restrictions, weak legal & institutional systems, and poor investment conditions. The Ethiopian government has continued to pursue economic development through revitalization of the private sector except during the command economy period of the communist regime (1975-1991), but the private sector has yet to establish itself as a development agent. As a result, agricultural development such as smooth supply of inputs through competition, creating value-added products through agricultural processing, improving market accessibility, and increasing employment and income has yet to be realized. Ethiopian small farmers cannot easily access agricultural inputs or equipment, which remain significantly higher in price than their farm income. Even if agricultural machinery is used, machinery parts are often not timely supplied to rural areas far from urban areas.

Until now, private investment in Ethiopia's agricultural sector has been active only in the horticulture sector, especially in the floriculture sector, and private sector investment activities in the rest of the agricultural sector are minimal. The downstream sectors such as agro-processing, storage & packaging, and cold chain are critical areas related to the quality and safety of food products, but investment in these sectors has not been activated, leaving them underdeveloped. While private companies' investment in manufacturing is beginning to gain momentum with the industrial parks development boom, private investment in the agricultural sector is very limited. However, as projects to develop IAIPs are currently being carried out in several regions of Ethiopia, it is expected that private companies in the agricultural sector will be activated.

The Ethiopian government is seeking to transform the structure of agriculture through domestic and foreign investment, which requires a drastic improvement in the investment environment. Ethiopia's poor investment environment is one of the biggest factors contributing to its failure to attract private investment. As shown in <Table 3-18> below, Ethiopia's investment environment is considered the lowest among 190 countries in the world. The one-stop service function of the Ethiopian Investment Commission (EIC) is not working properly, and due to overlapping work and conflicts of interest among Ethiopian government departments, investors have to struggle with different government departments. Customs clearance procedures are also complicated, so the flow of imports and exports is not smooth. Financial accessibility is even worse.

In Ethiopia, only 16% of corporations raise operating funds through institutional financial institutions (banks), far lower than in Kenya (41%) and Uganda (21%). The Ethiopian banks usually require collateral assets that are two to three times the size of a loan. Loans from microfinance institutions (MFI) are also very limited due to strict lending conditions. Despite the small amount of loans, borrowers are often forced to deposit 15-20% of their loans for more than six months. The Ethiopian microfinance agencies do not take into account customer credit information when providing loans. Ultimately, in many cases, Ethiopian people have no choice but to start their businesses by borrowing a small amount of money from family members, relatives, and private cooperative organizations.

<Table 3-18> Policy Recommendations for Improvement of Ethiopia's Doing Business

Items	Selected Indicators on Ethiopia's Doing Business		Policy Recommendations
	Detailed Indicators	Rank among 190 Economies	
Starting a business	Procedures, time, cost and paid-in minimum capital to start a limited liability company	168th	• Establish an online business approval system • Build an online business registration & license system • Connect online with government agencies involved in business licensing • Reduce the number of procedure by adopting modern ICT technologies
Getting electricity	Procedures, time and cost to get connected to the electrical grid, and the reliability of the electricity supply and the transparency of tariffs	137th	• Introduce online application and follow-up system to get electricity connection • Significantly reduce the time it takes to connect electricity (current average: 60 days vs 15 days in Rwanda)

<Table 3-18> Continued

Items	Selected Indicators on Ethiopia's Doing Business		Policy Recommendations
	Detailed Indicators	Rank among 190 Economies	
Registering property	Procedures, time and cost to transfer a property and the quality of the land administration system	142nd	• Digitize title deed information • Establish online property transactions & registration services
Getting credit	Movable collateral laws and credit information systems	176th	• Strengthen the credit information system by establish a database for all borrowers of banks and MFIs and other financial institutions • Develop & implement a credit scoring system
Paying taxes	Payments, time, total tax and contribution rate for a firm to comply with all tax regulations	132nd	• Modernize the tax system through software development and mobile payment, replacing cash register machine Establish online tax filing and payment system Automate tax payment system through banks
Trading across borders	Time and cost to export the product of comparative advantage and import auto parts	156th	• Simplify customs clearance through the introduction of electronic customs clearance Reduce physical & documentary inspection for import and export

Source: World Bank (2020).

4.2.2. Start-Up Support

Ethiopia has been in the blind spot for start-ups unlike Kenya and Nigeria, but the start-up boom has been slowly starting across diverse industrial sectors. Young start-up founders with innovative business ideas are also emerging in the agricultural sector. The social atmosphere for start-ups is increasing, with the success stories of young start-ups being introduced through YouTube as well as mass media such as the Internet, TV, newspapers and magazines. The number of start-ups that are jumping into the food processing sector to increase added value and develop export markets is also increasing. Some start-ups have developed cake products with teff, an Ethiopia's indigenous food crop, and are seeking export. Agri-tech startups are also emerging that are using ICT to engage in agricultural businesses.

<Table 3-19> Examples of Agri-Tech Start-Ups in Ethiopia

Digital Solution for Detecting Plant Diseases	• Developed an algorithm that automatically detects and classifies plant diseases through image detection • The digital solution can be accessed via mobile phones or through the web • Developed drone technologies with the capability of early disease detection on large commercial farms
Online Animal Exchange Platform	• Online animal exchange platform, which integrates agri-tech, fin-tech and e-commerce to allow the sourcing of live animals directly from the farmer • This modern e-marketing platform catalogues healthy and quality livestock for sale, catering for a majority of the vibrant livestock market in Ethiopia
Collecting Water Using Solar Power	• Drawing surface and underground water combining solar power with automated irrigation technology • The technology uses 2 KW electricity to provide up to 180L clean drinking water per day
e-Commerce	• Developed a web and mobile-based platform that endeavors to formulate a fresh produce sustainable supply chain between farmers and buyers with an integrated logistical service • The e-commerce platform also features mobile payments to better link fresh vegetable farmers to markets.
e-Marketing	• Developed an ecommerce platform that provides an honest and fair online marketplace to connect producers directly with buyers

Source: CTA (n.d.).

<Table 3-20> Ethiopia's Start-Up Environment

Items	Ethiopia	Sub-Saharan Africa	OECD Countries
Procedure (number)	11	7.4	4.9
Time (days)	32	21.5	9.2
Cost (% of income per capita)	45.4	36.3	3.0

Source: World Bank (2020).

In order to promote this startup boom and entrepreneurship, thereby leading the Agricultural Transformation, the Ethiopian government needs to establish an entrepreneurial ecosystem through various policy support as well as a favorable business environment. As shown in the table above, the start-up environment in Ethiopia is so poor that it falls short of the African average. Corporate registration is very complicated and costly. As a result, in Ethiopia, the proportion of economic activities in the informal sector without legal registration is significantly high.

The Ethiopian government needs to make great efforts to systematically provide management know-how and technical guidance through start-up support education and training programs. Amid the continued high unemployment of Ethiopia's youth population, more than 25,000 college graduates enter the labor market every year.

Finally, taking into account that aid agencies established by the World Bank, the U.S., Germany, Britain and South Korea are actively supporting start-up programs, the Ethiopian government needs to strengthen its partnership with these agencies so that aid programs can work effectively.

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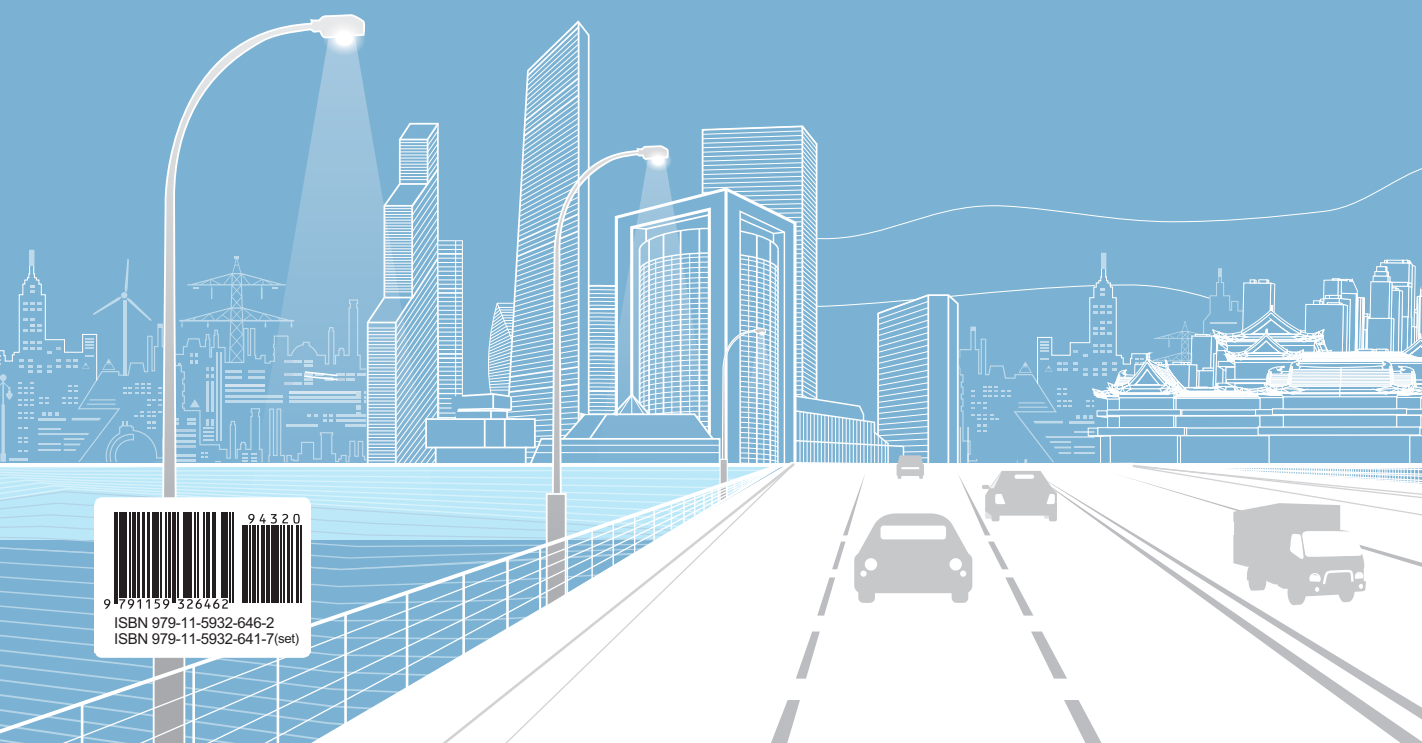

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