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MINISTRY OF AGRICULTURE

National Rice Flagship Program 2023 – 2027

National Rice Flagship Program 2023-2027

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The Federal Democratic Government of Ethiopia, Ministry of Agriculture (MoA) acknowledges the contributions of key stakeholders in the agricultural sector in the development of the National Rice Flagship Program (NRFP). The stakeholders include; The Alliance for a Green Revolution in Africa (AGRA) Ethiopia team; National Rice Technical Committee (NRTC) members including experts from the Ministry of Agriculture (MoA); Ethiopian Institute of Agricultural Research (EIAR); Agricultural Transformation Institute (ATI); Ethiopian Agricultural Business Enterprise (EABE); development partners including Sasakawa Global 2000 (SG2000); Mennonite Economic Development Associates (MEDA); Japan International Cooperation Agency (JICA), Ethio Rice; Agricultural Growth and Transformation Advisory project (AGTAO); Coalition for African Rice Development (CARD); International Rice Research Institute Africa (IRRI); Agricultural Policy Research in Africa (APRA); Program of the Future Agricultures Consortium (FAC); and Food and Agriculture Organization of the United Nations (FAO).

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ACRONYMS

AfricaRice	Africa Rice Centre
AGP	Agricultural Growth Program
AGRA	Alliance for a Green Revolution in Africa
APRA	Agricultural Policy Research in Africa (APRA) Program
ATVET	Agricultural Technical and Vocational Education and Training
ATI	Agricultural Transformation Institute
BMGF	Bill and Melinda Gates Foundation
CAADP	Comprehensive Africa Agricultural Development
CARD	Coalition for African Rice Development
DA	Development Agent
EGS	Early Generation Seed
EIAR	Ethiopian Institute of Agricultural research
ERCA	Ethiopian Revenue and Customs Authority
FAO	Food and Agricultural Organization of the United Nations
FCU	Farmers Cooperatives and Union
GDP	Gross Domestic Product
GoE	Government of Ethiopia
GTP	Growth and Transformation Plan
IRRI	International Rice Research Institute
JICA	Japan International Cooperation Agency
MoA	Ministry of Agriculture
MoWIE	Ministry of Water, Irrigation and Electricity
NRDS	National Rice Development Strategy
NAIP	National Agriculture Investment Plan
NARS	National Agricultural Research System
NRSP	National Rice Stakeholders Platform
PCO	Program Coordination Office
PSNP	Productive Safety Net Program
SNNP	Southern Nations Nationalities and Peoples
SoPARI	Somali Pastoral and Agro-Pastoral Research Institute
SSA	Sub-Saharan Africa
SSI	Small-Scale Irrigation
WARC	Werer Agricultural Research Cente

EXECUTIVE SUMMARY

Background

The implementation of the National Rice Flagship Program (NRFP) is aligned with the National Rice Sector Development Strategy II (2020 – 2030), which targets the potential of increasing rice production to ensure; (i) improved food and nutritional security at household level; (ii) enhanced livelihood opportunities from the rice based agrarian changes including development of rice processing industry, associated social services and business opportunities, and; (iii) rice import substitution.

The scope of the NRFP interventions focus on the value chains mainly the potential of increasing rice yields per unit area and expand its cultivation to new production areas. These activities will be implemented on both rainfed and irrigation systems. Irrigated rice production targets constructed small, medium and large-scale irrigation schemes in the target rice hubs, intensification and expansion. The NRFP will be disseminated to rice producers, processors and traders by government ministries and institutions mandated to implement the country's target of ensuring self-sufficiency of basic agricultural commodities including rice. The private sector will be given utmost attention and encouraged to participate in commercial level rice cultivation and product processing. The geographical scope in rice production and processing will cover target rice hubs in each of the regions and identified woredas.

Components of the NRFP

There are three major components with associated sub-components (business cases) identified in the NRFP with specific strategic interventions (activities). The following is a brief description of the NRFP components:

Component 1: Increasing Rice Production and Productivity

The first component deals with increasing rice production and productivity and has four sub-components with key activities.

Sub-Components	***Key Activities***
1.1 Enhancing access and use of quality seed of improved varieties.	a) Strengthen the collaboration between the national rice research with International Rice Research Institute (IRRI) and Africa Rice Center to foster release of adaptive rice varieties for the three rice ecosystems. b) Create demand for available improved rice varieties (demonstration and popularization). c) Enhance access to Early Generation Seeds (EGS) of improved rice varieties. d) Promote integrated seed system for rice production.

Sub-Components	Key Activities
1.2 Enhancing access and use of rice mechanization tools, implements and equipment.	a) Facilitate the establishment/strengthening of local rice manufacturers' mechanization tools and implements. b) Facilitate the establishment/strengthening of local rice mechanization service providers (land preparation, agro-chemical application, weeding, harvesting, threshing). c) Promote business linkage between importers of mechanization equipment and mechanization service providers (businesses, SMSs and youth groups). d) Build capacity of staff at the National Rice Research and Training Center (NRTRTC) of Ethiopian Institute of Agricultural Research (EIAR) to provide certified training in rice equipment operation and maintenance.
1.3 Sustainable intensification and expansion of rice production.	a) Promote sustainable intensification of rice production in current production areas. b) Promote small-scale rice production in potential areas. c) Promote commercial rice production in selected target areas. d) Promote production of irrigated rice targeting developed irrigation schemes.
1.4 Promoting sustainable rice-based crop production systems.	a) Promote sustainable and compatible rice-based crop production system for diversification. b) Support the marketing systems of the crops produced under rice-based production.

Component 2: Rice Processing and Market Development

The second component addresses promotion and modernization of rice processing, enhancing rice market and marketing systems along with facilitation of evidence-based paddy and milled rice marketing regulation to warrant the competitiveness of the national rice industry.

Sub-Components	Key Activities
2.1 Promotion and development of rice processing industry to warrant competitiveness of domestic rice (current production areas, new production areas).	a) Modernization of the rice processing industry. b) Establishment and promotion of rice processing services in new target areas.
2.2 Modernization of paddy and milled rice marketing system.	a) Establishment of paddy marketing system that incentivize both rice farmers and processors for production and processing of quality paddy and milled rice. b) Facilitation of market linkage between paddy producers with the already established state-of-the art rice processing industries. c) Consideration and facilitation of rice to be included in the Ethiopian Commodity Exchange (ECX) platform.
2.3 Facilitate evidence-based rice import regulation.	a) Designing regulatory measures for rice import considering; quality and phytosanitary and; competitiveness of domestic rice.

Component 3: Capacity Strengthening for Implementation, Mainstreaming of Cross-cutting Issues and Monitoring, Evaluation and Leraning (MEL)

The third component ensures effective implementation of interventions under component one and two through coordination, institutional and individual capacity strengthening and mainstreaming of cross cutting issues (gender and social inclusion, resilience, enabling environment) for sustainability of the impacts of the NRFP.

Sub-Components	***Key Activities***
3.1 Coordination of implementation of the NRFP.	a) Establishing the NRFP management unit/project coordination office (PMU/PCO) at MoA and RBoA. b) Establishing NRFP national and regional steering committee (SC).
3.2 Institutional and individual capacity strengthening.	a) Strengthening institutional capacity
3.3 Monitoring, Evaluation and Learning (MEL).	a) Developing clear M&E indicators (key performance indicators – KPIs) to track progress. b) Establishing feedback mechanism.
3.4 Cross-cutting themes (gender and social inclusion, environmental management, resilience building and policy interventions).	a) Mainstreaming gender and social inclusion. b) Mainstreaming business incubations. c) Mainstreaming enabling environment (policy, regulations)

Implementation Organizational Structure

The Ministry of Agriculture (MoA) will be the lead agency responsible for the implementation of the NRFP. The National Rice Sector Development Steering Committee (NRSD SC), established in 2010 to spearhead rice sector implementation following the approval of the first rice strategy, will provide oversight, decision making and strategic guidance. The committee will be chaired by the MoA (state minister) and members will be key stakeholder representatives from state and non-state actors, including government ministries (federal and regional), Agricultural Transformation Institute (ATI), EIAR, development partners and private sectors. Other public entities such as investment commission, Land Bank Corporation, and Ministry of Finance will be engaged on case-by-case basis. The committee members will be appointed as new representatives every year depending on their level of relevance.

A Program Coordination Office (PCO) will be established at MoA to provide overall leadership in the implementation of the NRFP. The office will constitute a NRFP coordination team (NRFP-CT) composed of a coordinator and technical staff members and will be responsible for overall planning, coordination, and facilitation of NRFP activities as guided by the NRSD SC. A similar structure will be established at regional level while planning, implementation, monitoring, evaluation and learning will target rice hubs that are identified in the National Rice Sector Development Strategy II (2020 – 2030).

NRFP Investment Costs and Resource Mobilization Strategies

The total cost of the implementation of the NRFP is estimated at USD 312,416,133 for five years shared between the private and public sector. It is estimated that at the end of the five-year implementation period, the private sector will have invested 93 percent against 7 percent of the public investments. This implies that the cost of the NRFP through public and development financing will be about 22 million USD with annual allocation over the five years (see table below).

Given the expected dominant role of private investment, the government should stimulate and incentivize private sector engagement in the implementation of the NRFP. The key proposed mechanism strategies are;

a) Identifying unique business opportunities for each rice hub;

b) Pro-active promotion of rice production in the new target areas in each hub through extension services and access to required inputs to smallholder farmers;

c) Ensuring easy access to land for commercial rice production and establishment of rice processing facilities;

d) Pro-active promotion of market linkage of local manufacturers and importers of rice technology with rice producers and processors targeting the uniqueness of each rice hub;

e) Facilitating access to finance for investors in rice related service provision and processing facilities; and

f) Establishing feedback mechanism to address the dynamic regulatory demands/issues.

Investment Costs by Year and Source

Indicator	Category	Y1	Y2	Y3	Y4	Y5	Total
Investment (USD)	Public	6,137,000	3,867,000	4,007,000	3,867,000	3,867,000	21,745,000
	Private	58,045,800	58,005,000	58,087,667	58,207,667	58,325,000	290,671,133
	Grand Total	64,182,800	61,872,000	62,094,667	62,074,667	62,192,000	312,416,133
Share of cost (%)	Public	10	6	6	6	6	7
	Private	90	94	94	94	94	93

Expected Impact of NRFP

Rice production in Ethiopia will exert economy-wide impacts both at macro and micro-levels. At the microeconomic level, increased rice production and productivity will translate to increased household income, improved food security and nutrition outcome, increased jobs for women and youth and poverty reduction. In north-western Ethiopia, evidence shows that increased use of fertilizer will significantly increase household income by about US$292.92–374.85 while household per-capita consumption expenditure will increase by US$53.98–57.89 and reduce the incidence of poverty by 17.4 percent–18.2 percent. However, this would worsen the income inequality. In Fogera Plain, evidence shows that rice farming supports households food security; improves their meal intake per day, provides food throughout the year, and is a source of income for clothing, health and housing expenditures.

Over the five years, the NRFP is expected to benefit 565,095 smallholder farmers cultivating about 217,080 ha and about 1,032 commercial farms operating from 25 to 100 ha each with a total land coverage of 83,013 ha in the seven hubs in the country. Similarly, by 2027, about 579 small-scale and 83 mediums to large scale rice processing facilities will be operational.

On employment, about 226,038 smallholder farmers are expected to create casual labor opportunities per year by hiring about 1.6 million laborers in the seasonal farms.

Similarly, rice processors will create both casual and permanent employment opportunities. As per the evidence from Fogera Plain, a processor employs about 6 casual and 4 permanent employees. This implies that the establishment of rice processing facilities is linked with the rice production

intensification and expansion. There will be employment opportunities for about 4,000 casual and 2,600 permanent jobs over the five years of the implementation of the NRFP in the seven hubs.

On import substitution, the domestic production will increase the level of self-sufficiency from the current 20 percent in 2019 to 83 percent by 2027. Based on the target expansion of rice production area, number of operational rice processors, and average profitability of rice producers (both smallholders and commercial farmers), the Internal Rate of Return (IRR) of the NRFP investment is estimated to be 32 percent over the five years, which is much higher than the prevailing commercial bank rate, which ranges from 17 percent to 20 percent in Ethiopia.

NRFP Execution Strategy

The NRFP Program Coordination Office (PCO) will effectively implement the key planned activities within the NRFP with overall leadership of the MoA and the guidance of the National Rice Flagship Program Steering Committee. The key activities to be implemented in the first year are:

a) Establishing the PCO both at federal and regional level;

b) Organizing a sensitization workshop for the NRFP at national and regional levels;

c) Organizing a high-level meeting with potential development partners;

d) Strengthening the national rice stakeholders' platform;

e) Developing an annual strategic plan for each rice hub;

f) Implementing planned business cases and respective activities in each rice hub;

g) Documenting business opportunities in each rice hub and sensitizing relevant rice stakeholders (private actors) on available opportunities; and

h) Setting up an integrated Monitoring, Evaluation and Learning (MEL) system at the start of the process to track progress and inform planning and programming.

The key performance indicators to be monitored by the PCO during implementation in the first-year are; (i) planning annual engagement meetings at hub level; (ii) planning regular meetings of the national and regional steering committees; (iii)effective coordination of the national rice stakeholders' platform and; (iv) monitoring the implementation of the NRFP activities.

1 INTRODUCTION

This section gives an overview of the agricultural sector and rice production in Ethiopia, socio-economic importance of rice and the rationale for the development of the NRFP. The section also highlights the relevance of the NRFP in regards to policy and defines the public-private incentives to encourage investments in rice production in Ethiopia.

Overview of the Ethiopian Agriculture Sector and Rice Production

Agriculture in Ethiopia accounts for 32.5 percent of Gross Domestic Product (GDP), 67 percent of employment opportunities, and 75 percent of export earnings (NBE, 2021). Crops take the highest share of total production and area coverage and contribute 68 percent of the agricultural GDP. Rice is among the cereals grown and identified as a crop with high potential of job-creation and significance on food security especially in places where other major cereals do not perform well.

Rice is the most important food grain of hundreds of millions of Asians, Africans, and Latin Americans living in the tropics and sub-tropics (Smith and Dilday, 2002). In Africa, rice consumption has been increasing as staple food with an escalating demand in the past three decades; however, these demands have not been commensurate with the total production. Most African countries are net importers of milled rice, which costs 6.4 billion USD annually. For instance, in 2015, 36 percent of consumed rice in Africa was imported (Africa Rice Center, 2018).

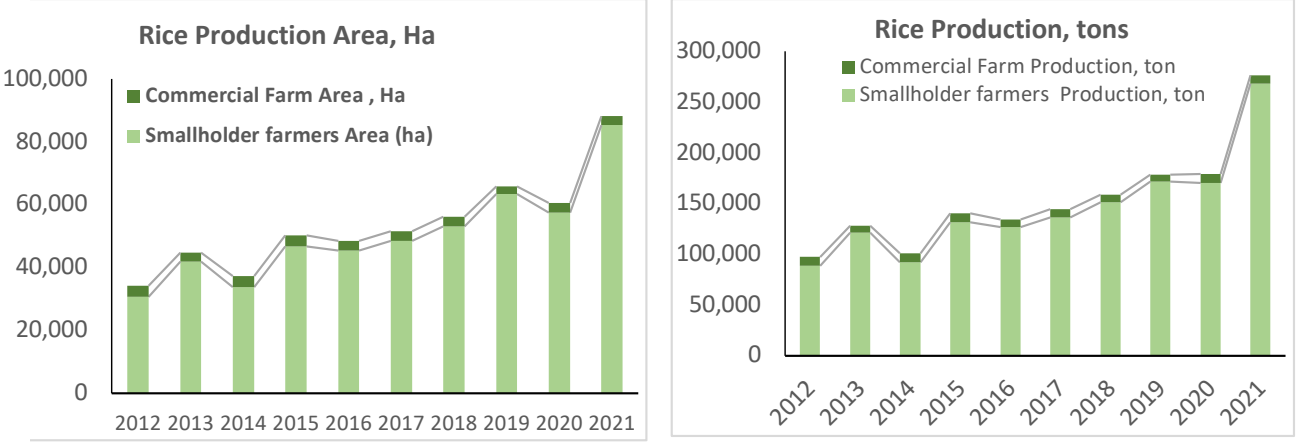

Figure 1: Area and production of rice
Source: Central Statistical Agency, 2012-2021

In Ethiopia, rice production is a recent phenomenon and was first introduced in Gambella (1973 – 1982), Pawe (1985 – 1988), and Fogera Plain (early 1980s). Initially, rice production spread in many areas in the country including Amhara, Oromia, Benshangul, Southern Nations Nationalities and Peoples (SNNP), Gambella and Tigray regional states. However, it is in Fogera Plain in the Amhara region where huge agrarian changes occurred (Alemu, 2019).

Trends in rice production in Ethiopia indicate increasing trajectory both in terms of production acreage and amount of rice produced (Figure 1). The acreage allocated to rice increased from 34 thousand ha in 2012 to 88 thousand ha in 2021, where the majority (97 percent) is cultivated by smallholder farmers (CSA 2012-2021). Whereas rice production was 97 thousand tons in 2012, and 276 thousand tons in 2021. Rice production was dominated by smallholder farmers who contributed 97 percent in 2021 both in area cultivated and production volume (CSA, 2021). The increase in rice production is attributed to an expansion in the wetland and upland areas. Rice production in irrigated areas has not increased substantially though there are small, medium and large-scale irrigation schemes suitable for rice production under irrigation.

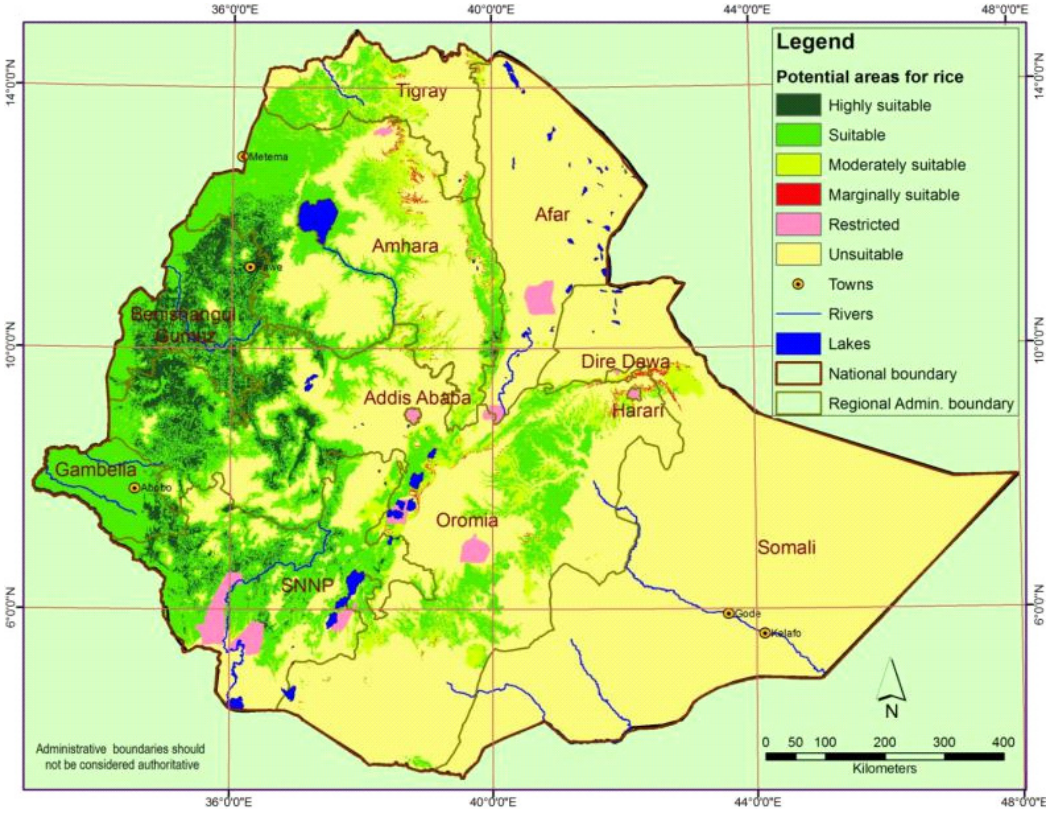

Figure 2: Rice production potential in Ethiopia (MoARD, 2010)

The land currently under rice production in Ethiopia is still low compared to its potential, with the western parts of the country having huge prospects for growing rice (Figure 2). According to Smallholders Irrigation and Drainage Strategy (MoA and MoIE, 2018), Ethiopia has irrigation potential of 11 million hectares. Potential for expansion of area for rice irrigation exist in Tendaho, Shebelle, Omo and Gambella. It is estimated that the country is endowed with about thirty million ha (5.6 million ha highly suitable and about 25 million suitable) for rain-fed rice production. In addition, about 3.7 million ha of land is estimated as suitable for irrigable rice production distributed around the different river basins in the country (MoARD, 2010).

To enhance focused research for development, seven main Rice R&D Hubs were identified in the National Rice Research Strategy (MoARD, 2010). These hubs are aligned with national and regional research centers engaged in rice research (Figure 3).

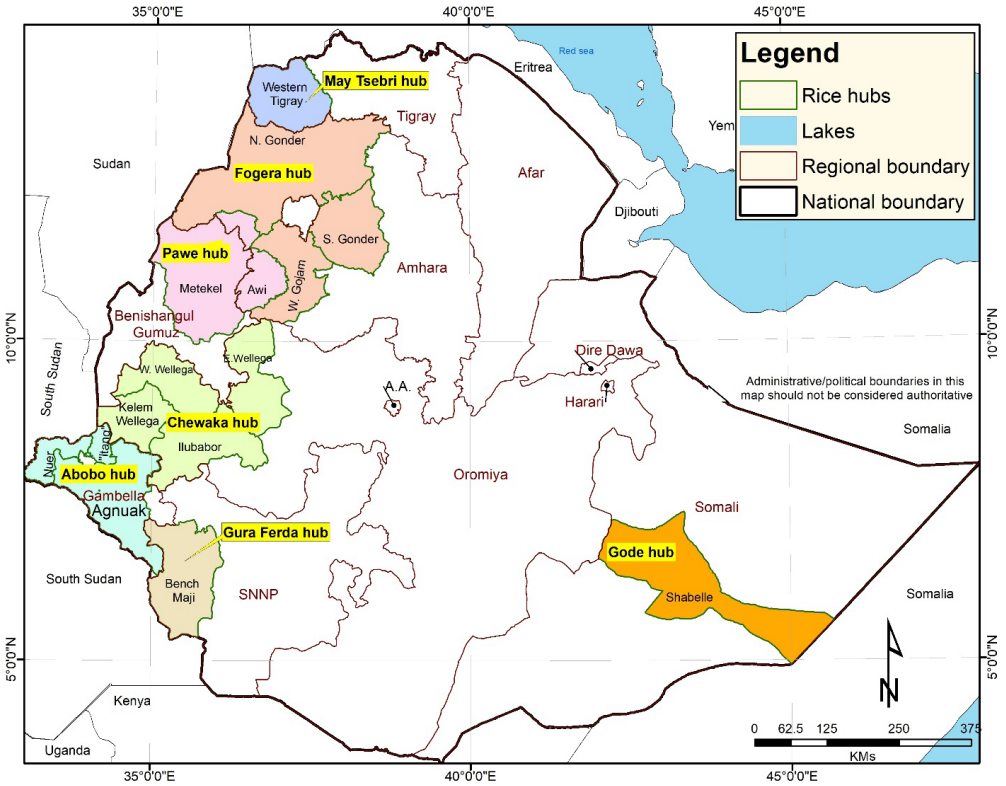

Figure 3: Rice R&D hubs in Ethiopia
Source: Alemu and Assaye, 2021

The seven hubs are distributed across the different regions in rice producing districts (Table 1). There are new rice producing districts identified due to increased relevance and recognition of the economic incentives of rice as a staple crop.

Table 1: Rice production hubs in Ethiopia

Rice Hub	Region	Target area (districts)
Fogera/ Metema	Amhara	Fogera, Dera, Libokemkem, Bahir Dar Zuria, Gonder Zuria, Dembia, Takusa, Achefer, Metema, Quara, Tach Armachiho, Adagn Ager Chaqo, Tegedi, Takusa, Dembia, Chilga, Alepha
Pawe/ Assosa	Benishangul-Gumuz	Jawi, Pawe, and Dangur, Dibate, Bullen, Assosa, Mandura, Guba, Guanga, Ayehu guagussa, Zigem, Kamash, Yaso, Agalo mexi, Sirba Abay, Balo jegonfoy, Assosa, Bambasi, Mange, Komosha, Sherkole, Oda Godare, Kurmuk, Mao komo
Abobo	Gambella	Abobo and Etang woredas
Gura Ferd/ South Omo	SNNP	Beralee, Weyito, Omorate, Gura Ferda, Menit, Gimbo, Decha, Bitta, Sheko, Maje, Bero, Mentigoldya, Gimbo, Bitta, Decha, Bero, Dasenech, Nyangatom, Benatsemay, Selamago
MyTsebri	Tigray	Northwest part of Tigray
Gode	Somali	Gode (Irrigated rice)
Chewaka	Oromia	Chewaka, Tuka Wayyu, Wama, Gidda Ayyana, Ilu-abba-Bor, Sadan Chanka, Hawa Galan, Haro Sabu, Shebe, Kersa, Omonada, Tiro Afeta, Goma

Source: MoARD, 2010 and Personal communication with National Rice Technical Committee

Major cereals crop yields have increased in the recent years compared to rice yields as shown in Figure 4. The current national average yield of smallholder rice is 3.14 t/ha, which is far lower than the local research trial records of 6.0 t/ha under upland and 7.0 t/ha under lowland agro-ecology (MoA, 2018, MoANR, 2017) and the world average of 4.5 t/ha.

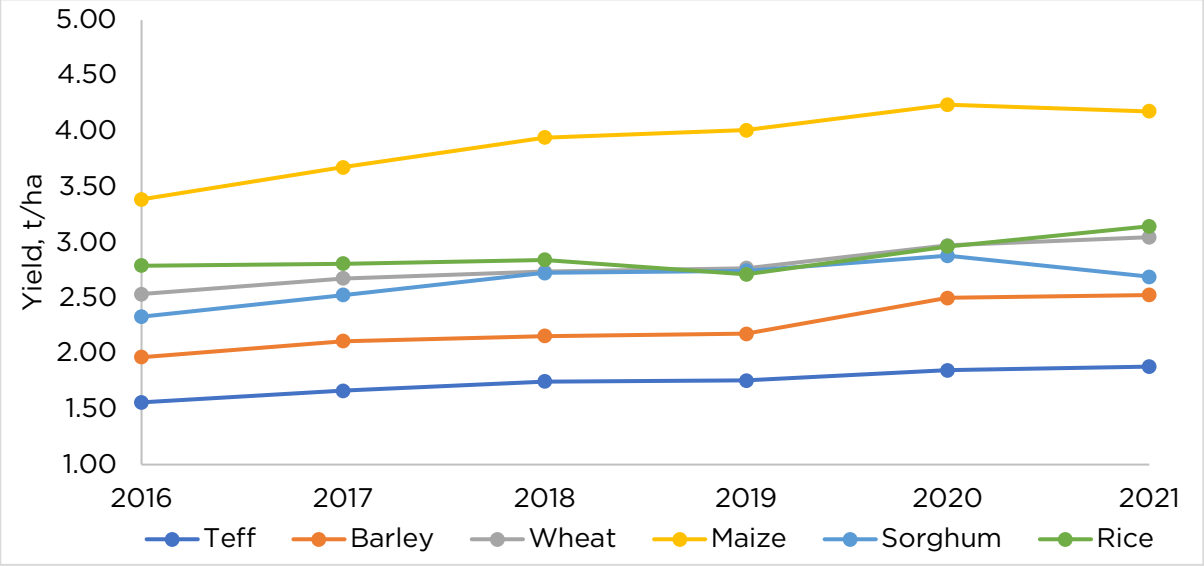

Figure 4: Yields of major cereal crops

Source: CSA, various annual publications (2016 – 2021)

Socio-Economic Importance of Rice in Ethiopia

Rice has successfully diffused into the Ethiopian local farming and food system, despite its recent introduction. Alemu (2018) states that in many parts of the country especially in areas where rice is produced, *enjera* (traditional pancake like flat bread) is made by mixing rice with tef. The mixing is favored due to the high preference for whitish *enjera* color and reduction of the unit cost of making *enjera*. In the earlier periods, there was increasing trend of *tella* (local brew) and *arekie* (local liquor) made from rice; however, due to increased price, farmers sell rice and purchase cheaper cereals such as maize to make traditionally homemade beverages.

According to Alemu (2018) farmers are advantaged economically to continue producing rice with high productivity levels, high demand for rice, and profitability. In addition, rice provides the possibility of crop production on fields considered as "waste" (waterlogged) during the main growing season. The diverse by products of rice have additional economic benefits and can be used as animal feed and fuel (straw, bran, and husk). Farmers have found rice to be more profitable than the crops they used to grow before, which include pulses, oil crops and even *teff*.

In the wetlands of the Fogera Plain, the farmers have shifted from cattle grazing to rice cultivation. Due to an expansion in rice cultivation, the land used for grazing of Fogera cattle and production of other crops began to shrink, resulting in significant changes in local farming systems. There is a significant decline in the production of noug, chickpea, wheat, *teff* and oats in the wetlands due to introduction of rice farming. The farmers started investing in supplementary irrigation for rice production thus increasing their income. This has in turn created the opportunity of production of other crops (e.g. vegetables) under irrigation, which has further increased household income. Some farmers were able to invest in deep wells and install motor pumps on their plots of land (Alemu, 2018).

There are three groups of rice consumers in Ethiopia (Abebe, 2016). The first group of consumers prefer quality rice (aromatic, long grain, and packed rice). These consumers fall under high-income group and are served entirely by imported rice. The second group of consumers prefer both local and imported rice and use rice both as flour for making *injera* as well as boiled rice especially for children. This market is relatively less sensitive to brand, and more price-sensitive than the high-income group. For these consumers, quality is important and local rice is currently able to serve their needs. The third category of consumers prefer local rice especially rice flour to make *injera*. Much of the local rice market falls within this category which is rapidly expanding.

Rationale for Development of the National Rice Flagship Program (NRFP)

The aim for the development of the NRFP is the benefits of the rice sector in the Ethiopian economy including; (i) reducing the trade deficit on the country's foreign currency due to continuous increase in rice consumption and growing imports; (ii) rice production enhances livelihoods through rural-urban linkages, emergence of off-farm sector, and employment promotion/labour absorption.

Ethiopia's reliance on relatively few agricultural exports, coupled with a dependence on imported intermediate inputs, such as capital goods, fuel and food has led to a widening structural trade deficit. The country loses foreign exchange from importation of rice yet it has a huge potential to produce rice locally. Ethiopia spends more than 200 million USD annually to import rice.

Rice consumption in Ethiopia has grown faster than the domestic production resulting in a decline in the rate of self-sufficiency which has decreased from 56 percent in 2011 to 12 percent in 2020 (Figure 5). According to data from Ethiopian Revenue and Customs Authority (ERCA), rice import increased from 80 thousand tons in 2011 to about 700 thousand tons in 2020, which is 50 million USD in 2011 to 317.5 million USD in 2020 (Alemu and Assaye, 2021). There are four main types of rice imported into the country and are recognized by the Ministry of Trade and ERCA. These are broken rice, husked brown rice, rice in the husk (paddy or rough), and semi-milled or wholly milled rice. India is the major rice exporting country to Ethiopia (ca. 50 percent); the remaining half is imported from Pakistan, China, United Arab Emirates, Thailand, Sri Lanka, and Indonesia (Alemu and Thompson, 2020).

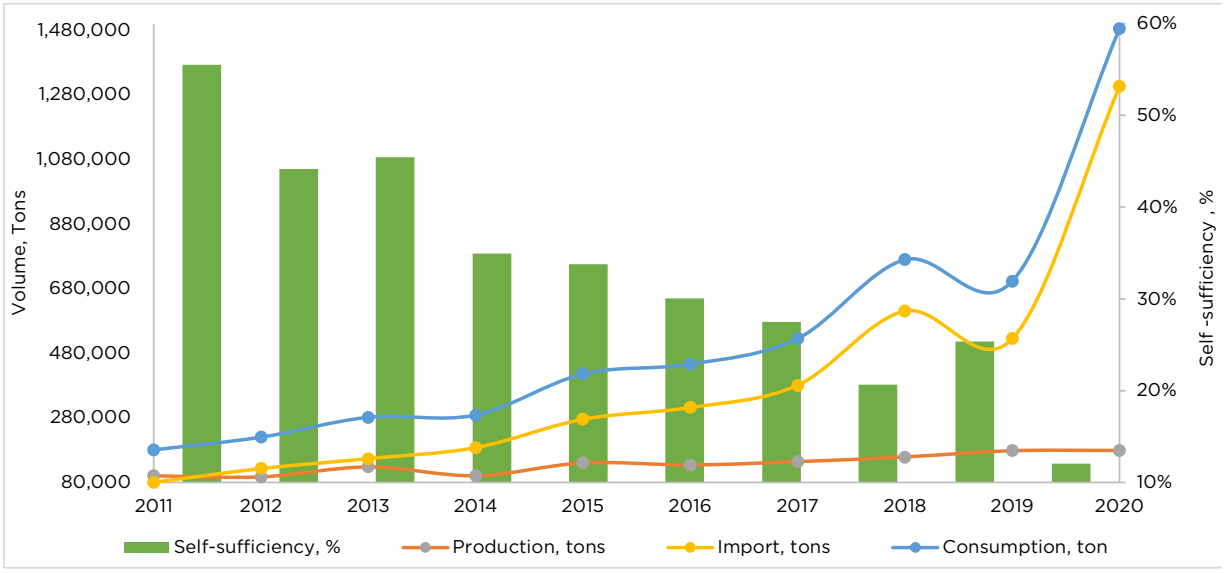

Figure 5: Rice production, import, consumption, and self-sufficiency

Source: Trade Map and Alemu and Thompson, 2020

As mentioned above, Ethiopia has a huge potential to adequately supply the domestic rice needs, working in partnership with institutions, improved innovations, and investment. The Government of Ethiopia is committed to addressing this challenge hence it has set up several initiatives to improve and expand rice production both at small scale and commercial levels.

Evidence from the Fogera Plain also indicate that rice has contributed to the transformation of the plain to a major food secure area, emergence of urban centres, and diverse livelihood opportunities, creating employment for locals and non-locals (Alemu, et al., 2021).

This NRFP is aimed at ensuring full exploitation of the opportunities offered from rice production and addressing the challenges faced in the sector. Specifically, it is;

b) To reduce the volume of rice importation in the country;

c) To provide an integrated and strategic approach of increasing local production and processing by small-scale farmers, private commercial farms and public-private partnership (PPP); and

d) To promote opportunities for livelihood through development of rice processing industry and associated off-farm businesses.

This NRFP is a follow up of the National Rice Development Strategy (NRDS) developed with the support of the Coalition for African Rice Development (CARD) and AGRA (MoA 2019). The objectives, major interventions and activities of the strategy are well aligned with those of the NRFP. The NRFP additionally proposes details of the interventions, operational activities, socio-economic benefits, costs, and financing mechanisms and identifies differential and integrated roles of government, development partners and the private sector.

Policy Relevance of the NRFP

There is enormous cereal deficit in Ethiopia which is a concern for policy makers. Despite being an agriculture-based economy, Ethiopia is unable to fulfil her domestic demand of cereals by local production. This forces the government to import both wheat and rice thus increasing payment deficit, for a country struggling with debt servicing and shortage of foreign currency reserves.

Rice is among the targeted commodities identified in transforming agricultural production in Ethiopia's 10-year development plan and the National Agricultural Investment Plan. Rice is considered as the *"Millennium crop"* that is expected to contribute to ensuring food security in the country due to its' comparative advantage over other cereal food crops. This is reflected in the successive rice strategy documents developed in the country (MoA, 2020). The strategy documents are; the current 10-year NRDS targets by 2030 to produce 1.93 million tons of rice on 385,000 ha, with an average of 5 t/ha (MoA 2020) and; the agriculture sector 10-year development plan (2020-2030) and its national program designed to address the political economy of the Ethiopian food systems, and improve the target balance of food trade to produce 2.0 million tons by 2030 and substitute import of rice by 2025 (MoA, 2021).

Despite the government's commitment through policy development, there are lessons to be drawn from Ethiopia's past experiences particularly on the expansion of commercial rice farms with critical policy implications. These range from improving the "*ease of doing business*" climate, availing commercial land and its smooth administration and institutional coordination.

Public and Private Incentives to Invest in Rice Sector

As earlier indicated, the demand for rice in Ethiopia is increasing every year resulting to a decline of self-sufficiency from about 56 percent in 2011 to about 12 percent in 2020 and creating a burden on the foreign currency reserve in the country. The government is committed to invest in the rice sector given the existing potential of domestic rice production and ensure import substitution, to address the challenges of balance of payment the country is facing. In addition, rice has considerable potential not only to ensure food and nutritional security but also promoting livelihood opportunities in the development of off-farm and non-farm business activities. The evidence in Fogera Plain shows its' contribution to food security, urbanization and emergence of city administration from small rural towns.

Rice production offers immense business opportunities for the private sector in production, processing and marketing. The government should address the bureaucratic processes to enable the private sector to adequately invest in rice production and incentivize them accordingly. The details of these incentives are presented in each of the sub-components and business cases.

2 APPROACH TO DEVELOPMENT OF THE RICE FLAGSHIP PROGRAM

Section 2 examines the overview of the process of the development of the NRFP including technical meetings and write shops, desk reviews and a synthesis of lessons learnt from other countries on rice production. The development of 'Theory of Change' for the NRFP is articulated in this section as well as the stakeholders' consultation and validation.

Overview of the Process

The development of the NRFP was initiated by a formal request from the Government of Ethiopia through the MoA to AGRA. Thereafter, a series of technical meetings were held with relevant institutions to further develop the inception proposals on the NRFP. As part of preparation, desk reviews on rice specific research from Agricultural Policy Research in Africa (APRA) and the Future Agricultures Consortium (FAC) were conducted. Lessons learnt from within and outside the country were reviewed and consultative workshops held with various stakeholders including the private sector. The National Rice Sector Development Technical Committee (NRSD TC) took a lead role in validation of "Theory of Change" along with the identified business cases by component and sub-component.

Technical Meetings and Write shops

AGRA led the conceptualization of the development of the NRFP beginning with in-depth literature review, discussions and brainstorming sessions and benchmarking of previously developed Flagship programs for wheat and oilseeds.

AGRA provided technical support during validation meetings held with NRSD TC members and collected feedback during the development process. The members comprised of technical officers from MoA, Ethiopian Institute of Agricultural Research (EIAR), Agricultural Transformation Institute (ATI), private sector, development partners (SG2000, MEDA, Japan International Cooperation Agency (JICA) (see Annex 12.2).

A sequence of write-shops was organized by the CABE team to draft the NRFP indicating the components, sub-components, activities and budget for implementation in line with the 10-year development plan and the National Rice Development Strategy (MoA 2020). The CABE team consulted experts in the agricultural sector from international organizations including CARD, FAO/Monitoring and Analysing Food and Agricultural Policies (MAFAP) and IRRI.

Desk Reviews

A comprehensive desk review was conducted on policies, performance reports, and documentation of challenges and opportunities to inform the development of the NRFP. The desk review targeted publications from recent surveys on rice producers, processors, laborers and other relevant stakeholders conducted by APRA. Literature on published documents including governments' reports, national and international research on rice production, and other related information was reviewed. Critical concerns requiring NRFP's attention were analyzed, synthesized and delineated. The analysis sought out limiting factors to increase rice production and productivity, competitiveness and access to technologies, finance, and markets. Further areas of interventions for the NRFP were identified and streamlined in line with the broad outcomes for increased rice production, input and use of technology.

Synthesis of Lessons from other Countries

Ethiopian farmers are still in the learning curve for rice cultivation, production, and household-level processing. The literature review to inform the development of the NRFP included a review of the approaches driving modern rice crop production with a focus on lessons learned from within and outside the country. This document has benefitted from decades of achievements of the International Rice Research Institute (http://irri.org) and the Africa Rice Program (https://www.africarice.org/).

Development of Theory of Change and NRFP Document

The development of the NRFP was informed by the findings of the analysis of the desk review and technical support from experts at the NRSD TCs. These included a synthesis of critical concerns facing Ethiopia such as reducing rice import dependence through local production. The consensus is that Ethiopia has the resources to produce rice locally and thus save the currency being spent on importation. This can be achieved through a conscious effort to boost local production through increased productivity of the existing cultivated land, expansion to both smallholder and commercial level production scale and investments on rice processing industry along with improving the performance of national rice marketing.

Stakeholders' Consultation and Validation

Firstly, key stakeholders including researchers, farmers, cooperatives, private sector, international NGOs and development partners were consulted through personal visits and telephone conversations by the AGRA consultant (Annex 1). Major concerns were raised by the private sector with a welcoming buy-in of the NRFP document.

Secondly, a consultative meeting was organized for key private sector stakeholders including rice farmers, commercial farms, input dealers, researchers, and technology developers, with the objectives to; enhance private sector participation in the development of the NRFP; identify the challenges and opportunities to increase local rice production, and the linkages with value-chain actors and; identify areas of intervention across the value chains, including policy considerations.

Thirdly, a workshop was organized to validate the draft key components, sub-components (business cases) along with key activities suggested for the NRFP document by engaging all members of the NRSD TC.

Rice field at Fogera

3 PRACTICAL UNDERPINNING OF THE NRFP FLAGSHIP

In this section, key technical issues that informed the structure of the NRFP are discussed and organized as follows; sub-section 3.1 presents a situation analysis of the rice subsector in Ethiopia; sub-section 3.2 discusses the potential approaches to promoting rice production; sub-section 3.3 discusses lessons from past interventions and; sub-section 3.4 briefly describes the scope of the NRFP.

Situation Analysis

To obtain an informative insight of the current situation of the rice subsector in Ethiopia, a SWOT Analysis was conducted. The strengths, weaknesses, opportunities, and threats are presented in Table 2. The key actors considered in the rice value chain for the SWOT analysis are presented in Box 3.1.

Box 3.1. Key Actors of the Rice Value Chain

The National Agricultural Research System (NARS): The NARS has released 38 improved rice varieties and recommended production practices with technical and financial support from the International Rice Research Institute (IRRI), Africa Rice, development partners mainly the Japan International Cooperation Agency (JICA). However, the use of quality seed of the released varieties and the availability of other rice related technologies is very limited.

Input suppliers: Use of improved seeds, fertilizers and agro-chemicals in rice cultivation is limited. For instance, 88 percent of the seed source is the local market, while the rest is from MoA and research institutions.

Rice producers: Rice production is dominated by smallholder farmers with limited successful attempts 2f large-scale commercial production. Smallholder female farmers have on average less household labour and land allocated for rice production than their male counterparts. The average rice productivity level achieved by female-headed households is also on average smaller than male-headed households. The commercialization of rice has contributed to the emergence of rural labour and land markets. Fifty-two per cent of smallholder rice farmers use hired labour to meet their demand. The same is true for rice processors as on average, a processor hires six casual laborers.

Rice processors: Working closely with rural collectors and farmer traders, processors play a crucial role in marketing both paddy and milled rice in addition to the processing services and job creation. The major challenges facing processors are the poor quality and inadequacy of paddy supply, power shortage, and lack of price incentives for quality rice products.

Source: Adapted from - Alemu, D. & A., 2021.

Potential Approaches to Promoting Rice Production

Literature shows that government interventions can improve agricultural outcomes. Research and rural infrastructure have been identified as some of the most important investment areas for improving agriculture.

Table 2: SWOT Analysis for Rice Subsector in Ethiopia

Strengths	***Opportunities***
• Farmers supported by the extension system appreciate the use of improved inputs. • Rice research infrastructure is in existence and various improved varieties have been tested and released. • Smallholder farmers are integrated into rice production. • High consumer demand for rice.	• Increasing population and urbanization resulting to high demand for rice. • There is huge potential to expand rice production into the rain-fed and semi-arid irrigation lowlands. • Emerging modern rice processing industry. • Supportive government policy as rice production is identified as a key commodity to be promoted. • High interests of international research institutes (IRRI and Africa Rice Center) and development partners that can ensure easy technology and innovation importation
Weaknesses	***Threats***
• Limited access to and high cost of productivity-enhancing inputs. • Small and fragmented land sizes. • Challenging land acquisition process for large scale commercial farms. • Weak market linkage between producers and processors. • Poor post-harvest processing (old and small-size processing machines). • Limited incentives for processors to improve quality of milled rice. • Weak institutional capacity for sub-sector coordination, results tracking and management of cross-cutting issues.	• High costs of improved inputs, reducing gains from rice production. • Malfunctioning paddy and milled rice marketing. • Competition from cheaper rice imports. • High cost of agro financing from private sources. • Political instability in rice production areas.

Source: Authors compilation based on literature including: Alemu and Assaye, 2021; MoA 2019.

Research and Development

Agricultural Research and Development (Ag. R&D) possess the greatest returns on investment and impact on agricultural growth and poverty reduction in the long run (Goyal and Nash, 2017; Mogues *et al*., 2012). The Africa Union's Executive Council in 2006 issued the Khartoum declaration regarding science and technology of allocating 1 percent of GDP for research. Although the Khartoum declaration does not specify sectoral targets (i.e., it does not set a 1 percent target on Ag R&D), the 1 percent of Ag GDP target is a commonly referenced benchmark as this is approximately what was dedicated to the national research institute Embrapa during their leading role in Brazil's successful transformation into a global agro-powerhouse (Mink, 2016; Hopwell, 2016).

In Ethiopia, agricultural research expenditures nearly doubled over time, but the share remains far below the benchmark of 1 percent of agricultural GDP, or 2 percent suggested by the Forum for Agricultural Research in Africa (Mink, 2016), averaging only 0.3 percent over the period.[1] Despite being the 5th highest spender in sub-Saharan Afica (SSA), Ethiopia compared to other countries ranks 29 out of 40 in agricultural GDP. And yet, only 6 countries in SSA spend 1 percent or more, and for those below the average is only 0.4 percent of agricultural GDP compared with 0.8 percent in Latin America and the Caribbean, where nearly half the countries spend 1 percent or more (ASTI, 2021).

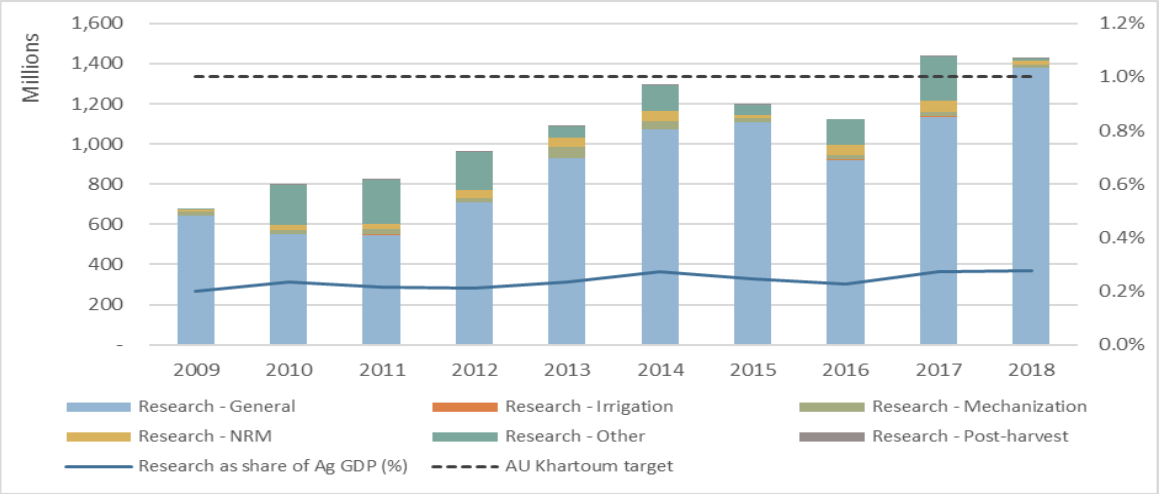

Figure 6: Agricultural research expenditure by subcategory and share of research over Ag GDP
Source: FAO-World Bank ARD PER Dataset, 2021

Rural Infrastructure

Overreliance on rain-fed agriculture is a major constraint to productivity in Ethiopia. Over the last decade, irrigation development has been on top of the governments' agenda, with ambitious targets set out in the five-year *Growth and Transformation Plans* (GTP) of the Government of Ethiopia – GTP I (2011-2015) and GTP II (2016-2020). Irrigation comprised almost 3 percent of total government expenditures over the period, primarily funding large capital investments in irrigation dams under the Ministry of Water, Irrigation, and Electricity (MOWIE). However, almost 40 percent of these irrigation development projects are supporting sugarcane plantations for state sugar companies under an import substitution/export promotion initiative. The remainder includes small-scale

1 This share is consistent with ASTI Indicators. Research spending considered in this analysis is primarily government support to agricultural research institutes, specializing in seed, soil, livestock, biodiversity, and agro forestry. As the main coordinating body of research activities in the country, the Ethiopian Institute of Agricultural Research (EIAR) is the largest and most well-funded, followed by the Oromia Agricultural Research Institute and other regional institutes. Ethiopia's expenditure on research is underestimated as research carried out by universities. However, even if we consider 5% of all university expenditures going to agricultural research, the share on AgGDP would still be only 0.6%.

irrigation (SSI) initiatives such as those conducted under several programs/projects including Agricultural Growth Program (AGP) and Productive Safety Net Program (PSNP) which account for 13 percent of irrigation expenditures. In this regard, introduction of irrigated rice using available irrigated rice varieties under both small-scale and commercial context considering the different irrigation schemes (small, medium and large irrigation schemes) will enhance the increased production and productivity for the aspired rice import substitution.

Marketing and Rural Enterprise Development

Despite the role played by efficient markets and small-medium agri-food enterprises (agri-SMEs) in rural transformation and agriculture-industry connectivity, there has been little attention and expenditure oriented towards the development of these critical food system elements. Support to rural enterprise development and agricultural marketing in Ethiopia comprised an average of only 4 percent of agriculture and rural development (ARD) expenditures between 2009 and 2018. However, support to agro-processing SMEs and cooperatives as well as market infrastructure began increasing in 2014 and accounted for 7 percent of ARD expenditures in 2018.

As discussed in Box 3.2 above, processors are central to paddy and milled rice marketing but face multiple challenges in accessing finance and reliable power as well as the quantity and quality of paddy supply. The lack of quality rice can be partially explained by the fact that domestic rice is predominantly used as flour in making of injera and does not face strong competition from imported rice, which is primarily consumed as a whole grain in urban restaurants and hotels.

The price of rice produced in Fogera Plain were positive overall, averaging 13 percent over the period, but declined since 2013. On the other hand, wholesale price of rice in Addis Ababa increased steadily from 2011 to 2018, owing to increased consumer and hospitality industry demand. The inverse trend between wholesale and farm gate reflects the disconnection between domestic markets owing primarily to distinct consumer preferences and inefficiencies in transport and logistics between rice producing areas and Addis Ababa. Therefore, despite perceived quality issues with domestic rice production, producers and millers appear to have a stable market, receiving higher prices than the international reference price (Figure 7). However, increasing price incentives for traders of imported rice in Addis Ababa could present an opportunity for quality incentives to produce import-competitive rice – but only with enhanced productivity and market integration.

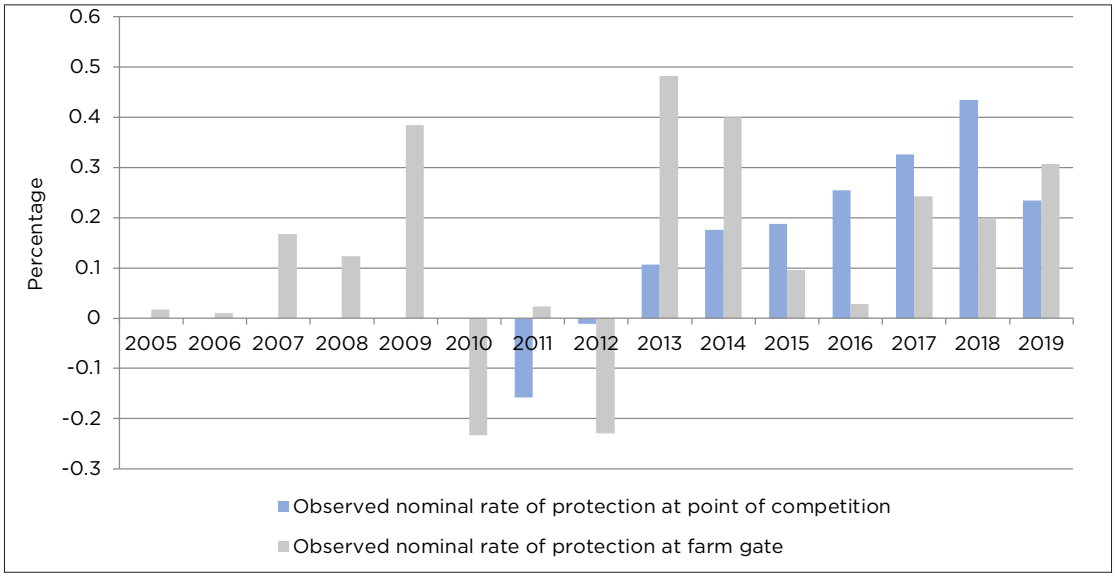

Figure 7: Nominal Rate of Protection for rice at farm gate and wholesale in Ethiopia (2005-2019)
Source: MAFAP Price Incentives Database, 2022

Investments and policy reforms targeting rice production, productivity, and quality enhancement therefore should target not only the supply-side constraints but also the demand-side. Support to SMEs through access to finance, machinery, and training will enable them to play a greater role in linking smallholders with increasing urban demand, and potentially providing price incentives for increased quality paddy through forward contracting. In doing so, the government will be indirectly supporting rural jobs, in particular providing employment opportunities to unskilled poor people and vulnerable groups such as women or youth.

Studies indicate that Ethiopia has the potential to increase local production of rice and productivity and this is strongly recommended as an important investment area in the country (Alemu et al. 2018; Girma et al 2018; Alemu et al. 2020). Box 3.2 presents a summary of approaches to improve the production and productivity of rice in Ethiopia.

Box 3.2: Recommended Approaches to Increase Rice Production and Productivity in Ethiopia

a) Use of improved rice varieties tolerant to both abiotic and biotic stresses together with science-based agronomic practices.

b) Variety development must be based on agro-ecologies and maturity groups (upland, paddy, and irrigated rice).

c) Integrated pest management (IPM) to control pests in a manner that minimizes economic, health and environmental risks.

d) Establishing stronger seed systems and scaling up methods. New and improved seeds may be produced but an effective seed system ensures that they reach the farmers at the right time at affordable price.

e) Building capacity for value addition in terms of quality and standards to increase the earnings by the value chain players and motivate the farmers to invest in rice production.

f) Introducing enabling policies and business environment. Subsidies on improved seed, irrigation equipment and water, and agro-chemicals encourage farmers to adopt improved technologies and inputs. Coupled with good infrastructure and marketing systems, these lead to a more vibrant rice sub-sector characterized by high production and productivity, and value addition.

g) Strengthening regional and international networks for collaborative research, production and dissemination of improved varieties and agronomic practices.

Source: Author's compilation based on literature including: Tadesse et al. (Eds). 2019c.

The World Bank (2018) identifies several opportunities and constraints in cereals marketing in Ethiopia, which in some cases also applies to rice marketing:

a) Lack of planning and coordination among rice-producing farmers and processors.

b) Cash constraints among the farmers and processors for input purchases and expansion of investment.

c) Breach of contracts by the cooperatives, making farmers hesitant to work with them, the cooperative members also engage in side-selling to receive better prices.

d) Poor rice quality standards, regulation, and enforcement of quality and standards.

Lessons from Past and Ongoing Rice Related Interventions in Ethiopia

Five key lessons that are relevant for the NRFP were identified as follows:

a) There exists a yield gap between the research potential and what is obtained under farmers' fields

Increasing productivity will be a key factor in ensuring the level of production projected for rice import substitution. This means, every parcel of land currently devoted to rice production should yield more than the national average (2.8 t/ha). This is not unrealistic and has been practically proven that the yield levels achieved by model farmers as well as commercial farms are much higher than the national averages. Smallholder rice cultivation in Ethiopia lacks appropriate level of input use and management practices (Alemu et al. 2018). However, published data indicate that input uses of improved seeds, soil fertility management (Tadesse et al. 2019a; Tadesse et al. 2019b), weeding (Zeleke et al. 2019) and pest protection practices (Yalew et al. 2019) can increase grain yields to more than 6 t/ha. A national average increase of at least 3.5 t/ha alone would lead to production of an additional 36,000 tons of rice.

Hybrid rice gives 15-20 percent higher yields than its non-hybrid counterparts. There have been attempts of introducing hybrid rice production in various countries in Africa, but Ethiopia is not one of them (Abebrese and Yeboah 2020).

b) Expansion of area for rice cultivation leads to more production

Ethiopia could gradually achieve self-sufficiency from local rice production. The area of production for rice will gradually increase from about 62 thousand hectares of the base year (2020) to 450 thousand hectares by the end of the NRFP duration (2030). Therefore, increased supply to the market can also come from area expansion. These expansion areas cover the two eco-systems of rice cultivation: the upland and the irrigated lowlands. Regarding the former, most of the "Rice Hubs" are found in SNNP, Gambella and Benishangul-Gumuz regional states (Alemu 2018).

c) Use of irrigation with improved rice production technologies leads to productivity increase

Ethiopia has a potential of 3.7 million ha land for irrigated lowland rice production where the research system has released nine high-yielding varieties for irrigated conditions (Girma et al. 2018). These include the lowland areas where cotton is the main crop and wheat and rice can be part of the rotation system. With the establishment of the Land Bank and Development Corporation in 2018 to enhance improved access to land for commercial agricultural investment, there is high potential to consider rice sector through land that can potentially be transferred to the private sector (FNG, 2018). This endeavour should be supported by research and extension system including genetic improvement for salt tolerance (salinity), irrigation water management and governance, and the expansion of extension and mechanization services. Available data indicates that supplementary irrigation improves rice yield in otherwise normally rain-fed areas of production (Alemu and Kinfe 2021). However, caution should be exercised on the suitability of rice to lowland irrigated areas where the evapotranspiration rate is huge (Desta Gebre, personal communication).

d) Addressing the challenges facing rice processors to produce quality milled rice

Rice processing is a critical stage of the rice value chain to ensure supply of quality domestic produce. Rice processing plays a central role in rice product chain upgrading – in terms of process, product, functional, channel and intersectoral improvements – as well as stimulating new business opportunities and unskilled and skilled employment. The introduction of rice processing industries has created dynamic rural-urban linkages as drivers of agrarian change including transformations in farming systems, land tenure, input markets, as well as social relations. However, most rice

processors operate on small-scale machines, limited working capital and interrupted by power supply (Assaye and Alemu 2020). This means rice processing is not commensurate with the current level of production in terms of quantity and quality. In order to expand rice production there is need to provide formal trainings to the private sector, standardization of the requirements for licensing rice processing facility and provision of incentive mechanisms (e.g., access to land, finance, and tax holidays). The lack of milling machinery for research and production is one of the major problems that limit the production and expansion of rice in lowland irrigated areas.

e) Diversification of rice cultivation with vegetable production can improve farmers' income

The introduction of rice in some areas like the Fogera Plain has transformed food insecure communities to surplus income earners. One of the outcomes of the increased rice production has been the ability of smallholder rice farmers to intensify their production through investments, mainly in supplementary irrigation. This has enabled rice farmers to diversify crop production during the off-season through the production of vegetables mainly onion. However, market failures could be disincentives for such diversification and thus should be given due attention (Alemu and Kinfe 2021).

Scope of the NRFP

The scope of the NRFP interventions on the value chains focus on the potential of increasing rice yields per unit area and expanding its cultivation to new production areas. The interventions will be implemented on both rain-fed and irrigation systems. Irrigated rice production targets constructed small, medium and large-scale irrigation schemes in the target rice hubs and intensification and expansion districts. The NRFP will be disseminated to rice producers, processors and traders facilitated by government ministries and institutions mandated to implement the country's ambitious plan for self-sufficiency of basic agricultural commodities including rice. The private sector will be offered an opportunity for commercial level rice cultivation and product processing.

The geographical scope of the NRFP in promoting rice production and processing will be the target rice hubs in each of the regions and identified woredas (Table 1).

Rice harvesting at Fogera Plain

4 PROBLEM CONTEXT, OBJECTIVES, AND THEORY OF CHANGE

This section highlights the objectives of the NRFP and the problem context leading to the development of the NRFP. The section mainly provides a detailed description of the NRFP components and sub-components.

Objectives of the NRFP

The goal of NRFP is to increase local rice production with the aim of promoting rice import substitution and domestic livelihood opportunities. The specific objectives of the NRFP are to:

a. Increase rice production and productivity through intensification and expansion.

b. Enhance the development of rice processing industry and market development of rice products (paddy and milled rice).

c. Improve institutional capacity for implementation, coordination and monitoring and evaluation of interventions in the rice subsector.

Problem Context and Development Opportunity of the NRFP

Ethiopia has the biophysical resources to boost production and productivity of rice by building on the efforts made over the last two decades. Low rice productivity can be attributed to smallholders' limited access to agricultural inputs, financial services, improved production technologies, irrigation, and agricultural markets (MoA, 2020).

The NRFP focuses on transforming rice production by boosting productivity in rain-fed areas and expanding production into lowland and upland areas under rain-fed condition and use of irrigation. It will also focus on addressing the marketing constraints in the rice value chain, mainly the mechanization and processing aspects of producing quality milled rice. Improving rice production and productivity and facilitating its marketing access are consistent with the "Ministerial Core Activities" that are derived from Ethiopia's 10-years development plan and *National Rice Development Strategy* (NRDS).

The NRFP will facilitate public-private dialogue on policy and technical challenges to avail large tracts of land to the private sector for establishment of commercial rice farms. The NFRP will strengthen actors in the national seed system to enhance production and supply of appropriate improved varieties that respond to the demand. A workable and sustainable credit mechanisms will be established for small holder farmers to buy the production inputs needed for increasing rice productivity such as seeds, fertilizers, and agrochemicals.

The NRFP Theory of Change

The main objective of the NRFP is to enhance rice import substitution and contribute to increasing local rice production, processing and marketing. Envisaged impact include; increased transformations in livelihood; employment opportunities for youth and women; improved income for rice value chain actors; improved household income; reduced poverty among the value chain rice actors; improved food and nutrition security and; overall growth in agricultural GDP.

Three impact pathways are envisioned; (i) increased rice productivity through research and development of yield-enhancing technologies and expansion of commercial rice farms and irrigation; ii) processing, market linkages and agri-financing; and (iii) strengthening institutional capacity for effective implementation, coordination, results tracking and management of cross-cutting issues. This entails identification and bridging institutional and individual capacity gaps for implementation and delivery of the NRFP, establishment of experience-sharing platforms, setting up and operationalizing M&E and learning system, and policy advocacy and influence. Figure 9 provides a summary of this theory of change. For successful implementation of the planned interventions, there is need for socio-economic stability, supportive government policies and infrastructures. Measures to enhance resilience to shocks such as climate variability and change which are expected to prevail must be undertaken.

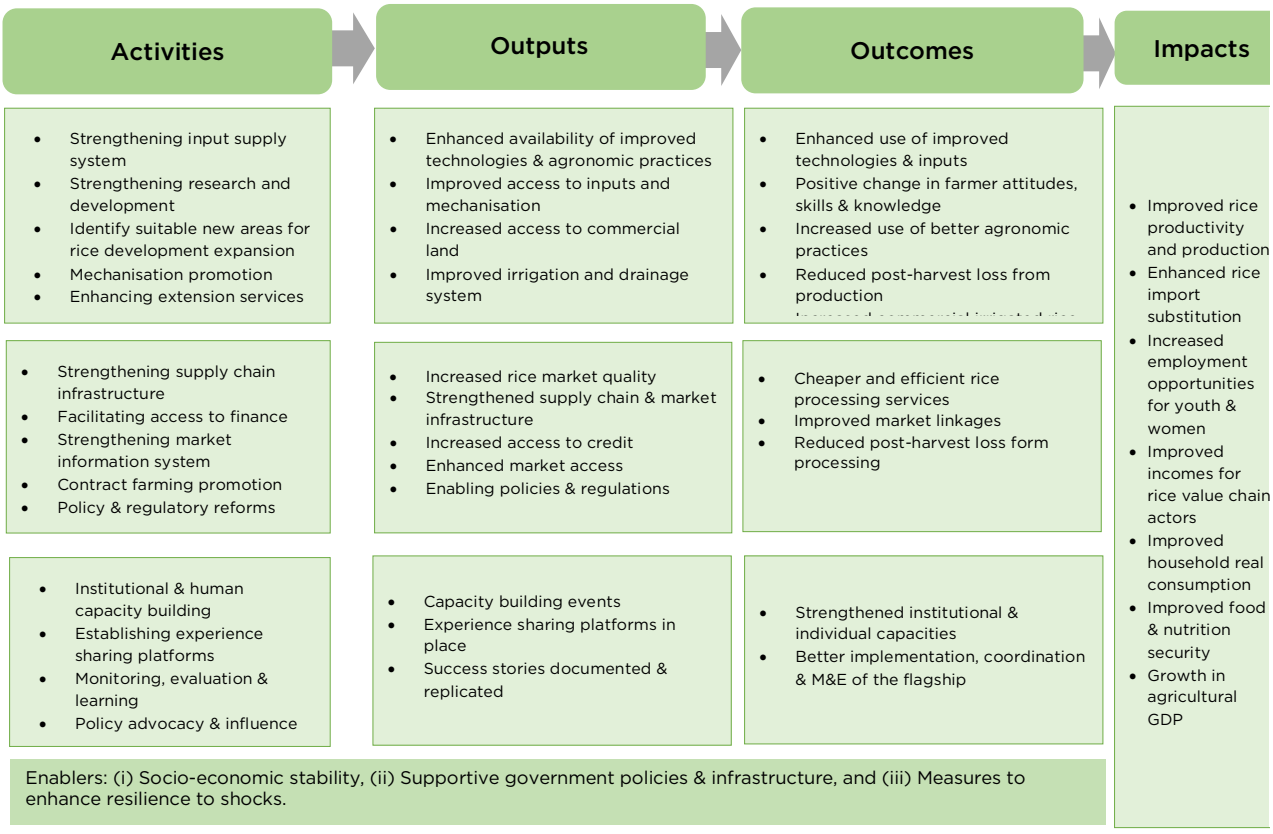

Figure 8 :The NRFP Theory of Change

Source: Authors' conceptualization

5 DESCRIPTION OF THE NRFP COMPONENTS AND SUB-COMPONENTS

The NRFP is envisioned to have three broad components namely: (i) Increase rice productivity and production; (ii) Rice processing, Market Linkage, Agri-Finance, and Promotion of Private Investments (iii) Program Coordination, Results Tracking and Cross-cutting themes. Each of the components has sub-components as shown in Table 3.

Table 3 Summary of NRFP Components and Sub-components

Components	***Sub-Components***	***Key Activities***
Component 1: Increase Rice Productivity and Production	1.1 Enhancing access and use of quality seed of improved varieties.	a) Strengthen the collaboration of the national rice research with IRRI and Africa Rice Center for release of adaptive rice varieties for the three rice ecosystems. b) Create demand for available improved rice varieties (demonstration and popularization). c) Enhance access to EGS of demanded varieties. d) Promote integrated seed system for rice.
	1.2 Enhancing access and use of rice mechanization tools, implements and equipment.	a) Facilitate the establishment/ strengthening of local manufacturers of rice mechanization tools and implements. b) Facilitate the establishment/ strengthening of local rice mechanization service providers (land preparation, agro-chemical application, weeding, harvesting, threshing). c) Promote business linkage between importers of mechanization equipment and mechanization service providers. d) Provide capacity building to staff at the National Rice Research and Training Center (NRRTC) of EIAR to provide certified training in rice equipment operation and maintenance.
	1.3 Sustainable intensification and expansion of rice production.	a) Promote sustainable intensification of rice production in current production areas. b) Promote small-scale rice production in potential areas. c) Promote commercial rice production in selected target areas. d) Promote irrigated rice targeting developed irrigation schemes.

Components	Sub-Components	Key Activities
	1.4 Promoting sustainable rice-based crop production systems.	a) Promote sustainable and compatible rice-based crop production system for diversifications. b) Support the marketing systems of crops produced under rice-based production.
Component 2: Rice Processing, Market Linkage, Agri-Finance and Promotion of Private Investments	2.1 Promote the development of rice processing industry to ensure competitiveness of domestic rice (current production areas, new production areas).	a) Modernization of the rice processing industry. b) Promotion of establishment of rice processing services in the new areas.
	2.2 Modernization of paddy and milled rice marketing system	a) Establishment of paddy marketing system that incentivize both rice farmers and processors for production and processing of quality paddy and milled rice. b) Facilitation of market linkage between paddy producers with the already established state-of-the art rice processing industries. c) Facilitation of the consideration of rice in the Ethiopian Commodity Exchange (ECX) platform.
	2.3 Facilitate evidence-based rice import regulation	a) Designing regulatory measures for rice import considering (i) quality and phytosanitary and (ii) competitiveness of domestic rice.
Component 3: Institutional Capacity Strengthening, Coordination, MEL and Cross-cutting themes	3.1 Coordination of implementation of the NRFP	a) Establishing a NRFP Management Unit/Project Coordination Office (PMU/PCO) at MoA and RBoA b) Establishing the NRFP Steering Committee (SC) National and Regional
	3.2 Institutional and Individual Capacity strengthening	b) Strengthening institutional capacity
	3.3 Monitoring, Evaluation and Learning (MEL)	a) Clear M&E indicators (Key Performance Indicators – KPIs) to track progress. b) Establishing feedback mechanism.
	3.4 Cross Cutting Themes (Gender, Environmental management, Resilience building and Policy interventions)	a) Mainstreaming gender and social inclusion. b) Mainstreaming business incubations. c) Mainstreaming enabling environment (policy, regulations).

Component One: Increasing Rice Productivity per unit Area

This component has four subcomponents, investment activities and expected results.

Enhancing Access and Use of Quality Seed of Improved Varieties

Access and use of quality, suitable and better performing seed varieties is crucial to ensure intensification and expansion of rice production in the new potential areas. Key components to be promoted include; enhancing the current pool of available released varieties; demand creation and; enhancing the development of integrated rice seed system. There are thirty-eight improved rice varieties for the three rice ecologies in Ethiopia. These include seven varieties for irrigated area, ten varieties for rainfed lowlands and twenty-one for rainfed uplands (MoA, 2020).

Additional thirteen tested varieties were recently introduced in efforts to enhance rice production. They include Shaga, Wanzaye, Erib, Abay, Fogera-1, Maitsebri-2, Fogera-2, Adet, Nerica-13, Nerica-12, Hibir, Chewaka, and Ediget. Details of the varieties are presented in the annex. Additional tested improved varieties including Pawe-1, Nerica-3, Hidasie and Nerica-12 have improved yield of 2735 – 3763 kg/ha (Delele, Zenebe and Simachew, 2021; Abera et al. 2021; Tefera et al, 2019; Belayneh & Tekle, 2017) while the X-Jigna, which takes about 122 days to mature producing 3504 kg/ha, is preferred among farmers in Fogera Plains (Mulugeta et al., 2021). Other specific improved varieties for lowland include Komboka, Tanzania Tai, TXD 306I, Edigeti and Hibree (Lakew, Dessie & Abebe, 2021) while Azmera was tested as a suitable improved upland rice variety (Mulugeta et al. 2021). The main intervention areas under this sub-component are presented in Table 4 and discussed below.

Table 4: Specific investments to enhance access and use of quality seed of improved varieties

Key investment area	Activities and targets	Result
A. Strengthening the collaboration of the national rice research with IRRI and Africa Rice Center for release of adaptive rice varieties for the three rice ecosystems.	• Secondment of IRRI and Africa Rice Center scientists to technical backstopping and facilitation of germplasm and prototype exchange (Assigning of three senior scientists (breeder, agronomist, agricultural engineers at NRRTC). • Germplasm sharing (IRRI and Africa Rice Center germplasm exchange. • Testing and release of adaptive and better performing varieties across the 7 rice hubs.	• National Rice Research Strengthened. • Wider options of improved varieties available for the different rice ecosystems.
B. Demand creation for available improved rice varieties. ((demonstration and popularization)	• Demonstration (demos in 70 districts at the target regions for the first three years). • Large-scale demonstration and popularization (30 districts at target regions).	• Demand of released varieties created among users in the different rice ecosystems.
C. Enhance access to EGS of demanded varieties.	• Maintenance breeding and breeder seed. production (eight RCs will engage in breeder seed production). • Pre-basic production (eight RCs will engage in pre-basic seed production). • Basic seed production (eight RCs will engage in basic seed production). • Facilitation of contract EGS production.	• EGS available for the demanded varieties in the required quantity and quality. • System for access to EGS established.

Key investment area	Activities and targets	Result
D. Promote integrated seed system for rice.	• Supporting rice seed producers' cooperatives (facilitate establishment and capacity building, two cooperatives at each hub). • Private seed companies (engage two private seed companies in rice seed production (EGS, market linkage) per hub. • Public Seed Enterprises (engage the five PSE to engage in rice seed production (EGS, market linkage) per hub).	• The national rice seed system strengthened ensuring availability of quality rice seed varieties demand at the required place in large quantities. • Improved diversity of actors including cooperatives engaged in rice seed production and marketing as a business.

A. Strengthening the Collaboration of National Rice Research Program with IRRI and Africa Rice Center for Release of Adaptive Rice Varieties for Three Rice Ecosystems

Since 2021, a total of thirty-eight rice varieties have been released of which twenty-one are for upland rice-ecosystem, ten for lowland and the rest seven varieties for irrigated conditions (MoA, 2020). However, the local variety *X-Jigna* is popular with estimated coverage of 67 percent of the production fields (Atnaf et al. 2021). The NRFP will focus on variety replacement efforts, testing and determination of the suitability of the existing varieties to the various agro-ecological conditions, including rain-fed and irrigated environments.

Due to limited domestic genetic pool, there is need to strengthen collaboration with regional and international rice research institutes to develop wider varietal portfolio for the different rice ecosystems. Ethiopia has been a member of Africa Rice Center since 2016 and has a formal collaboration framework agreement with IRRI, making it easier to strengthen collaboration efforts through different modalities. This will include: (i) secondment of IRRI and Africa Rice Center scientists; (ii) enhancing germplasm sharing; and (iii) testing and release of adaptive and better performing varieties through the continental and international variety testing framework.

B. Demand Creation for Available Improved Rice Varieties (Demonstration and Popularization)

As indicated above, the adoption of released rice seed varieties for the different ecosystems is low and dominated by a local variety called X-Jigna, thus, it is important to create demand for improved rice varieties. Currently, demand creation for released varieties of rice is carried out by members of the National Agricultural Research System (NARS). The NRFP stipulates that the demand creation for available improved rice varieties will be the responsibility of the members of the NARS and private seed companies that have registered rice varieties in their respective target woredas, identified for intensification and expansion of rice production. Key proposed activities for demand creation are; (i) demonstrations of released varieties and (ii) Large-Scale Demonstrations - LSD (popularization) in the target rice intensification and expansion areas.

C. Enhance Access to EGS for Demanded Rice Seed Varieties

The availability of EGS has been a challenge in the national seed system in Ethiopia. There is need to produce adequate types of EGS if quality demanded varieties of rice seeds are to be provided. The production of EGS is currently the responsibility of the members of the NARS. In addition to demand creation, production of demanded varieties of EGS will be the responsibility of members of NARS who will be expected to supply the same to rice seed producers.

In addition, variety maintenance, breeder and pre-basic seed production will be the responsibility of the members of the NARS. These are eight research centers that are actively engaged in rice research (Fogera, Abebo, Assosa, Bako, Pawe, May Tsebre, Gode, and Jinka research centers). On the other hand, basic seed multiplication will be done depending on the capacity by different rice seed producers supported by members of the NARS. In line with the established system of EGS mainly pre-basic and basic seed production, there will be promotion of contractual production and supply schemes with seed information exchange systems. In addition, the NRFP will build adequate physical capacity for rice breeder and pre-basic seed multiplication and internal quality control schemes.

D. Promote Integrated Seed System for Rice

Currently, the Ethiopian seed system is characterized by three major components namely; formal, intermediate, and informal sector. The intermediate sector is managed by the less stringent quality declared seed (QDS) certification system, which has its own directive and standards and allows full responsibility of the producers with the regulatory engagement in field and seed certification. Since rice production was recently introduced in Ethiopia, its seed production focuses on limited geographies under low levels of engagement by the public, private or cooperative based enterprises. Overall, the rice seed supply, marketing and usage are at an infant stage in the country (MoA, 2020).

There is an urgent need to promote integrated seed system for rice including the participation of actors in the formal and the intermediary seed system. The composition and type of the seed system to be promoted will depend on the rice hub given the expected difference in the system performance of the rice seed. Key participants will be; (i) actors of the formal seed system both public seed enterprises and private seed producers; and (ii) actors of the intermediary seed system, which includes seed producers' cooperatives, and registered farmers' seed-producing groups. The quality declared seed (QDS) system will be promoted to improve rice seed quality assurance and ensure wide access to quality seed.

Guidelines for producing quality rice seed will be developed for use by seed producers, quality managers, field inspectors, and seed analysts.

Enhancing Access and Use of Rice Mechanization Tools, Implements and Equipment

The agricultural authorities at federal and state level have been implementing strategies to promote the use of mechanisation for over five years. Among such initiatives include the removal of import duty on agricultural machinery in 2019 to enhance uptake of mechanization services for continued investment in agriculture (Kirsch & Hailgeberiel, 2019).

The German agency Gesellschaft für Internationale Zusammenarbeit (GIZ) asserts that, although substantial yield increase is recorded by using the highest mechanization technology (H-2/AT), from the service-provider side, an intermediate technology level is found to be more profitable. The challenges to mechanization include lack of skilled staff, lack of credit, lack of policy support (e.g., tax exemptions), land fragmentation, and lack of customized tools. While the scope of mechanization in other countries includes crop protection and irrigation tools among others, it only relates to tractors and combine harvesters in Ethiopia. Therefore, there is need for a broader understanding of mechanization to include diverse approaches of business incubation for example, organizing and/or capacitating existing SMEs and youth groups to use solar energy as a source of power for irrigation (Mengistu & Teshome, 2018).

According to Deribe, Solomon and Getnet (2019), only 2 percent of rice farmers in Ethiopia use tractors for land preparation and 22.7 percent have access to rice polishing facilities. More farm labour power is consumed during weeding estimated as 175 labour-days and comprising 66 percent

of the total labour. In the rural areas, 42 percent of households rely on shared labour for harvesting operations. The study findings confirm that the land-labour ratio is significantly larger for farmers than the use of tractor generated power. Mechanical power is needed for priority activities such as rice processing, harvesting and threshing, tractor ploughing, and weeding.

Table 5: Specific investments to enhancing access and use of rice mechanization tools, implements and equipment

Key investment area	Activities and targets	Result
A. Facilitate the establishment/ strengthening of local manufacturers of rice mechanization tools and implements.	• Identification of local manufacturers in target areas (three manufacturers in each hub, a total of twenty-one manufacturers). • Sharing available and importation of prototypes (facilitation by the national rice research program). • Providing capacity building to manufacturers for multiplication of prototypes (facilitate access to required equipment for multiplication – two per hub).	• Enhanced availability of improved rice mechanization tools and implements. • Business opportunities for local manufacturers/ metal workshops created.
B. Facilitate the establishment/ strengthening of local rice mechanization service providers including SMEs and youth groups (land preparation, agro-chemical application, weeding, harvesting, threshing).	• Identification of local mechanization service providers in target areas (establish or strengthen ten service providers nationally/year). • Importation of appropriate mechanization equipment (importation for ten service providers/year).	• Access to mechanization service enhanced for smallholder and commercial rice producers. • Create business opportunities for local service providers. • Create local employment opportunities.
C. Promote business linkage between importers of mechanization equipment and mechanization service providers.	• Facilitate improved access to foreign currency for importers. • Strengthen the National Rice Stakeholders' Platform for improved market linkage (suppliers and buyers). • Regular (biannual) organization of the platform events.	• Enhanced access to quality and appropriate rice processing equipment for rice processors/ mechanization service providers.
D. Build the capacity of staff at the National Rice Research and Training Center (NRTRTC) of EIAR to provide certified training in rice equipment operation and maintenance.	• Installation of required mechanization equipment suitable for training. • Development of local curricula (adapt curricula by benchmarking). • Building human capacity for training (four expatriates from countries with advanced rice sector). • Setting up the system for training (regulation, procedures, etc).	• Availability of well training rice mechanization operators and maintainers. • Enhanced job opportunities for youth.

Ensuring access and use of the diverse rice mechanization tools, implements and equipment demands; (i) strengthening of local manufacturers to multiply and ensure market access; (ii) provision of market for rice mechanization services and; (iii) ensuring improved access to relevant and quality imported equipment through creation of business linkages among users, importers and manufacturers/exporters in other countries. In addition, effective use demands the development of human capacity to operate and maintain available mechanization options. The main investment areas with expected results under this sub-component are summarized in Table 5.

A. Facilitate the Establishment/Strengthening of Local Manufacturers of Rice Mechanization Tools and Implements

Previous interventions to promote agricultural mechanization have facilitated the emergence of small to medium scale local manufacturers mainly metal workshops that can design or manufacture different farm tools and implements. The local manufacturers should be engaged and their capacity built in the multiplication of rice tools and implements in terms of; (i) human skills; (ii) manufacturing equipment; (iii) introduction of prototypes; and (iv) market linkage for the multiplied tools and implements.

B. Facilitate the Establishment/Strengthening of Local Rice Mechanization Service Providers

The major approach in promoting rice mechanization is through mechanisation service providers who conduct operations such as related land preparation, agro-chemical application, weeding, harvesting, and threshing. This approach demands facilitation of the emergence of such service providers through innovative financing and group action approaches. It also demands to link with the different public initiatives of creating job opportunities and youth empowerment.

C. Promote Business Linkage Between Importers of Mechanization Equipment and Mechanization Service Providers

There are a few importers of demanded mechanization equipment in Ethiopia with more or less the same challenges such as; (i) limited access to foreign currency; (ii) limited market linkage with domestic potential buyers; and (iii) limited financing system. Thus, activities will address these challenges by closely working with the identified potential importing companies in the country and strengthening the functioning of the National Rice Stakeholders' Platform.

D. Build the Capacity of Staff at the National Rice Research and Training Center (NRR TC) of EIAR to Provide Certified Training in Operation and Maintenance of Rice Equipment

The NRR TC was established to provide diverse nature training and research for the development of the rice sector in Ethiopia. However, the center has not provided any certified training in any field since its official inauguration in 2018. Thus, it is important to build the capacity of staff at the center through; (i) installation of required mechanization equipment suitable for provision of training; (ii) development of curricula; (iii) building human capacity and training; and (iv) setting up the system (regulation, procedures, etc.) for training. All the potential trainees from the national rice hubs will have access to the training. The center will work closely with the Agricultural Technical and Vocational Education and Training ATVET office of the MoA to standardize and certify the trainees.

Sustainable Intensification and Expansion of Rice Production

Over the decades, the levels of rice production in Ethiopia have been on the rise from 11,244 tons in 2006 to 161,212 tons in 2019. Similarly, the area allocated for rice production has increased in a 10-fold ratio from 6,000 ha in 2006 to approximately 57,576 ha in 2019. The total number of rice-producing farmers increased in a 4-fold ratio from 32,000 in 2006 to about 178,185 in 2019 (CSA, 2020). However, the production levels are far below the total rice consumption in the country estimated at 551,585 tons (Tegenge, 2022; Alemu, 2015). By expanding the area for rice production and harvesting, Ethio-

pia can realise the dream of increasing the capacity of rice production. There are 39,354,190 ha potential areas for rain-fed rice production in Tigray, Afar, Amhara, Benishangul, Gumuz, Somali, Oromiya, Dire Dawa, Gambela and SNNPRR. Further 3,798,782 ha of irrigable land is available for production of irrigated rice in the river basins of Tekeze, Abay, Baro –Akobo, Omo-Gibe, Rift Valley (Lakes), Mereb, Afar /Danakil, Awash, Wabi-Shebelle and Genale-Dawa (Belayneh & Tekle, 2017).

Enhancing rice production and productivity demands sustainable intensification not only through improved access to required inputs (component I), but also through improved access to other services like extension and human capacity development in the current production areas. It also demands expansion of rice production to new areas under small-scale, commercial farming systems and irrigated areas. Tegegne (2022) recommended strategic measures to be adopted to promote sustainable intensification and expansion of rice production within the spheres of food price hike and government actions such as; technology, inputs, research and extension; partnership and linkage; and market demand, availability of rural labour and land.

The key investment areas and expected results of this sub-component are summarized in Table 6.

Table 6: Specific investments to sustainable intensification and expansion of rice production

Key investment area	Activities and targets	Result
A. Promote sustainable intensification of rice production in current production areas.	• Enhancing the performance of the rice seed systems (support the rice seed marketing system at regional level). • Promoting access to rice mechanization tools, implements and equipment through different models of access (creating marketing system for rice tools and implements using different models). • Scaling up of best production practices through pluralistic extension service including building capacity of rice producers in paddy marketing (enhancing public extension in each of the hubs), and extension service providers (enhancing private extension in each of the hubs).	• Ensuring sustainable increase in rice productivity. • Improved availability of domestic rice and enhanced contribution for import substitution.
B. Promoting small-scale rice production in potential areas.	• Testing and validation of rice variety (variety testing at representative districts in each hub). • Large-scale demonstration and popularization of tested rice varieties (undertake three LSD at each hub every year). • Promoting access to rice mechanization tools, implements and equipment through different models of access. • Building capacity of rice producers in paddy marketing and establishing market system for paddy. • Introduction of rice processing services through business incubation including youth (five businesses per hub).	• Expanded rice production in new areas. • Improved availability of domestic rice and enhanced contribution for import substitution.

Key investment area	Activities and targets	Result
C. Promotion of commercial rice production in selected target areas.	• Identification and verification of new and existing commercial farmlands and development of database system at regional and federal level (six regions). • Investment promotion activities for domestic and foreign investors (organize national and regional events -one every year in six regions and one federal). • Organization of national and regional stakeholders' forum on rice commercial farming regulations (above). • Providing knowledge and skill-based training for experts and investors (organize two regional training events at respective Hub RC).	• Increased rice production by commercial farms • Improved availability of domestic rice and enhanced contribution for import substitution.
D. Promotion of irrigated rice targeting developed irrigation schemes.	• Testing and validation of rice variety (variety testing at three potential regions - BG, Gambella, Somali). • Large-scale demonstration and popularization of tested rice varieties for both small-scale and commercial production (undertake three LSD at three regions). • Introduction of rice processing services through business incubation including for youth (establish five processing entities in each of the three regions through facilitation of access to finance). • Promoting commercial rice farming in the target areas with irrigation scheme (licensing 5 commercial farms in each region per year). • Promoting irrigation water management skills (organizing training events at regional level in the three regions)	• Increased rice production at targeted developed irrigation schemes. • Improved availability of domestic rice and enhanced contribution for import substitution.

A. Promote Sustainable Intensification of Rice Production in Current Production Areas

Intensification of rice production in the current rice producing woredas demands; (i) scaling up of best production practices through pluralistic extension service; (ii) enhancing the performance of the intermediary seed systems; (iii) promoting access to rice mechanization tools, implements and equipment through different models including access to mechanization services; (iv) capacitating rice producers in paddy marketing; and (v) capacitating extension service providers.

The NRFP will develop tailored and rice specific extension system with emphasis on market-oriented production and linkages across the rice value chain. It will support the development of customized (rice agroecology specific) extension communication packages, training on market-oriented production, rice-specific full package, and extension communication package (ICT 4 Extension); specialized training for Development Agents (DAs) and organization of field days. The package formulations will be carefully identified, compiled, disseminated, and scaled up. The capacity of

extension infrastructure will be strengthened for demonstration and pre-scaling of the packages. The NRFP will seek to create and strengthen linkages between research, extension, and other stakeholders in the various rice production hubs and administrative levels.

B. Promoting Small-scale Rice Production in Potential Areas

Promotion of rice production in new areas within the country requires integrated and comprehensive approach from variety testing to promoting local consumption. This intervention will cover; (i) rice variety testing and validation; (ii) large-scale demonstration and popularization of tested rice varieties; (iii) introduction of rice processing services through business incubation including for youth; and (iv) promotion of local consumption.

C. Promotion of Commercial Rice Production in Selected Target Areas

Rice production in Ethiopia is one of the target priority commodities given the governments' commitment for commercial investment for agricultural goods that contribute to import substitution. There is a huge concession for foreign and national companies to invest in rice production and processing. However, a few of these companies are currently operational including the Saudi Star PLC in Gambella and others in Benishangul-Gumuz regional states. The north-western and south-western parts of the country is reported to be suitable for commercial upland rice production. This intervention will set up incentive mechanism to access land and innovative financing to private investments. Specifically, the intervention will cover; (i) investment promotion activities for domestic and foreign investors; (ii) designing and implementation of incentive systems (access to finance, land, tax holidays); and (iii) facilitating linkage to explore technological spill over effects and market linkage opportunities (Table 6).

Rice marketing with other crops at Fogera

D. Promotion of Irrigated Rice Targeting Developed Irrigation Schemes

Research on rice irrigation in Ethiopia started in 2001 by the Somali Pastoral and Agro-Pastoral Research Institute (SoPARI) and Werer Agricultural Research Center (WARC), which resulted in the release of irrigated rice varieties and promotion of rice production under irrigation in those areas.

This intervention will target selected rice hubs with experience in irrigated rice and new areas that can access irrigation with potential for rice production. The specific activities will be; (i) rice variety testing and validation; (ii) large-scale demonstration and popularization of tested rice varieties for both small-scale and commercial production; (iii) introduction of rice processing services through business incubation including for youth; (iii) promoting commercial rice farming in the target areas with irrigation scheme; and (iv) promoting irrigation water management, which will include irrigation technology demonstration, proper agricultural land drainage, and associated capacity building/training for irrigation water management.

Promoting Sustainable Rice-based Crop Production Systems

Lessons learned in Fogera Plain indicates that sustainable and compatible rice-based crop production systems can be promoted to contribute to improved livelihood and diversification of production. Thus, this intervention will target promotion of crop rotation and off-season crop production especially vegetable production. This is an evidence-based intervention from the Fogera Plain having become one of the major vegetable production areas using off-season vegetable production. Previous research interventions have successfully classified the various seeds variety to the most appropriate ecological conditions for best performance. Each variety is known for use in either rain-fed upland, rain-fed lowlands or irrigated areas. For instance, four varieties (Shaga, Wanzaye, Ereb and Abay) were released by Fogera National Rice Research and Training Center in 2017 for rainfed lowland rice production. These varieties were compared to X.Jigina and two of them, Shaga and Wanzaye, ranked the first and second respectively by farmers and researchers. The varieties are compared with various traits including biomass, yield, disease resistance and cold tolerance. At the moment these varieties are replacing those old varieties and they are undergoing the process of commercial multiplication (Tegegne, 2022; Belayneh & Tekle, 2017; Lakew, Dessie & Abebe, 2021).

In addition, further interventions in promoting sustainable rice-based systems will include building the capacity of farmers to market other crops produced during off-season to ensure sustainability and nutritional security. The intervention covers part of the challenges identified by Belayneh & Tekle, 2017 as part of the constraints affecting rice production. The specific investment areas with expected results from this sub-component is presented in Table 7.

Table 7: Specific investments to promoting sustainable rice-based crop production systems

Key Activities	Activities and targets	Result
A. Promoting sustainable and compatible rice-based crop production system for diversification.	• Testing and validation of compatible high value crops (vegetables, pulses) (variety testing at representative districts in each hub). • Establish sustainable seed supply system for adapted high value crops (promote seed system for adapted crops at each hub). • Capacity building of rice farmers through extension service at each hub.	• Sustainability of rice production ensured • Livelihood of rice producers increased due to diversification of production (income, food and nutritional security).
B. Support the extension and marketing systems of the rotational crops produced under rice-based production.	• Promote farmers' cooperatives for efficient aggregation and enhancing farmers bargaining power (five cooperatives/year/hub). • Provide marketing extension service (promote contract farming, five cooperatives/year/hub).	• Performance of the marketing system for crops produced under the rice-based production enhanced.

Component Two: Rice Processing and Market Development

Experiences both domestic and international show that promotion of rice processing and marketing are highly linked. In Ethiopian context, rice processors are the central actors of paddy and milled rice marketing. This component addresses the issue of modernization and enhancing the competitiveness of the domestic rice processing industry and issues related with enhancing the national paddy and milled rice marketing system.

The development of a vibrant rice processing industry plays a crucial role in the expansion of rice production as a pull factor, along with enhancing the commercialization of smallholder producers. However, the rice processing industry in Ethiopia faces several challenges categorized into two; technical and market related; and policy enablers (Alemu et al., 2021). These include; i) poor quality and shortage of supply for paddy rice; ii) small size, old and obsolete processing machines; ii) shortage of management skills for processing technology; iv) lack of standards for both paddy and milled rice; v) limitations related to access to land, finance, skilled labour and energy source. Three sub-components with respective specific intervention areas are identified to respond to these challenges.

Promotion of Development of Rice Processing Industry to Ensure Competitiveness of Domestic Rice (Current Production Areas, New Production Areas)

Rice processing involves three major steps: i) cleaning after harvest to remove foreign objects using a destoner, paddy grader and cleaner machines; ii) dehusking or dehulling- a process to remove the husk from the clean paddy to produce brown rice; and iii) milling- a stage to remove the bran layer of the de-husked brown rice and turning to white rice (Atungulu and Pan 2014). The entire process can be performed through different technological methods; single- two- and multiple-pass rice milling methods. End-product quality increases as the number of passes/polishes is increased. All the three methods are applied in Ethiopia however, the single pass/polish is predominantly (84 percent) used by small-scale farmers while multiple-pass rice milling is practiced in large commercial mills. It is reported that inefficiencies in rice processing increases the price of locally produced rice by up to 30 percent making it uncompetitive with imported rice (Kilimo Trust 2014).

Most processors use old and outdated processing machines except for a few established processing facilities. Even though there are processors who are willing to invest in a modern processing facility, access to such facilities in the domestic market is almost nil. Consequently, lack of or insufficiency of processing machinery contributes to the lower quality rice produced in comparison with the imported rice, hence unfavourable competition that favours imported rice. Key findings from the APRA program for transforming the rice sector in Ethiopia indicates there is limited competitiveness of the locally produced rice because of production and productivity remaining significantly low with a yield of 2.96 MT/ha nationally (Odame & Alemu, 2022). Temesgen, Tilahun and Belaythe (2014) recommends the need for review of existing policies to promote economic incentives to enhance efficiency and attain country level competitiveness in upland rice production. This intervention will have two aspects; the first activities will facilitate the modernization of rice processing industry as envisioned in the NRDS 2 (2020); and the second one will promote the establishment of rice processing services in the new rice producing areas (Table 8).

Table 8: Specific investments for promotion of the development of rice processing industry to ensure competitiveness of domestic rice

Key Activities	Activities and targets	Result
A. Modernization of the rice processing industry.	• Facilitation of market linkage between processing machine manufacturers/ importers with processors; (i) Facilitate importation of standard rice processing equipment relevant for modernization; and (ii) organize processing equipment market fair events at hub level once a year). • Development of incentive mechanism to promote the use of improved processing machines (Facilitate innovative access to finance-lease financing). • Development of standard guidelines for licensing of rice processing businesses and create awareness at federal and regional level.	• Improved quality of domestic milled rice. • Enhanced import substitution through improved competitiveness of domestic milled rice.
B. Promotion of establishment of rice processing services in the new areas.	• Introduction of rice processing services through business incubation including for youth (business incubation in rice processing for youth as pull factor, five businesses per hub).	• Improved access to rice processing services for paddy producers in the new areas. • Improved employment and livelihood opportunities in the target areas.

A. Modernization of Rice Processing Industry

The modernization of rice processing industry will be through; (i) facilitation of market linkage between processing machine manufacturers/importers with processors; (ii) development of incentive mechanism for use of improved processing machines (access to finance, forex, taxation etc); and (iii) development of standard for licensing of rice processing business (land size, components – storage for paddy, milled rice and husk, machine space, office, etc). This requires ensuring and enhancing access to electricity as part of the modernization of the processing industry. The type and size of the rice processing machines to be promoted by the NRFP will depend on demand by the different actors engaged in rice processing and accessibility of infrastructure mainly electricity.

B. Promotion of Establishment of Rice Processing Services in the New Areas

Numerous incentives will be offered to promote the establishment of rice processing services in the new areas including access to finance, land, and tax holidays along with standard guidelines for licensing of rice processing industries. As stated above, the type and size of the rice processing machines to be promoted by NRFP will depend on demand by the different actors that will engage in the rice processing and accessibility of infrastructure mainly electricity.

Modernization of Paddy and Milled Rice Marketing System

The modernized marketing systems for paddy and milled rice will be set up along with associated regulatory frameworks and required human and physical capacities. Specifically, this component will target; (i) establishment of paddy marketing system that incentivize both rice farmers and processors for production and processing of quality paddy and milled rice; (ii) facilitation of market linkage between paddy producers with the already established state-of-the art rice processing industries (like Saudi star at Bishoftu/Debre Zeit, Mint at Bako); (iii) facilitation of inclusion of rice in the Ethiopian Commodity Exchange (ECX) platform including acceptable standards, required systems such as warehousing and financial transactions (discussion underway with ECX), and creating awareness about the platform for actors of rice value chain (Table 9). Smallholder farmers of paddy rice face numerous marketing challenges with their cooperatives expected to provide better market access. Therefore, inclusion of rice in the ECX platform will increase bargaining power for small holder farmers' and their cooperatives through easy access to marketing information system. Soya bean producers in the country were initially faced with similar marketing challenges that were adequately addressed, following its' inclusion in the ECX platform.

Table 9: Specific investments for modernization of paddy and milled rice marketing system

Key Investment area	Activities and targets	Result
A. Establishment of paddy marketing system that incentivize both rice farmers and processors for production and processing of quality paddy and milled rice.	• Introduce paddy and milled rice quality standards for price differentiation. • Create awareness about standards and enforcement.	• Improved income for smallholder rice farmers. • Enhanced quality of domestic rice (paddy and milled rice) for improved competitiveness with imported rice.
B. Facilitation of market linkage between paddy producers with the established state-of-the art rice processing industries.	• Established processing companies to sign contracts for farming.	• Enhanced utilization of available rice processing facilities. • Increased availability of quality milled rice from domestic sources. • Improved employment opportunities.
C. Enhancing the role of cooperatives in paddy and milled rice marketing.	• Promote group marketing (cooperatives) to enhance contract farming. • Build capacity of established cooperatives to engage in rice processing (two cooperatives/hub).	• Cooperatives engaged in paddy and milled rice marketing through effective aggregation, processing service provision, and enhancing bargaining power through group action.
D. Facilitation of the inclusion of rice in the Ethiopian Commodity Exchange (ECX) platform.	• Ensure the inclusion of both paddy and milled rice for marketing at ECX platform.	• Warehousing system established. • Paddy and milled rice standards developed. • Enhanced rice market information system.

Facilitation of Evidence-based Rice Import Regulation

In 2021, the Government of Ethiopia through the Ministry of Trade and Industry issued a timely regulation which permitted importation of basic food items and commodities including rice (Dibala, 2021). During the COVID-19 pandemic period, the volume of rice imports increased tremendously to 1,305,694 tons in 2020, representing 149 percent increase from 524,930 tons imported in 2019 (Trade Map, 2021). Looking into the trends in rice import and its composition in terms of importation of broken rice which is estimated to be over 20 percent of the total import, there is need to regulate the rice import considering; (i) quality and phytosanitary measures; (ii) export conditions from source countries – dumping pricing, sustainability of export etc; and (iii) factors required to enhance the competitiveness of the emerging domestic rice industry. This sub-component is expected to result in enhanced competitiveness of domestic rice.

Component Three: Coordination, Capacity development, Cross-cutting Themes, and MEL

This component has four sub-components related with setting up of coordination of the implementation of the NRFP, strengthening of institutional and individual capacity, Monitoring, Evaluation and Learning (MEL) for solicited feedback and learning, and addressing key cross-cutting issues. Key investment areas along with expected results are presented in Table 10.

Table 10: Specific investment areas for coordination, capacity development, cross-cutting themes, and MEL

Sub-components	Key Investment area	Result
3.1 Coordination of implementation of the NRFP.	A. Establishing a NRFP Management Unit/Project Coordination Office (PMU/PCO) at MoA and RBoA.	Enhanced management of the NRFP.
	B. NRFP Steering Committee (SC) national and regional.	Proper oversight, decision making and strategic guidance for the implementation of the NRFP.
3.2 Institutional and Individual Capacity strengthening.	A. Strengthening institutional capacity. B. Strengthening the National Rice Stakeholders' platform.	Required human and institutional capacity for effective implementation of the NRFP.
3.3 Cross-cutting themes (gender, environmental management, resilience building and policy interventions),	A. Mainstreaming of gender and social inclusion.	Gender and social inclusion ensured.
	B. Mainstreaming of business incubations.	Private sector development enhanced.
	C. Mainstreaming enabling environment (policy, regulations).	Key policy challenges addressed.
3.4 Monitoring, Evaluation and Learning (MEL).	A. Clear M&E indicators (key performance indicators – KPIs) to track progress.	Effective tracking of progress to timely address emerging challenges.
	B. Establishing solicited feedback mechanism.	Effective response to emerging challenges.

Governance and Coordination of Implementation of the NRFP

Adapted from the Wheat Flagship program, the NRFP management unit/project coordination office (PMU/PCO) to be established within the Ministry of Agriculture (MoA) will provide the overall leadership in the implementation and will utilise the existing structures at national and sub-national levels. The NRFP steering committee (SC) will be established to provide general oversight, decision making and strategic guidance for the NRFP management unit/program coordination office (PMU/PCO). The NRFP coordinator will be employed on competitive basis, while finance and program staff will be hired in all PMU/PCO offices at the various levels to facilitate effective implementation.

Monitoring, Evaluation and Learning and additional subject matter specialists will be assigned as deemed necessary and where applicable, consultancy services will be employed.

Strengthening Institutional and Individual Capacity

This intervention will facilitate institutional capacity strengthening across the rice value chain, to be mainstreamed in the programs and projects indicated above (human, physical and work procedures – institutional linkages). This will include strengthening of the national rice stakeholders' platform to ensure linkages for business and policy lobby. In addition, the activities will enhance the level of awareness of experts and beneficiaries for behavioural change, to facilitate the process of mainstreaming of cross-cutting issues by the NRFP implementing institutions at all levels. Capacity building approaches will include training and consultative meetings at all levels for NRFP implementing partners and decision makers. Printed materials and audio visuals such as leaflets, posters and video documentaries of success stories will be developed and distributed.

Mainstreaming of Gender and Social Inclusion

This intervention targets mainstreaming of gender and social inclusion across the rice value chain, to be considered in the components and sub-components indicated above through both affirmative action and transformational gender and social inclusion measures.

Monitoring, Evaluation and Learning (ME&L)

A clear M&E system and key performance indicators will be included in the NRFP to track progress. The learning component from monitoring and evaluation processes will be clearly articulated. Linked with the operation of all actors engaged in the governance of the NRFP, the ME&L system will have a strong feedback mechanism with emphasis on learning from positive and negative experiences.

The NRFP coordination unit will monitor, evaluate and periodically report on progress and impact of the program as per the KPIs to ensure effective implementation to the required standards by stakeholders such as smallholder farmers, private sector investors, government, and development partners. The ME&L will support information gathering and analysis for the NRFP management and other stakeholders on the quality of its' implementation to facilitate appropriate and timely decision making, institutionalize a learning mechanism to assess the outcomes and impact.

A five-year monitoring plan showing *indicator* data sources, baseline and annual targets will be prepared at the start of implementation to facilitate routine monitoring of the progress.

Key milestones (outputs) for each year will be set and used in the annual reviews of the progress of the NRFP. The review will focus on determining if the planned activities are moving towards achieving the annual targets and will observe if they are on track, off track, or at risk. In addition, the review will track any changes in terms of outputs realised over the period as well as assessing

the issues, challenges and lessons learnt over the years and to what extent the outputs delivered contribute towards the achievement of the objectives. The milestone reviews will be conducted quarterly, and their findings used to adjust implementation strategies whenever necessary.

A midterm evaluation of the NRFP will be undertaken after three years of implementation to assess the relevance and progress towards achieving its' set objectives. Feedback received will be reviewed and incorporated to adjust the implementation strategy and activities. A final evaluation will be conducted towards the end of the fifth year to assess the relevance, extent of implementation, effectiveness, efficiency, impact, sustainability and lessons to be learned. The recommendations of the study will inform future phases of the NRFP and/or related future programs.

6 NRFP INVESTMENT COST AND RESOURCE MOBILIZATION STRATEGIES

Chapter 6 gives a projection of the total cost of the NRFP, benefits and associated assumptions and program costs by year and components. The section defines estimated direct beneficiaries and impact of the NRFP, estimated returns to the NRFP investments, selected business case investments and proposed financing strategies and resource mobilization.

Total Cost of NRFP

The NRFP is expected to cost an estimated USD 312,416,133 in the five years of its implementation (Table 12). Overall costs are shared between the private and public sectors. At the end of the 5-year implementation period the private sector will have invested 93 percent against 7 percent of public investments.

However, the investment ratios between the private and public sector vary across the various strategic components. For instance, the private sector is expected to take lead in investing in mechanization (80 percent), intensification and expansion (82 percent), rice processing (97 percent), and rice marketing systems (100 percent). On the other hand, the public sector leads in seed development (77 percent), support for rice-based crop production (67 percent), rice import regulation (100 percent), and coordination (100 percent).

The costs for each subcomponent and activities are presented from Annex 5 to Annex 12.

Table 11: Program costs by component and year

	Sub Components		Y1	Y2	Y3	Y4	Y5	Total	
Compo-nent 1	Variety and Seed	Public	1,150,000	1,150,000	1,290,000	1,150,000	1,150,000	5,890,000	77%
		Private	180,800	240,000	322,667	442,667	560,000	1,746,133	23%
			1,330,800	1,390,000	1,612,667	1,592,667	1,710,000	7,636,133	
	Mechanization	Public	2,245,000	165,000	165,000	165,000	165,000	2,905,000	20%
		Private	2,320,000	2,320,000	2,320,000	2,320,000	2,320,000	11,600,000	80%
			4,565,000	2,485,000	2,485,000	2,485,000	2,485,000	14,505,000	
	Intensification and Expansion	Public	1,072,000	1,072,000	1,072,000	1,072,000	1,072,000	5,360,000	18%
		Private	4,925,000	4,925,000	4,925,000	4,925,000	4,925,000	24,625,000	82%
			5,997,000	5,997,000	5,997,000	5,997,000	5,997,000	29,985,000	
	Rice Based Crop Production	Public	640,000	640,000	640,000	640,000	640,000	3,200,000	67%
		Private	320,000	320,000	320,000	320,000	320,000	1,600,000	33%
			960,000	960,000	960,000	960,000	960,000	4,800,000	
Compo-nent 2	Rice Processing Industry	Public	100,000	60,000	60,000	60,000	60,000	340,000	3%
		Private	2,200,000	2,200,000	2,200,000	2,200,000	2,200,000	11,000,000	97%
			2,300,000	2,260,000	2,260,000	2,260,000	2,260,000	11,340,000	
	Rice Marketing System	Public	150,000	120,000	120,000	120,000	120,000	630,000	0%
		Private	48,100,000	48,000,000	48,000,000	48,000,000	48,000,000	240,100,000	100%
			48,250,000	48,120,000	48,120,000	48,120,000	48,120,000	240,730,000	
	Rice Import Regulation	Public	20,000	20,000	20,000	20,000	20,000	100,000	100%
		Private	-	-	-	-	-	-	0%
			20,000	20,000	20,000	20,000	20,000	100,000	
Compo-nent 3	Coordination	Public	1,650,000	640,000	640,000	640,000	640,000	4,210,000	100%
		Private	-	-	-	-	-	-	0%
			1,650,000	640,000	640,000	640,000	640,000	4,210,000	
Grand Total			**65,072,800**	**61,872,000**	**62,094,667**	**62,074,667**	**62,192,000**	**313,306,133**	
Share of cost	USD	Public	7,027,000	3,867,000	4,007,000	3,867,000	3,867,000	22,635,000	7%
		Private	58,045,800	58,005,000	58,087,667	58,207,667	58,325,000	290,671,133	93%
	%	Public	11%	6%	6%	6%	6%	7%	
		Private	89%	94%	94%	94%	94%	93%	

NRFP Projected Costs, Benefits and Associated Assumptions

The rice sector in Ethiopia faces numerous challenges such as high competition from imported rice, poor infrastructure, insufficient mechanization and post-harvest processing technologies, lack of skilled manpower and research facilities and poor marketing infrastructure and channels[2]. Similar challenges on rice production are faced by neighbouring countries spanning along the value chain. In neighbouring South Sudan, rice production is affected by weather-related challenges including unreliable rainfall, poor access to credit facilities, poor soil and water management practices, poor rice storage facilities, inadequate and poor processing machines and limited technical skills[3]. In Nigeria, high cost of labour (81.0 percent), poor marketing information (75.6 percent) and inadequate credit (73.1 percent) are critical constraints limiting rice farmers to engage in value addition activities.

2 Tamirat Belayneh, and Jember Tekle. (2017). Review On Adoption, Trend, Potential, And Constraints of Rice Production to Livelihood In Ethiopia. International Journal of Research - Granthaalayah, 5(6), 644-658. https://doi.org/10.29121/granthaalayah.v5.i6.2017.2097

3 Mogga, M., Sibiya, J., Shimelis, H., Lamo, J., & Ochanda, N. (2019). Appraisal of Major Determinants of Rice Production and Farmers' Choice Of Rice Ideotypes In South Sudan: Implications For Breeding And Policy Interventions. *Experimental Agriculture, 55*(1), 143-156. doi:10.1017/S0014479718000017

Estimated Direct Beneficiaries and Impact

Rice Producers

The estimated number of smallholder and commercial rice farmers to be engaged in rice production is identified considering the existing potentials of the different rice hubs and assuming the land holdings prevailing currently. It is estimated that by the end of the NRFP implementation in five years, there will be 565,095 smallholder farmers (of which 61,142 will be female headed households) cultivating about 217,080 ha and about 1,032 commercial farmers operating from 25 to 100 ha each with a total land coverage of 83,013 ha in the seven hubs in the country (Table 12). Target districts for intensification and expansion are presented in Annex 4.

Table 12: Target beneficiaries and area coverage by rice hub

Rice Hub	Region	Type of producers	Target no of producers			Area coverage (ha)
			Male	Female	Total	
Fogera	Amhara	Smallholders	366,002	44,314	410,316	105,253
		Commercial farms			321	32,115
Pawe	Benishangul-Gumuz	Smallholders	22,625	2,739	25,365	27,627
		Commercial farms			11	532
Abobo	Gambella	Smallholders	20,803	2,519	23,321	12,284
		Commercial farms			247	24,744
Gura Ferda	SNNP	Smallholders	50,083	6,064	56,146	39,617
		Commercial farms			261	6,537
MyTsebri	Tigray	Smallholders	14,562	1,763	16,325	4,188
		Commercial farms			-	-
Gode	Somali	Smallholders	5,934	718	6,652	5,637
		Commercial farms			175	17,549
Chewaka	Oromia	Smallholders	24,056	2,913	26,969	22,474
		Commercial farms			15	1,536
National Commercial farms		Smallholders	504,065	61,030	565,095	217,080
				1,032	83,013	
Total		504,985	61,142	566,126	300,093	

Source: Estimated based on MoA (2020) and data from the National Rice Technical committee

Rice Processors

The expansion of rice processing in Ethiopia is envisioned from the establishment of small-scale and medium to large scale rice processing facilities in the different rice hubs. The estimated number of both small-scale and medium to large-scale rice processors is presented in Table 14. The estimates are based on the average scale of operation of existing rice processing facilities in the Fogera Plain Gura Ferda and Cheweka rice hubs, which is estimated to be about 400 ha of rice for small-scale and over 400 ha from medium to large-scale processing facility (Alemu et al., 2021).

Table 13: Target rice processors by rice hub and scale of operation

Rice Hub	Region	Type of producers	No of rice processors
Fogera	Amhara	Small-scale	281
		Medium to large scale	32
Pawe/Assosa	Benishangul-Gumuz	Small-scale	74
		Medium to large scale	1
Abobo	Gambella	Small-scale	33
		Medium to large scale	25
Gura Ferda	SNNP	Small-scale	106
		Medium to large scale	7
MyTsebri	Tigray	Small-scale	11
		Medium to large scale	-
Gode	Somali	Small-scale	15
		Medium to large scale	18
Chewaka	Oromia	Small-scale	60
		Medium to large scale	2
National		Small-scale	579
		Medium to large scale	83
		Total	662

Source: Estimated based on Alemu et al., (2021), MoA (2020) and data from the National Rice Technical committee

In total, it is estimated that the 579 small-scale and 83 medium to large-scale rice processing facilities will be operational by the end of the implementation of the NRFP (Table 13). As indicated in Table 14, the number of operational processors will increase over the years to ensure the availability of required capacity of processing rice.

Table 14: Number of rice processors to be operational over the flagship implementation

Type of processors	Y1	Y2	Y3	Y4	Y5
Small-scale	200	295	390	485	579
Medium to large-scale	10	28	47	65	83
Total	210	323	436	549	662

Employment Opportunities

Lessons learned from Fogera Plain indicates about 40 percent of smallholder farmers hire laborers for timely accomplishment of seasonal activities including planting, weeding, cultivation, harvesting and threshing with a total average of 55.29 man-hours per farmer (Alemu et. Al., 2021). With this consideration and a target 565,095 smallholder rice farmers, about 226,038 of them are expected to create casual labor opportunities for over a year, with about 1.6 million man-days.

Similarly, rice processors create both casual and permanent employment opportunities. As per the evidence from Fogera Plain, a processor employs about 6 casuals and 4 permanent employees. This implies the creation of employment opportunities for about 4,000 casual and about 2.6 thousand permanent jobs.

Diverse businesses linked to rice commercialization are expected to emerge including those related to rice production, rice processing service providers, hospitability and financial services and many others. Rice commercialization necessitated Wereta town in the Fogera Plain to become an administration city, that is why locals call rice "the white gold". Thus, considerable job and employment opportunities will be created through such services and emergence of towns and cities from rice enhanced rural-urban linkages (Taddesse et al., 2020).

Rice Self-Sufficiency

The main challenge facing the country is the continuous decline in the level of rice self-sufficiency, which reached 20 percent in 2019. With the intensification and expansion in rice production, it is estimated that the extent of rice self-sufficiency will be about 83 percent as indicated in the National Rice Development Strategy (MoA, 2020).

Estimated Returns to the NRFP Investments

The estimated returns of the NRFP investments are calculated in relations to the estimated profitability for rice producers and processors based on the assumptions of average cost of production, paddy prices, average profitability of rice processing service provision and average exchange rate of ETB to USD as follows:

a) Average profitability of rice producers (smallholders and commercial rice producers) is estimated to be 16,000 ETB/ha assuming; (i) 3.5 t/ha average yield over five years; (ii) average paddy price of 1,500 ETB/quintal; and (iii) average cost of production 36,500 ETB/ha (1,043 ETB/Quintal).

b) Average profitability of rice processors (small-scale and medium to large scale processors) from rice processing and milled rice marketing is estimated to be 20,000 ETB/ton.

c) The target rice area coverage and number of rice processors that will be operational are put into consideration.

As indicated in Table 15, the estimated IRR is 32 percent over the five years, which is much higher than the prevailing commercial bank rate, which ranges from 17 to 20 percent in Ethiopia.

Table 15: Internal rate of return for the NRFP investments (rice producers and processors

Profit (USD)	Y1	Y2	Y3	Y4	Y5
Producers' profit	47,224,727	57,204,655	67,248,582	77,228,800	87,299,782
Processors' profit	1,108,235	872,117	759,678	692,933	649,640
Total profit	48,332,962	58,076,771	68,008,260	77,921,733	87,949,422
NRFP investment cost	64,182,800	61,872,000	62,094,667	62,074,667	62,192,000
Net profit	(-)15,849,838	(-)3,795,229	5,913,593	15,847,066	25,757,422
Estimated IRR	32%				

Selected Business case/Investment cases

Impact of investment in five selected cases is presented below to indicate how the individual investment contribute to the overall impact of the NRFP.

Adoption and Cultivation of Seed Rice

Evidence shows that inappropriate seed rate is a limiting factor for rice production in Ethiopia. The country has varying agro-ecological zones that dictate different rates of seed use. Several case studies have been conducted with different seed rates that befit specific agro-ecological zones. For instance, in Amhara region, without considering specific soil types and agro-ecological characteristics, a seed rate of 60 - 120 kg/ha has been recommended for rice production[4]. In Fogera district, north-western Ethiopia, households in the area use a minimum of 15 kg/ha and a maximum of 400 kg/ha with average of 98 kg/ha of seed respectively. The agronomic recommendation rate used in the area is between 120 up to 140kg/ha of seed.[5] In Metema district, maximum benefit is obtained from use of 80 kg/ha for upland rice variety production under the rain-fed condition[6]. In Mizan Aman area, seed rate of 40kg/ha was found to be the best performing for Nerica-4 rice variety[7].

In terms of input response, 1 percent increase in seed use, land and labour translate to 0.11 percent, 0.53 percent and 0.06 percent increase in yield of rice respectively (Table 13). However, these elasticities vary from one region to another within the country. In most cases, yield response is highest either in labour or land. This implies that investments in labour saving technology and in land expansion are likely to be the most important investments despite the decreasing constant to scale scenario on input use.

Table 16: Input responses to rice productivity

Indicator	[8]Dependent Variable (Rice Yield)	Tadesse et al 2016 Yield (all sig)	Abebaw et al 2020 Yield
Land	0.671***	0.015***	0.5345***
Labour	08	0.312***	0.0624*
Seeds	0.309***	0.06***	0.1106
Fertilizer		0.041***	-058
Oxen		0.027***	0.0881***

The average yield of rice in Ethiopia is estimated to be 2.9 tons/ha in rain-fed conditions. In the west African countries, average rice yield is estimated to be 4.1, 2.0, and 1.5tons/ha in irrigated lowland, rain-fed lowland, and rain-fed upland systems respectively with maximum attainable yields of 8.3, 6.5, and 4.0 tons/ha[9] . The yields from irrigated production systems are twice those of rain-fed systems but associated with the use of fertilizers, and the high frequency of weeding. In Ethiopia, the expansion should focus on investments in labour saving technologies, land expansion and increase in seed rate applications. An increase in the seed rate is recommended in order to increase yields since seed rate is a limiting factor to increased production and productivity. A doubling of seed rate application in rice production will increase the productivity from the national average of 2.9 tons/ha to 3.29 tons/ha (Table 17).

4 Endalkachew Aklilu. Effect of Seed Rate and Row Spacing on Yield and Yield Components of Upland Rice (Oryza sativa L.) in Metema, West Gondar, Ethiopia. American Journal of Agriculture and Forestry. Vol. 8, No. 4, 2020, pp. 112-125. doi: 10.11648/j.ajaf.20200804.14

5 Takele Astewel 2017. Determinants of Rice Production and Marketing in low Producer Farmers: The Case of Fogera Districts, North-Western Ethiopia. *International Journal of Environment, Agriculture and Biotechnology (IJEAB) Vol-2, Issue-5, Sep-Oct- 2017. http://dx.doi.org/10.22161/ijeab/2.5.34 ISSN: 2456-1878.*

6 Endalkachew Aklilu, Effect of Seed Rate and Row Spacing on Yield and Yield Components of Upland Rice (Oryza sativa L.) in Metema, West Gondar, Ethiopia, *American Journal of Agriculture and Forestry*. Volume 8, Issue 4, July 2020 pp. 112-125. doi: 10.11648/j.ajaf.20200804.14

7 Tilahun Alemayehu1, Demelash Kefalem and Walelign Worku 2019. Effect of Seeding Rate on Growth and Yield Performance of Rice (Oryza Sativa L.) Varieties at Mizan Aman, Southern Ethiopia.

8 Okello, D.M., Bonabana-Wabbi, J. & Mugonola, B. Farm level allocative efficiency of rice production in Gulu and Amuru districts, Northern Uganda. *Agric Econ* **7,** 19 (2019). https://doi.org/10.1186/s40100-019-0140-x

9 Abibou et al 2017 Variability and determinants of yields in rice production systems of West Africa

Table 17: Seed rate application

Indicators	Doubling Effect				
	Y1	Y2	Y3	Y4	Y5
Proportionate increase in seed use	1%	10%	20%	30%	100%
Seed use from Av (55Kgs Per Ha)	55.25	60.17	65.64	71.11	109.40
Proportionate increase in yield (Translation)	0.11%	1.11%	2.21%	3.32%	11.06%
Yields	2.97	3	3.03	3.06	3.29

Profitability of Rain-fed Rice in Ethiopia

The profitability of rice is estimated assuming that yields are 2,064 per hectare and a price of ETB 4.65 per kilogram. Farm budgeting indicates that the investment cost in one hectare of rice is estimated to reach ETB 16,748. From one hectare, a farmer harvests ETB 29,155 worth of paddy and ETB 4,012 worth of straw. This totals to ETB 33,176 worth of returns from one hectare. The gross margin (total returns net total investment cost) is estimated to reach ETB 16,428-Table 18[10].

Table 18: Cost benefit analysis for rain-fed rice production system

Cost (ETB) per Hectare Components for Rain Fed lowland rice production			Av.	Min	Max	% of TVC
Material Cost	Seed	ETB/Ha	1,906.45	660	3890	11%
	Fertilizer	ETB/Ha	1,498.29	0	3564	9%
Husbandry Practices	Land Preparations	ETB/Ha	1,962.87	1165	4852	12%
	Water Management	ETB/Ha	62.38	0	345	0%
	Planting	ETB/Ha	548.65	137	1733	3%
	Weeding	ETB/Ha	5,949.47	2015	15660	36%
	Fertilizer Application	ETB/Ha	63.78	0	255	0%
	Harvesting and Pileup	ETB/Ha	2,083.18	543	11020	12%
	Threshing and Winnowing	ETB/Ha	1,516.92	706	3610	9%
	Transportation	ETB/Ha	1,156.24	360	6965	7%
	Total Variable costs (TVC)	ETB/Ha	16,748.23			100%
Per Ha Returns	Paddy	ETB/Ha	29,155.45	16,220	48,660	
	Straw	ETB/Ha	4,021.25	1,400	7,466.67	
	Total Return (TR)		33,176.70	19,420	53,736.44	
	Gross Margin (TR-TVC)		16,428.47			
	BCR		1.98			
	Profit Margin		0.495			
	Break-Even Yield (Kg)		2064			
	Break-Even Price (ETB)		4.66			

The estimated Benefit to Cost ratio is 1.98 indicating that investment on a hectare of rice is profitable in Ethiopia with the break-even yield estimated at 2,064Kgs per hectare. Benefit cost ratios range are estimated to 1.98 in low land ecologies, 1.92 in upland ecologies and 1.77 in Pawe region (Table 19). It is worth noting that in research studies on rice production, the returns to scale are less than one implying that production is on a decreasing return to scale.

10 Shewaye Abera, et.al (2019). Cost and Return Analysis of Rain Fed Lowland Rice Production under Smallholder Farmers in Fogera District, North Western Ethiopia. *International Journal of Research Studies in Agricultural Sciences* (IJRSAS), 5(3), pp. 30-35, http://dx.doi.org/10.20431/2454-6224.0503004

Table 19: Cost-Benefit analysis for rain-fed rice production system [11]

Indicators	Fogera Plains		Pawe
	Upland Ecology	Lowland Ecology	
TR- Total Revenue	25,156.39	33,156.43	15,304.09
TVC- Total variable Costs	13,071.93	16,737.65	8,625.31
GM-Gross Margins	12,084.46	16,417.92	6,048.2
BCR- Benefit Cost Ratio	1.92	1.98	1.77

The future of the rice sector in Ethiopia lies in exploiting productivity and efficiency gaps in the sector. Technical, economic and allocative efficiencies are estimated at 78.5 percent, 63.18 percent and 80.56 percent, respectively[12]. There is the possibility of increasing rice production by more than 20 percent in both technical and allocative efficiencies even without use of additional inputs and hence at a lower cost of production. Evidence shows that by operating at full technical efficiency levels, rice productivity could increase on average from the current 3.2 tons/ha to 3.7 tons/ha[13]. These gains can be made by designing better institutional support, improving soil fertility, focusing on livestock production (to provide alternative manure to fertilizers) and ensuring an adequate provision of research and extension support to rice farmers. *Economic efficiency* is positively and significantly affected by education, frequency of extension contacts and cooperatives membership[14].

Productivity gaps in the rice sector can be addressed through enhanced inputs and access to services. On average, if the area allocated for rice production (land) is expanded, human and oxen labour is increased and rice seed for production is increased by one percent each, the level of rice yield will increase by 53.45 percent, 6.24 percent, 8.81 percent, and 11.06 percent respectively. As extension contact increases by one unit, ceteris paribus, the probability of technical efficiency could increase by 11 percent (Abebaw et al 2020).

Ethiopia has 30 million hectares of potential rice production land with requirements for a head-start in rice production on large scale for a remarkable economic transformation which will be great opportunity for the country (Sreepada, and Vijayalaxmi, 2013). The Ministry of Agriculture and Natural Resources[15] estimates that of the 30 million hectares, 5.6 million are highly suitable and about 25 million are suitable. In addition, the country has an estimated 3.7 million irrigable hectare suitable for rice production. Because of the agro-ecological variations across the country, the Ethiopia Rice Research Strategy has established seven (7) hubs as key fronts to advance rice production in the country. These are *Fogera, Pawi, Abobo, Gura Fereda, May Tsebri, Gode and Chewaka* (Table 1).

The target for the National Rice Research and Development Strategy is to ensure rice self-sufficiency then export later in the years. Similarly, assuming that the target of the NRFP is to meet the rice consumption deficit estimated to be 600,000 MT. Then in the five-year strategic plan, the area (hectare) under rice cultivation should meet the production of 600,000 MT of rice. If the productivity (yields) remains 2.9 tons/ha (CSA, 2020), and assuming uniform expansion of each area in the 5 years, then the government and private sector will invest in approximately 40,500 hectares of rice farming every year. The cost of investing in one hectare is estimated at ETB 16,748 while the returns (from paddy and straw) are estimated at ETB 29,155. The spread of investment cost and benefits are shown in the upper panel of Table 20.

11 Birhanu Ayalew, Shewaye Aber, Adam Bekel, Abebaw Assaye, Adane Melak, Fetene Adamu, Yalew Mazengia and Desalegn Teshale. Costs and Returns of Rice Production under Smallholder Farming in Fogera and Pawe

12 Véronique Houngue & Gbêtondji Melaine Armel Nonvide, Fatih Yildiz (Reviewing editor). (2020). Estimation and determinants of efficiency among rice farmers in Benin, Cogent Food & Agriculture, 6:1, DOI: 10.1080/23311932.2020.1819004

13 Abebaw et al 2020. Technical Efficiency of Lowland Rice Production in Northwest of Ethiopia Ethiop. J. Agric. Sci. 30(1) 99-111 (2020)

14 Tsegaye Melese, Mebratu Alemu, Amsalu Mitiku and Nesre Kedir, 2019. Economic Efficiency of Smallholder Farmers in Rice Production: The Case of Guraferda Woreda, Southern Nations Nationalities People's Region, Ethiopia. International Journal of Agriculture Innovations and Research Volume 8, Issue 2, ISSN (Online) 2319-1473

15 MoANR, 2010

In the second panel, the productivity (yield) of rice is increased to 3.29 tons/ha. The increase results from increased use of seed rice which has a marginal effect of 0.11 percent for every 1 percent increase from the average use of 55kgs/ha during planting. The benefits of enhanced yield will emanate from the reduced costs -while the yield increases by 11 percent, the cost declines by a similar proportion to reflect the marginal effect of seed and the shortened time to meeting the consumption deficit.

Table 20: Meeting self-sufficiency in 5 years (bridging the deficit gap) under profitable rice production regimes

Scenario 1: Rice productivity remains equal to the national average at 2.96 tonnes per ha						
		Y1	Y2	Y3	Y4	Y5
Meeting Self-Sufficiency						
Rice deficit (demand potential)	600,000	120,000				
Productivity/yield (tonnes/ha)	2.96					
Ha. needed under current productivity	202,459	40,491.80				
Annual increment in ha (cumulative)		40,492	80,984	121,475	161,967	202,459
Costs of Investment (ETB)		678,165,991	1,356,331,982	2,034,497,973	2,712,663,964	3,390,829,955
Total Return Investment (ETB)		1,343,384,324	2,686,768,648	4,030,152,971	5,373,537,295	6,716,921,619
BC		1.98	1.98	1.98	1.98	1.98
Scenario 2: Rice productivity improved to 3.29 tonnes per ha (resulting from increased use of rice seed (rice seed utilization doubles-doubling effect of seed use)						
Meeting Self-Sufficiency						
Rice deficit (demand potential)	600,000	120,000				
Productivity/yield (tones/ha)	3.29					
Ha. needed under current Productivity	182,297	36,459.39				
Annual increment in ha (cumulative)		36,459	76,951	117,443	157,935	198,427
Costs of Investment (ETB)		610,630,282	1,288,796,273	1,966,962,264	2,645,128,255	3,323,294,246
Total Return Investment (ETB)		1,209,602,308	2,552,986,632	3,896,370,956	5,239,755,280	6,583,139,604
BC		1.98	1.98	1.98	1.98	1.98

Investment on Physical Infrastructure-roads, irrigation

Agricultural productivity and infrastructure are closely linked. Infrastructure enhances access to market-leading to increased marketed output while integrating economic sectors. Evidence shows that investments on roads in agricultural potential areas spurs growth in agricultural output and diversification with benefits spiralling to increased household income, food security, and low poverty levels. In Kenya, Mozambique and Uganda, access to road network is negatively correlated with poverty with a unit change in access index leading to 10.31 percent reduction in poverty. In some cases, coupling effects or infrastructure development are recorded through intensification of input use. For instance, in India, households who benefited from roads connectivity recorded an intensification of hired labour by 52 percent and commercialized agricultural output . There is evidence that roads spur considerable consumption/benefits in rural areas (Dercon et al., 2009; Wondemu and Weiss, 2010; Worku, 2010; Stifel et al 2013). Reducing transportation costs by US$50 per metric ton for most remote households results in benefits worth 35 percent of the households' consumption. If the road lasts 10years, the IRR ranges from 12-34 percent conservatively (Stifel, et al 2013). It is estimated that it costs roughly 800,000 Birr to construct one kilometre of gravel road (2013 estimates)- considering inflation this cost could double or tripple.

Rice processor at Wereta at Fogera

Investment in Mechanization: Planting, Rice Processing (small-scale, medium and large-scale rice processors)

Rice in Ethiopia is farmed under rudimentary technologies. Land preparation is still largely cultivated using plough or *Maresha* pulled by oxen. There is limited use of certified seeds and use of chemical fertilizers. Although there is machinery for land preparation, technologies for planting, weeding and harvesting have not been tested and adapted to the local agro-ecological and social-economical situations of farmers in Ethiopia. This provides adequate room for investment in mechanization at the production and processing levels.

Box 1 Improving quantity and quality of rice in Ethiopia through investment in mechanization

When we talk about import substitution, do we have sufficient quantity and quality of rice produced at the local level that can competitively substitute rice imports? What is the relationship between quantity and quality of rice and rice processing in Ethiopia?

To enhance rice import substitution, we need to increase rice productivity (quantity and quality of rice). This calls for supportive policy and incentives in rice production and processing. It is argued that the rice commercialization process of smallholder farmer in Ethiopia is slow because of the weak linkages between rice production and processing, as well as low rates of mechanization to improve the quality and quantity of rice (both paddy and milled).

The poor quality of paddy rice and processed rice are associated with the type of machinery in the rice production and processing stages. For instance, in the Fogera Plain, there is rampant use of traditional machinery for pre-processing, processing, and post-processing of rice. This situation calls for investing in better processing machinery, building utilization capacity, repair and maintenance of the machinery, and providing incubation and demo sites to create jobs for the youth.

Overall, mechanization is critical for improving the quantity and quality of rice in Ethiopia in order to address import substitution. This can be achieved by first developing a suitability map for both irrigated rice and rain-fed rice production; and second, enabling a proper design of production and processing systems – which require incentives on mechanization and collaboration among the government, private sector and civil society. Specifically, the role of the private sector is critical in linking private processors to the producers – with the government playing a facilitative role. Mechanization in rice processing is a big challenge in the country; therefore, MoA can play a catalytic role in providing cost-sharing arrangements in the production and post-production stages for the private sector to invest in rice mechanization.

Source: Dawit and Odame, https://www.future-agricultures.org/blog/a-way-forward-for-ethiopias-rice-sector-outcomes-of-a-national-event/

Investment in Regulatory Implementation

Whereas there are incentives to support the agricultural exports, none has been done to cushion domestic rice producers from the imports of cheap rice. The importation of rice in Ethiopia has increased over the years since the recognition of the crop as national strategic importance. In 2016, imports of rice cost the country close to 200 million USD and reached an estimated 300 thousand tons of rice. Indeed, data shows that rice imports increased from 22,500 tons in 2008 to 311,827 tons in 2016, which is 12.07 million USD in 2008 to 170.69 million USD in 2016. There are four main types of rice imported into the country, which are recognized by the Ministry of Trade and ERCA.

These are broken rice, husked brown rice, rice in the husk (paddy or rough), and semi-milled or wholly milled rice.

The costs and benefits of trade policy vary from country to country and depend on the context and extent of implementation of the trade policy. In several countries, evidence shows benefits in trade liberalization allowing competition between imported and domestically produced commodities. The technology transfer and quality improvement of the sector spur part of the gains. In most cases, reduced consumer and producer prices lead to a slump in the domestic sector if the trade regimes are not well managed.

In Southeast Asia, evidence shows that the less government imposes tax barriers on the rice sector to control prices, the more rice production will increase. A decline in the state's tax intervention in the rice sector increases rice production in both rice exporting and importing countries (Thanapan Laiprakobsup (2019). This implies that a reduction in tax barriers and the abandonment of the state's price control are state policies that encourage rice production in the long run. The story is different in Nigeria where, imposing or banning steep tariffs on food imports seems to have positive impacts on the rice industry in the short run, through an increase in area for rice production, higher productivity and better milling-operation capacity.

Ethiopia faces several trade-related and foreign investment challenges including bureaucratic procedures, lack of transparency in the government procurement system, cancelled tenders, poor infrastructure, lack of coordination, inefficiency in government systems, foreign exchange shortage and high transportation and transaction costs. Moreover, importers of goods for domestic sale face difficulty in obtaining foreign exchange emanating from the strict foreign currency regulatory regime administered by the National Bank of Ethiopia (NBE). An importer must apply for an import permit and obtain a letter of credit for the total value of the imports before an order can be placed.

Whereas the rice produced in Ethiopia is still of low quality and quantity, application and extent of institutionalization and implementation of the trade regime will still be of importance in order to meet the consumer preferences.

Economy-Wide Benefits of NRFP

Rice production in Ethiopia will exert economy-wide impacts both at macro and micro-levels. At the microeconomic level increased rice production and productivity will translate to increased household income, improved food security and nutrition outcome, and a reduction in poverty rates. In north-western Ethiopia, evidence shows that increased use of fertilizer will significantly increase household income by about US$292.92–374.85 while household per-capita consumption expenditure increases by US$53.98–57.89 and reduce the incidence of poverty by 17.4 percent–18.2 percent. However, this would also worsen the income inequality . In Fogera Plain, evidence shows that there is substantial food security in many households due to rice farming and thus, improving meal intake per day, providing food throughout the year, and is a source of income for clothing, health and housing expenditures. The micro-benefits are likely to be disproportionate unless deliberate efforts are made to make the NRFP inclusive. Evidence shows that rice farming in Ethiopia is male dominated, with female headed families engaged in rice farming ranging between 10 percent and 20 percent. This implies that deliberate efforts are needed to make the NRFP gender inclusive.

Evidence shows that adoption of new variety of rice-NERICA, provides food security and lowers the poverty levels. A survey in sub-Saharan countries shows that average household income increased from US$ 25 per capita to USD58 per capita for households who adopted NERICA rice variety

The impact would be higher if production constraints and certified seeds bottlenecks are addressed.

At the macro-economic level, positive growth in GDP will be realized in the country. Although there lacks concrete evidence of the extent of the impact, evidence from CGE studies on similar cereal crops such as wheat has been quite far-reaching. Positive impacts across the realm of the economy are expected due to the emergence of rice as a major cereal in the country.

The forward and backward linkage will be evident as the rice sector in Ethiopia continues to grow driven by the exponential demand. Rice production will largely contribute to the agrochemical and other industries that supply inputs for rice production. Further, it will create a push for industries that use rice as raw input and by extension, the rice milling industry will contribute to pushing other industries that use milled rice as an input. Changes in rice production will impact other complementary industries. For instance, rice mills, rice trade, and livestock and poultry that are fed on rice bran, a side-product of the rice mills.

Environmental costs are often associated with rice farming with negative aspects of rice production including pollution and health effects resulting from the use of agro-chemicals. Evidence elsewhere shows that the benefits of rice farming far outweigh the environmental costs. In Indonesia, it was found that the conversion of Javanese rice fields to other uses represents a net environmental loss of US$ 2,101.12 per hectare per year, or a total economic, social, and environmental loss of about US$ 3,927 per hectare per year.

Scenarios –Private, Public and Joint Investments

Since 2001, development partners have had an interest in rice production in Ethiopia after the crop attracted national interest and its usage increased exponentially. The three partners and activities are elaborated in Box 2. Since then, there has been tremendous growth in the rice subsector despite the increase in consumption. Evidence shows that along the period that the partners collaborated with the government and other private sectors including small-scale farmers, rice production increased from 71,316.07 tons in 2008 to 126,806.45 tons in 2016. Moreover, part of their support towards rice research can be traced through the national research systems and have led to increased release of varieties. For instance, the national research system in collaboration with AfricaRice and IRRI released 35 improved rice varieties (15 for rain-fed upland, 11 for rain-fed lowland and 9 for irrigated ecosystems.

The costing of the NRFP reveals that 93 percent of the strategic activities will be taken by the private sector and this includes the rice farmers irrespective of the scale. This implies that 93 percent of the expected gain will be hinged on the participation of the private sector. In this case, the role of the government will be to create a conducive environment for the private sector participation and continue building partnerships with organizations such as JICA, CIDA and other bilateral agencies for continued support. The impact of the private sector in rice production can be measured upon the evaluation of EthioRice, MEDA and AgroBig projects whose implementation period ended in 2020. Impeding the participation of the private sector will reduce the for seen gains of the NRFP. A joint investment on the NRFP will optimize the expected gains in the rice sector.

Box 2: Contribution of Development Partners in Rice Production

Rice programs supported by development partners are; the EthioRice project supported by JICA, Mennonite Economic Development Associates (MEDA) now (EMERTA) supported by Canadian International Development Agency (CIDA) and AgroBIG project supported by Finland Government.

EthioRice project ensures the functionality of the National Rice Research and Training center through facilitation of the development, accumulation, and transfer of rice related research outputs (technologies), capacity development for researchers to undertake research and provision of training to relevant stakeholders and establishment of rice related information sharing system to all stakeholders. The project started in 2015 with the first phase ending in 2020.

Ethiopians Driving Growth Through Entrepreneurship and Trade (EDGET) project implemented by Mennonite Economic Development Associates (MEDA)) with the support of the Government of Canada implemented rice related activities from 2010 – 2015 as follows:

a) Improving rice input supplies, creating awareness of improved techniques, irrigation, micro-irrigation technologies, and rural credit;

b) Post-harvest rice handling including storage, grading and market segmentation, improved technologies for value added activities; and

c) Rice market linkages through consolidation/bulking and strategies to deal effectively with traders and development of marketing strategies to new markets.

The second phase of the project Ethiopians Motivating Enterprises to Rise in Trade and Agri-business (EMERTA): 2016 - 2020) targets promotion of agribusinesses to create business solutions to poverty focusing on rice, gem and vegetable sectors with the objective of increasing employment and income for women and men in the Amhara region in Ethiopia.

AgroBIG is implemented as a bilateral cooperation between governments of Ethiopia and Finland. It targets scaling up of successes of the first phase of the program (2013 –2017) in promoting business induced growth in the rice sector by working closely with smallholder farmers, agricultural cooperatives, private and value chain actors with emphasis on youth and women. The program which was implemented until 2021 targeted eight districts around Lake Tana of Amhara region. Among the eight districts were the main rice producing districts of the Fogera Plain namely Fogera, Libokemkem, and Dera.

Source: Dawit Alemu 2019. Rice Cultivation, Processing, and Marketing in Ethiopia. In book: Advances in Rice Research and Development in Ethiopia, Publisher: Ethiopian Institute of Agricultural Research (EIAR)

Financing Strategies-Resource Mobilization Strategies

The key resource mobilization strategies emanate from; (i) ensuring the mainstreaming of identified flagship activities in public programs to allocate sufficient budget and improving enabling environment; (ii) facilitation of the mobilization of resources and engagement of different development partners; and (iii) facilitation and incentivization of private investments in rice production, processing and marketing (Table 21).

In the strategies, the overarching element is enhancing the full utilization of available investments. The NRFP national and regional management units are expected to implement the proposed strategies and associated actions to ensure effective mobilization of required resources.

The government should stimulate and incentivize the private sector given the expected dominant role of private investment in rice production. The proposed mechanisms are;

a) Undertake business opportunity for each rice hub considering the specific opportunities each hub provides;

b) Pro-active promotion of rice production in the target areas in each hub using extension services and access to required inputs to smallholder farmers;

c) Ensuring access to land for commercial rice production and establishing of rice processing facilities;

d) Pro-active promotion of market linkage of rice technology local manufacturers and importers with rice producers and processors targeting each rice hub;

e) Facilitate access to finance for investors in rice related service provision and rice processing facilities; and

f) Provision of feedback mechanism to address the dynamic regulatory demands/issues.

Table 21: Required resource mobilization strategies and actions for the implantation of the NRFP

Source of Funding	Strategy	Action
Public	• Implementation of government commitments to increase public spending in the agriculture sector to meet the CAADP, Malabo target of 10 percent. • Mainstreaming public budgeting and consideration of the NRFP activities.	• Ensuring proper incorporation and mainstreaming of the NRFP activities in the national, regional, and zonal agricultural public budgeting, considering the current and expansion target woredas for rice sector development. • Advocacy for increased public funding of agriculture and implementation of the rice import substitution including adequate investment in rural electrification. • Enhance full utilization of investments for implementation of the NRFP activities. • Engage proactively to stimulate and incentivize private investment given the 93 percent of the expected private investment for the NRFP.
Development Partners	• Involvement of Development Partners (DPs) that are committed to and/or interested in supporting the Ethiopian National Agriculture Investment plan (NAIP). • Alignment of development partner support to the rice sector development projects.	• Reaching out to the DPs involved/ interested in the agricultural sector to support the NRFP awareness creation. • Identify and engage development partners working in Ethiopian rice sector development in the country to align their projects with the NRFP.

Source of Funding	Strategy	Action
Private Sector	• Support private sector rice related investments (production and processing) to start and/or to fully operate at their respective capacity. • Develop and share business opportunity documents for each rice hub along with available incentives (access to land, finance etc) to potential private actors. • Improve the business environment for rice production processing and marketing to private investment.	• Implement private sector support for start and/or full operation of investments (such as the Saudi Star rice processing at Bishoftu). • Develop and create awareness about private investment incentives for rice sector development (access to land, finance, technology, rice processing technology etc). • Develop rice hub specific business opportunity documents along with information about available investment incentives. • Establish public-private partnership framework and forum for networking with the public and private sector investments to support the NRFP. • Facilitate setting up of standards to avoid importation of milling machine below certain capacity.

7 INSTITUTIONAL ARRANGEMENTS ROLES AND RESPONSIBILITIES FOR DELIVERY OF THE NRFP

This section defines the responsibilities of key stakeholders in the delivery of the NRFP including the executing agencies roles, NRFP program oversight and implementation structure. It highlights the private sector engagement, yearly execution strategies and activities, monitoring, evaluation, accountability and tracking of results.

Executing Agency

The Ministry of Agriculture (MoA) will be the lead agency responsible for the program implementation. MoA will work in close collaboration with several other government ministries including finance, trade, industry and water, irrigation and energy. The implementation of the NRFP will entail a well-designed and effectively managed partnership involving various government ministries, agencies and commissions, private sector, farmers` organizations and the development partners. Their involvement will depend on their mandate and the capacity to handle various sub-components and program interventions.

Key partners will be the Government of Ethiopia and development partners. The development partners will provide a critical role of providing technical and financial resources beyond what the government may allocate for the implementation of the NRFP. Potential development partners for the NRFP include: the Alliance for a Green Revolution in Africa (AGRA), Japan International Cooperation Agency (JICA), the Bill and Melinda Gates Foundation (BMGF), the Food and Agricultural Organization of the United Nations (FAO), Africa Rice and the International Rice Research Institute (IRRI). These organisations are currently providing support to the agricultural sector in Ethiopia. Table 22 summarizes the roles and responsibilities of the different NRFP stakeholders.

Table 22 Summary of roles and responsibilities of different NRFP stakeholders

Institution	Roles and responsibilities
Ministry of Agriculture	• Overall coordination of the NRFP implementation. • Resource mobilization. • Monitoring & Evaluation, reporting and documentation of lessons learnt. • Capacity building of staff and other stakeholders. • Formulation and/or reviews of policies, regulation, and guidelines. • Engagement with the non-state actors (NSA). • Building and managing partnerships for technical & financial support to the NRFP.
EIAR and Regional Agricultural Research Institute (RARI)	• Research on technologies and innovation, value addition and marketing. • Technical backstopping in the implementation areas. • Early Generation Seed (EGS) production and supply.
Regional Bureaus of Agriculture	• Coordinate and lead the project in their respective regions. • Provide support to zonal and Woreda offices of agriculture in delivering extension services. • Coordinate NRFP value chain activities at the respective levels.
Ethiopian Agricultural Transformation Institute (ATI)	• Technical and analytical support to NRFP implementation. • Capacity building.
Ministry of Finance	• Budgetary support to the NRFP (public-sector contribution) • Supportive macro-economic policies
Private sector-led Associations	• Coordinate participation of their members in the NRFP implementation. • Represent their members in policy dialogue. • Facilitate information /data sharing.
Private sector along the value chain (agro-dealers, seed producers, mechanization service providers, processors, grain traders, banks and micro-finance institutions, processors,	• Production and distribution of agricultural inputs. • Supply of mechanization services and irrigation materials. • Agro-processing and marketing. • Engagement with government for policy formulation and/or reviews. • Participate in the implementation of the NRFP projects. • Linking along value chains. • Construction of warehouses. • Ensure access to financial service provision.
Smallholder rice farmers, cooperative agencies, farmers organizations	• Taking up and/or expanding rice production. • Adoption of appropriate technologies. • Providing feedback to other stakeholders. • Providing input to new policies or policy reviews. • Organizing for appropriate collective action. • Participate in the implementation of the NRFP projects.
Commercial farms and processors	• Expanding and modernizing rice production. • Leading in technology adoption. • Spearheading value addition, including grades and standards. • Supporting mechanization process. • Providing feedback to research organizations and government. • Feeding into the policy formulation and/or review processes.
Development Partners	• Participate in implementation of the NRFP projects. • Facilitate resource mobilization for the NRFP. • Facilitate technical and other strategic and capacity building support to the implementation of the NRFP. • Align respective strategies, plans, projects and interventions with the NRFP framework. • Promote benefits of the NRFP.

The NRFP Program Oversight

The National Rice Sector Development Steering Committee (NRSD SC), which was established in 2010 to over-see rice sector development following the approval of the first rice strategy, will provide oversight, decision making and strategic guidance. The committee will be chaired by the MoA (state minister) and members will be key stakeholder representatives from state and non-state actors, including government ministries (federal and regional), Agricultural Transformation Institute (ATI), EIAR, development partners and private sectors. Other public entities such as investment commission, Land Bank Corporation, and Ministry of Finance will be engaged on case-by-case basis. The committee members will be appointed as new representatives every year depending on their level of relevance.

The NRFP Implementation Structure

A Program Coordination Office (PCO) will be established at MoA to provide overall leadership in the NRFP implementation. PCO will have a NRFP coordination team (NRFP-CT), which will compose of a coordinator and technical staff members to provide overall planning, coordination, and facilitation of NRFP activities. Specifically, NRFP coordination team, under the oversight of the State Minister of MoA will maintain overall responsibility for the management and supervision of NRFP, including:

- Preparation of the annual work plans and budgets for approval by the Ministry of Finance;
- Execution of the approved work plan and budget;
- Procurement of goods, works and services;
- Financial management and accounting;
- Monitoring and reporting;
- Knowledge management (preparation of reports and other knowledge products related to NRFP implementation);
- Resource mobilization for NRFP; and
- Facilitating compliance with environmental, gender and other social safeguards.

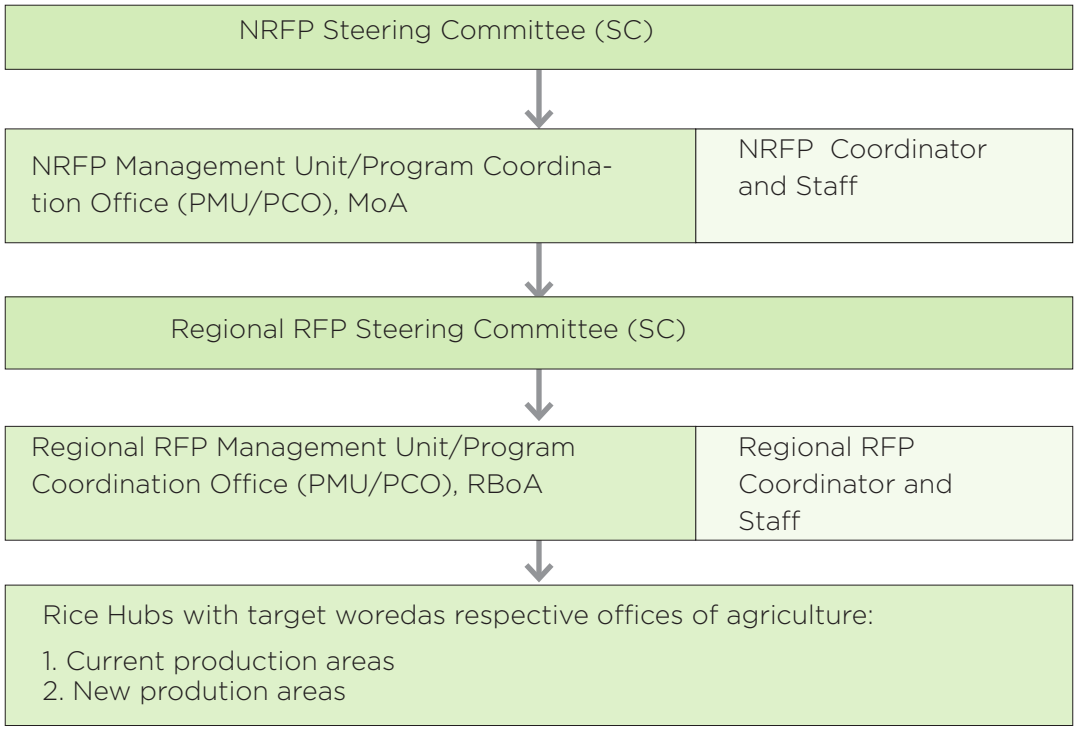

Figure 9: Suggested governance and coordination structure for the NRFP implementation

The NRFP coordination team will be responsible for developing the NRFP implementation manual. The composition of the NRFP-CT will include; i) The NRFP coordinator (TC); ii) M&E specialist; and iii) Resource mobilization and private sector engagement specialist. It is recommended that each component gets a lead specialist to ensure efficient and effective implementation. The specialists will include; i) Specialist: Rice agronomy and intensification; ii) Specialist: Agro-Capacity Strengthening; and iii) Specialist – Agri-business and market linkages (Figure 10).

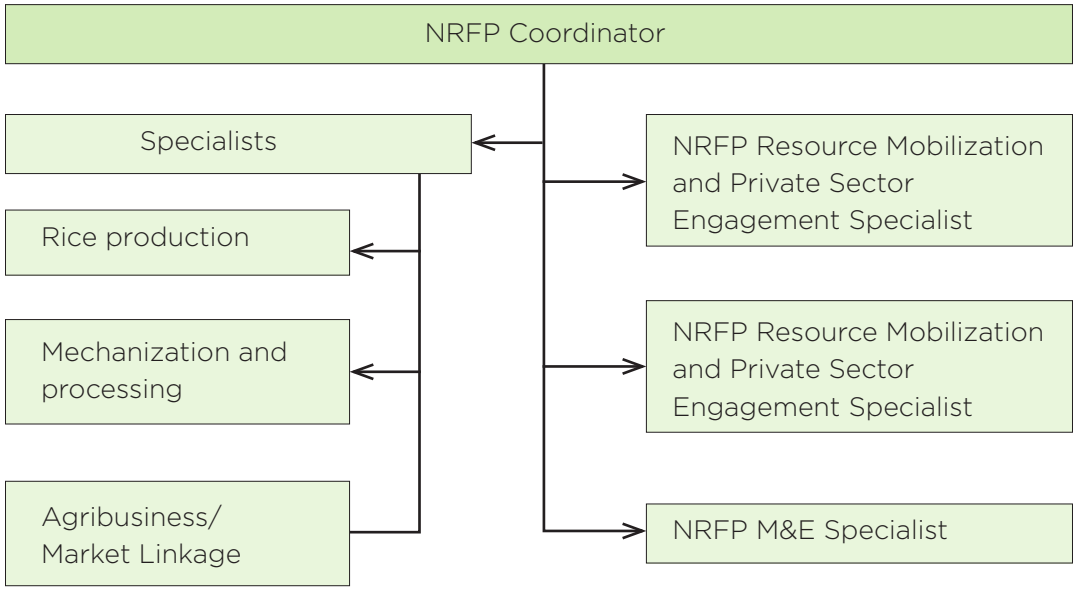

Figure 10: Suggested organizational setup for the NRFP coordination Office/unit

The technical specialists will comprise of competent government staff deployed to NRFP either on full-time or part-time basis. The candidate for the position of NRFP coordinator should have extensive experience in implementing large development programs with relevance to rice crop production, and markets and trade development.

Private Sector Engagement

The engagement with the private sector will be accorded top priority in the implementation of the NRFP, in order to achieve and sustain the stated goal of the project – rice import substitution. The private sector will take a leading role in implementation of activities spanning from input supplies, agricultural production, processing and marketing. The PSE will play a major role in policy dialogue to successfully implement the NRFP. Business-to-Business linkages are critical with facilitative role of government agencies in activities such as input and service supplies. Despite its relevant role, public sector investments remain insufficient for the sustainability of the NRFP. The PSE strategy will engage the private sector to get their views, ideas, action, and participation in the management and implementation of the NRFP.

The PSE strategy will include the following measures:

- A clearly defined inclusion strategy of the private sector in the implementation of the NRFP component activities that relate to their areas of competence and comparative advantage.
- Provision of strategic support and capacity building to commercial rice farmers.
- The creation of enabling policies, regulations, infrastructure development and incentives for the private sector to play a lead role in rice production, processing and marketing and importation of required technologies.
- Involvement of the private sector in decision-making and implementation organs and consultative/coordination forums, monitoring and evaluation and progress reviews.
- Involvement of the private sector in mobilisation of the required investments, especially those that are concerned with commercial production and the provision of services including financial services.

The NRFP Execution Strategy

With the overall leadership of the MoA and the guidance of the NRFP Steering committee, the coordination office is expected to sequentially implement the following activities to ensure effective implementation of the planned components, business cases and respective activities.

First year NRFP activities

The different activities identified in each of the sub-components (business cases) over the targeted years are indicated in detail in Part 5. The key activities to be implemented in the first year of the NRFP are presented in Table 23 along with responsible organization and purpose.

Table 23: Immediate tasks for the MoA Flagship Coordination Office

Activity	Responsibility	Purpose
Setting up of the coordination office both at federal and regional level	MoA	Initiating the start of implementation
Organization of sensitization workshop about the NRFP both at national and regional level	NRFP coordination office (FCO)	Create awareness to wider stakeholders
Organization of high-level meeting with potential development partners	MoA/FCO	To ensure alignment of DP supported initiatives To mobilize resources
Strengthening the National Rice Stakeholders platform targeting its development into formal Association	FCO	To address timely emerging challenges and explore opportunities in a sustainable manner
Undertake rice hub level annual plan for five years	FCO	To ensure the components, business cases and activities are mainstreamed in regular planning at all administrative level, hub, regional and national level
Initiate implementation of planned business cases and respective activities in each hub	FCO and all rice value chain actors	To initiate the implementation of target activities in the NRFP
Documentation of business opportunities in each hub and sensitization of relevant rice stakeholders (private actors).	FCO	To inform private actors about existing opportunities for enhance private investment
Ensure set up of proper monitoring, evaluation and learning system	FCO	To ensure provision of feedback mechanism for efficient progress tracking

Strategy for follow up years

The strategic measures following the first-year target implementation to be undertaken evert year by the FCO are presented in Table 22.

Table 24 Key annual strategic activities of FCO/MoA for effective implementation of the NRFP

Activity	Responsibility	Purpose
Annual planning at hub level	FCO	To ensure full exploitation of opportunities
Ensure regular meetings of the national and regional steering committees	MoA/FCO	To ensure proper guidance for the effective implementation of the NRFP
Ensure proper functioning of the National Rice Stakeholders Platform	FCO	To instil timely measures for emerging challenges of the rice sector To sustain linkages among rice value chain actors Facilitate the progression of the platform into Stakeholders' Association
Follow up of the implementation of the designed NRFP activities	FCO	To ensure the implementation of design activities by respective actors at each hub

8 MONITORING AND EVALUATION, ACCOUNTABILITY AND RESULT TRACKING

Ethiopia is a signatory to CAADP and the Malabo Declaration and among the countries committed to the mutual accountability principles. In this respect, the NRFP will follow the CAADP/ Malabo mutual accountability principles. The country is currently implementing a National Agriculture Investment Plan (NAIP), which has various mutual accountability platforms including the Agriculture Joint Sector Reviews and the CAADP Biennial Reviews. Progress on the implementation of NRFP will be reported in these review processes. The NRFP Coordination Office at the MoA will track the progress annually and will ensure the generation of baseline and end of program data to ensure technically feasible documentation of the achievements and impact of the program. Table 22 presents a draft result framework for the NRFP.

Table 25 Results Framework on impact and outcomes for the NRFP

Result – level	Intervention logic	Indicators	Baseline/target*	Assumptions
Long-term Impact (High-level country outcomes).	Enhanced economic growth, wealth creation, food and nutrition security in Ethiopia through agriculture.	• Agriculture GDP growth rate • Percentage of households below the food poverty line in the NRFP implementation areas.	No data (baseline and endline survey).	• Political and economic stability will prevail for investors' confidence.
Development Objective (Outcomes to which NRFP contributes).	Increased market share of locally produced rice.	• Amount of foreign currency saved for rice import	~ 300M to ~ 50 M USD	• The thrust and political will of the government towards rice import substitution will be sustained. • There is alignment and harmony among institutions of the Federal and Regional governments.
		• Price stability of milled rice.	No data (baseline and endline survey).	
		• Percentage of the beneficiaries with asset ownership.	No data (baseline and endline survey).	
Outcomes from Component 1	Outcome 1 Increased production and productivity	• % change in volume (MT) produced	268,223.51 to 1,621,327 tons.	• There will be enhanced momentum to raise farm productivity along the value chains
		• % change in yield (MT/ ha)	3.1 to 4.50 MT/ha	
		• % change in pre and post-harvest losses (no data)	No data (baseline and endline survey)	

Result – level	Intervention logic	Indicators	Baseline/target*	Assumptions
Immediate outcomes from sub-components (IO)	IO 1.1 Enhance availability and use of new rice varieties with improved agronomic practices.	• # and type of new technologies and agronomic practices provided to the extension system by research.	No data (baseline and endline survey)	• There will be enhanced momentum to raise farm productivity along the value chain. • Smallholder attitudes will improve towards enhanced agricultural production and productivity and commercialisation.
		• # and type of new technologies and agronomic practices adopted by farmers during pre-extension demonstration.	No data (baseline and endline survey)	
		• Volume (MTs) of EGS and certified seed	Less 10 to 6,000	
	IO 1.2 Enhance adoption of available rice mechanization tools, implements and equipment.	• # of SHF who have applied improved technologies and practices by type of technologies.	No data (baseline and endline survey).	
	IO 1.3 Extent of intensification and expansion of rice production.	• Average rice productivity increase.	2.71 to 4.50 MT/ha.	• Enhanced commitment of the public sector in each rice ecosystem.
		• Extent of rice production expansion (area in ha) by rice ecosystem (upland, lowland, irrigated).	63,362 - 300,093 ha.	
	IO 1.4 Sustainable rice-based crop production systems.	• Type of crops produced in addition to rice.	No data (baseline and endline survey).	• Improved input/ seed supply system. • Efficient product marketing system.
		• Area covered in ha.	No data (baseline and endline survey)	
		• Average household income generated.	No data (baseline and endline survey	
Outcomes from Component 2	Outcome 2 Rice processing and marketing efficiency enhanced.	• # newly established modern rice processors.	~200 - 579 small-scale ~ 3 – 83 medium-to large scale	• Improved “ease of doing business.”
		• Extent of rice import substitution	~ 20% to 83%	
		• Volume of packed domestic rice sold through supermarkets	No data (baseline and endline survey).	
Immediate outcomes from sub-components	IO 2.1 Modernization of rice processing industry.	• # of newly established modern rice processors. • Proportion of quality milled rice produced.	~ 200 to 579 small-scale. ~ 3 to 83 medium-to large scale.	• Access to modern processing equipment ensured. • Required skilled manpower made available.
	IO 2.2 Increased marketable surplus.	• % change in share of marketable surplus from total rice production. • Share (%) of cooperatives in paddy marketing.	No data (baseline and endline survey).	• Efficient marketing system.

Result – level	Intervention logic	Indicators	Baseline/target*	Assumptions
	IO 2.3 Extent of established rice processing facilities enhanced.	• % of capacity utilization of established rice processing facilities	~ 5% to 100%	• Contract farming enforcement put in place.
Outcomes for Component 3	IO 3.1 The NRFP coordination and institutional arrangements.	• Coordination unit in place(yes/no).		• Required resources are made available timely.
	IO 3.2 Monitoring, Evaluation and Learning (ME&L.)	• Annual progress reports. • Mid-term review conducted. • Terminal evaluation conducted. • Learning events conducted.		
	Outcome 3.3 Cross Cutting Issues and Capacity Development	• Percentage of trainings delivered as per the agreed capacity development.	Smallholder farmers (50%) Commercial farmers (50%) Service providers (100%) Processors (50%)	
		• Number of technologies promoted to extension services (disaggregated by gender sensitive, nutrition, and CSA)	No data (baseline and endline survey).	

Sources: * MoA (2020) and CSA (2020)

9 RISKS AND RISK MANAGEMENT

There are four potential risks categories anticipated during the implementation of the NRFP which are assessed to be from low to moderate considering the expected trends. In order to timely put in place mitigation measures, the NRFP coordination team need to undertake regular assessment and develop mitigation strategies and measures at all levels. Key risks and suggested mitigation measures are presented Table 26.

Table 26 Potential Risks of the NRFP and Proposed Mitigation Measures

Category of risks	Risks	Risk rating with mitigation	Risk mitigation measures
Economic and Financial Risks	Wavering commitment from key stakeholders.	Low	• Institutional level commitment • Create incentive mechanisms
	Low interest from private sector to invest.	Moderate	• Policy adjustments and improving the ease of doing business by the GoE.
	The ease and doing business remain challenging.	Moderate	• Ensure the commitment at all administration levels.
	Delayed funding from government and DPs. Program activities are time bound and any delay in funding will jeopardize its' success	Moderate	• Ensure adequate resource mobilization approach. • Strong M&EL system. • Sensitize PMU.
	Conflicting mindsets and priorities may hamper implementation	Moderate	• Promote evidence-based engagement with policy makers (rice production will replace other crop production).
Institutional Risks	Linkage between research, extension, and development agencies are weak (+ Federal vs. Regional)	Low	• All stakeholders will be sensitized to own the NRFP and contribute their share with appropriate credit/ incentive.
	Capacity gap	High	• Ensure capacity development for all rice value chain actors and NRFP implementors.

Category of risks	Risks	Risk rating with mitigation	Risk mitigation measures
Environmental and Climate Change Risks	climate change (drought, floods and occurrence of diseases and pest).	Moderate	• Utilization of modern technology would allow the project team to detect factors such as shortage in rainfall, incidence of diseases and pests (early warning system).
Social Risks	Political and social unrest	Low/ moderate	• Commitment from regional governments to timely address challenges

10 SOCIAL AND ENVIRONMENTAL IMPACTS OF NRFP

Rice is one of the main human diets. In countries like Ethiopia, population increase and changes in lifestyle are forcing governments to spend their hard-earned foreign currency to rice importation. The NRFP is expected to promote rice production through increase in yield and expansion of area under production. The existing areas for expansion are irrigated land and there are plans to bring in new areas into large-scale production. Irrigation of large-scale farms encourage more quantity in production and timing of availability of water to support crop establishment, growth, and yield. Irrigation can also support multiple cropping in a year. Besides influencing production and productivity directly, irrigation also enhances adoption and productivity of complementary inputs such as high-yielding crop varieties and fertilisers.

Despite the positive contributions of the NRFP through introduction and/or expansion of irrigation, water withdrawn for irrigation is likely to impact environmental services provided by free-flowing rivers. Habitat and resident flora and fauna may be destroyed, and the flooding of biomass may result in release of carbon dioxide (CO_2) and methane (CH_4). This may have impacts on global climate and localised air pollution problems. Abstraction of ground water for irrigation could also cause soil compaction problems. Waterlogging and salinity are more likely with poor management of irrigation while higher levels of complementary input use may result in fertiliser and pesticide runoff.

To decrease environmental impact and obtain an environmentally friendly oilseed production system, the NRFP proposes to promote different practices including water management systems, crop rotation and integrated soil fertility management.

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12 ANNEXES

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Annex 1: Stakeholders involved in drafting the NRFP

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13	Mr. Ali Serur	M&E Senior Expert, Japan International Cooperation Development (JICA)	aliseruryasin@gmail.com

Annex 2: Members of the National Rice Sector Development Technical Committee

Organization	Positions	Name
Crop Development Directorate Director	Chair Person	Mr Essayas Lemma
Crop Research Directorate Director	Co-chair	Dr Taye Tadesse
Agricultural Growth and Transformation Advisory project (AGTAO)	Secretariat	Mr Keisuke Urasugi
Agricultural Engineering Research Directorate Director	Member	Dr Laike Kebede
Agricultural Economics Research Directorate Director	Member	Dr Endeshaw Habte
Ethio-Rice	Member	Mr Kiyoshi Shiratori
Agricultural Extension Director	Member	Mrs Yenenesh Egu
Agricultural Mechanization Director	Member	Mr Berket Forsido
Ethiopian Agricultural Business Enterprise (EABE)	Member	Mr Birhanu Yeshitla
Sasakawa Global 2000 (SG2000)	Member	Mr Melesse Liyeh
Mennonite Economic Development Associates (MEDA)	Member	Mr Mekuria Yemer
Agricultural Transformation Institute (ATI)	Member	Mr. Eshetayehu Tefera
Alliance for a Green Revolution in Africa (AGRA)	Programme Officer	Mr. Ayele Gebreamlak
Alliance for a Green Revolution in Africa (AGRA)	Programme Officer	Mr. Bisrat Ermias
Alliance for a Green Revolution in Africa (AGRA)	Programme Officer	Mr. Samson Jemaneh

Annex 3: Target area expansion for rice production by year (2023 – 2027)

Rice Hub	Region	Type of producers	2023	2024	2025	2026	2027
Fogera	Amhara	Smallholders	85,010	90,071	95,132	100,192	105,253
		Commercial farms	6,423	12,846	19,269	25,692	32,115
Pawe	Benishan-gul-Gumuzzzz	Smallholders	8,975	13,638	18,301	22,964	27,627
		Commercial farms	-	-	219	219	532
Abobo	Gambella	Smallholders	2,457	4,914	7,371	9,828	12,284
		Commercial farms	4,949	9,898	14,847	19,795	24,744
Gura Ferda	SNNP	Smallholders	29,986	32,394	34,801	37,209	39,617
		Commercial farms	1,307	2,615	3,922	5,230	6,537
MyTsebri	Tigray	Smallholders	3,907	3,977	4,047	4,118	4,188
		Commercial farms	-	-	-	-	-
Gode	Somali	Smallholders	1,425	2,478	3,531	4,584	5,637
		Commercial farms	3,510	7,020	10,529	14,039	17,549
Chewaka	Oromia	Smallholders	14,078	16,177	18,276	20,375	22,474
		Commercial farms	307	614	921	1,228	1,536
National		Smallholders	145,838	163,649	181,459	199,270	217,080
		Commercial farms	16,496	32,992	49,708	66,204	83,013
		Total	162,335	196,641	231,167	265,474	300,093

Annex 4: Target intensification and expansion districts by National Rice Hub

Rice Hub	Region	Intensification districts		Expansion districts	
		Name of the district	No	Name of the district	No
Fogera/ Metema	Amhara	Fogera, Dera, Libokemkem, North Achefer, Bahir dar Zuria, Bahir Dar City administration,	6	North Achefer, Bahir Dar Zuria, Bahir Dar City Administration, and Gonder Zuria	5
				Quara, Metema, Tach Armachiho, Adagn Ager Chaqo, Tegedi, Takusa, Dembia, Gondar Zuria, Chilga, and Alepha	10
Pawe/Assosa	Benishangul-Gumuz	Jawi, Pawe, Dangur, Dibate, Bullen, Mandura, Guba	7	Guanga, Guba, Ayehu, guagussa, and Zigem	5
				Kamash, Yaso, Agalo mexi, Sirba Abay, Balo jegonfoy,Assosa, Bambasi, Mange, Komosha, Sherkole, Oda Godare, Kurmuk Mao komo leyu woreda	14
Abobo	Gambella	Abobo and Etang	2	Abobo and Etang	2
Gura Ferda	SNNP	Keffa (Gimbo, Decha, Bitta) Bench-sheko (Guraferda, Sheko) Southwest omo (Maje, Bero, Mentigoldya) South Omo (Dasenech)	9	Kaffa (Gimbo, Bitta, Decha) Bench-sheko (Guraferda, Sheko) Southwest omo (Maje, Bero) South Omo (Dasenech, Nyangatom, Benatsemay, Selamago)	11
MyTsebri	Tigray	Northwest part of Tigray	3	Northwest part of Tigray	3
Gode	Somali	Gode (Irrigated rice)	3	Gode (Irrigated rice)	3
Chewaka	Oromia	Chewaka, Tuka Wayyu, Wama, Gidda Ayyana, Ilu-abba-Bor, Sadan Chanka, Hawa Galan, Haro Sabu, shebe	9	Chewaka, Tuka Wayyu, Wama, Gidda Ayyana, Ilu-abba-Bor, Sadan Chanka, Hawa Galan, Haro Sabu, kersa, Omonada, Tiro afeta, Goma	12

Note: some of the intensification districts are indicated also as expansion area, which is associated with the planned expansion in terms of kebeles that did not yet engaged in rice production in the respective districts

Annex 5: Budget breakdown for subcomponent: Enhancing access and use of quality seed of improved varieties

Investment Areas	Activities	Assumptions/ estimates	Year I	Year II	Year III	Year IV	Year V	Financial source
Strengthening the collaboration of the national rice research program with IRRI and AfricaRice.	Secondment of IRRI and AfricaRice scientists for technical back stopping and facilitation of germplasm and prototype exchange.	Assigning of three senior scientists (breeder, agronomist, agricultural engineers at NRRTC).	360,000	360,000	360,000	360,000	360,000	GoE and DPs
	Germplasm sharing.	IRRI and AfricaRice germplasm exchange.						GoE and DPs
	Testing and release of adaptive and better performing varieties.	Varietal testing across the 7 rice hubs.	350,000	350,000	350,000	350,000	350,000	GoE and DPs
Demand creation for available improved rice varieties.	Demonstration	Demos in 70 target districts at the target regions for the first three years.	140,000	140,000	140,000			GoE and DPs
	Large-Scale Demonstration (Popularization).	LSD in 30 target districts at target regions.			140,000	140,000	140,000	GoE and DPs
EGS production for demanded varieties	Maintenance of breeding and breeder seed production.	Eight RCs will engage in breeder seed production.	80,000	80,000	80,000	80,000	80,000	GoE and DPs
	Pre-basic production.	Eight RCs will engage in pre-basic seed production.	80,000	80,000	80,000	80,000	80,000	Private
	Basic seed production.	Eight RCs will engage in basic seed production.	100,800	160,000	242,666.67	362,666.67	480,000	Private
	Facilitation of contract EGS production.	National and regional level facilitation events.	10,000	10,000	10,000	10,000	10,000	GoE and DPs
Development of integrated rice seed system.	Supporting rice seed producers' cooperatives.	Facilitate establishment and capacity building of 2 coops at each hub.	160,000	160,000	160,000	160,000	160,000	GoE and DPs
	Private seed companies.	Engage 2 private seed companies in rice seed production (EGS, market linkage) per hub.	40,000	40,000	40,000	40,000	40,000	GoE and DPs
	Public Seed Enterprises.	Engage the 5 PSE in rice seed production (EGS, market linkage) per hub.	10,000	10,000	10,000	10,000	10,000	GoE and DPs

Annex 6: Budget breakdown for subcomponent: Enhancing access and use of rice mechanization tools, implements and equipment

Investment Areas	Activities	Assumptions/estimates	Year I	Year II	Year III	Year IV	Year V	Source of finance
Facilitate the establishment/ strengthening of local manufacturers.	Identification of qualified local manufacturers in target areas.	3 manufacturers in each hub, a total of 21 manufacturers.	30,000	30,000	30,000	30,000	30,000	GoE and DPs
	Sharing available and importation of prototypes.	Facilitation by the national rice research program.	5,000	5,000	5,000	5,000	5,000	GoE and DPs
	Capacitate each manufacturer for multiplication of prototypes.	Facilitate access to required equipment.	320,000	320,000	320,000	320,000	320,000	Private
Facilitate the establishment/ strengthening of local rice mechanization service providers.	Identification of qualified local mechanization service providers in target areas.	Establish or strengthen 10 service providers nationally/year.	30,000	30,000	30,000	30,000	30,000	GoE and DPs
	Importation of appropriate mechanization equipment.	Importation for 10 service providers/ year.	2,000,000	2,000,000	2,000,000	2,000,000	2, ,000	Private
Building capacity of staff at the National Rice Research and Training Center (NRTRTC) of EIAR to provide certified training in rice equipment operation and maintenance.	Installation of required mechanization equipment suitable for training.	Installation of training equipment.	2,000,000					GoE and DPs
	Development of curricula.	Adapt curricula by benchmarking and training.	50,000					GoE and DPs
	Capacity building and training.	Provision of training to NRRTC members by four expatriates from countries with advanced rice sector programs.	100,000	100,000	100,000	100,000	100,000	GoE and DPs
	Setting up the system (regulation, procedures, etc) for training.		30,000					GoE and DPs

Annex 7: Budget breakdown for subcomponent: Sustainable intensification and expansion of rice production

Investment Areas	Activities	Assumptions/ estimates	Year I	Year II	Year III	Year IV	Year V	Source of finance
Intensification of rice production in current production areas.	Enhancing the performance of the rice seed systems.	Support the rice seed marketing system at regional level.	60,000	60,000	60,000	60,000	60,000	GoE and DPs
	Promoting access to rice mechanization tools, implements and equipment through different models of access.	Creating marketing system for rice tools and implements using different models.	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000	Private
	Scaling up of best production practices through pluralistic extension service including building capacity of rice producers in paddy marketing, and extension service providers.	Enhancing public extension in each of the hubs.	240,000	240,000	240,000	240,000	240,000	GoE and DPs
		1) Enhancing private extension in each of the hubs. 2) Estimated cost: 30000 USD/hub.	240,000	240,000	240,000	240,000	240,000	Private

Investment Areas	Activities	Assumptions/ estimates	Year I	Year II	Year III	Year IV	Year V	Source of finance
Promoting small-scale rice production in potential areas	Rice variety testing and validation.	Variety testing at representative districts in each hub.	80,000	80,000	80,000	80,000	80,000	GoE and DPs
	large-scale demonstration and popularization of tested rice varieties.	Undertake 3 LSD at each hub every year.	96,000	96,000	96,000	96,000	96,000	GoE and DPs
	Promoting access to rice mechanization tools, implements and equipment through different models of access.	Covered by component II.						
	Capacity building of rice producers in paddy marketing.	Capacity building of rice producers and establishing market system for paddy.	160,000	160,000	160,000	160,000	160,000	GoE and DPs
	Introduction of rice processing services through business incubation including youth.	Business incubation in rice processing for youth as pull factor, 5 businesses per hub.	2,200,000	2,200,000	2,200,000	2,200,000	2,200,000	Private

Investment Areas	Activities	Assumptions/ estimates	Year I	Year II	Year III	Year IV	Year V	Source of finance
Promotion of commercial rice production in selected target area.s	Identification and verification of new and existing commercial farmlands and development of database system at regional and federal level.	Undertake assessment at regional level (6 regions).	180,000	180,000	180,000	180,000	180,000	GoE and DPs
	Investment promotion activities for domestic and foreign investors.	Organize yearly national and regional events (one in 6 regions and one in federal).	70,000	70,000	70,000	70,000	70,000	GoE and DPs
	Organization of national and regional stakeholders' forum on rice commercial farming regulations.	Organize to adhere with the above						GoE and DPs
	Provide knowledge and skill-based training for experts and investors.	Organize two regional training events at respective Hub RC.	120,000	120,000	120,000	120,000	120,000	GoE and DPs

Investment Areas	Activities	Assumptions/ estimates	Year I	Year II	Year III	Year IV	Year V	Source of finance
Promotion of irrigated rice targeting developed irrigation schemes.	Rice variety testing and validation.	Variety testing at three potential regions (BG, Gambella, Somali).	30,000	30,000	30,000	30,000	30,000	GoE and DPs
	large-scale demonstration and popularization of tested rice varieties for both small-scale and commercial production.	Undertake 3 LSD at three regions.	36,000	36,000	36,000	36,000	36,000	GoE and DPs
	Introduction of rice processing services through business incubation including the youth.	Establish 5 processing entities in each of the three regions through facilitation of access to finance.	825000	825000	825000	825000	825000	Private
	Promoting commercial rice farming in the target areas with irrigation scheme.	Licencing 5 commercial farms at each region per year.						GoE and DPs
	Promoting irrigation water management skills	organizing training events at regional level in the 3 regions.	60,000	60,000	60,000	60,000	60,000	Private

Annex 8: Budget breakdown for subcomponent: Promoting sustainable rice-based crop production systems

Investment Areas	Activities	Assumptions/ estimates	Year I	Year II	Year III	Year IV	Year V	Source of finance
Promotion of crop rotation and off-season crop production within rice-based system.	Testing and validation of compatible high value crops (vegetables, pulses).	Variety testing at representative districts in each hub.	80,000	80,000	80,000	80,000	80,000	GoE and DPs
	Establish sustainable seed supply system for adapted high value crops.	Promote seed system for adapted crops at each hub.	160,000	160,000	160,000	160,000	160,000	Private
	Capacity building of rice farmers through extension service.	Enhancing public extension in each of the hubs.	160,000	160,000	160,000	160,000	160,000	GoE and DPs
		Enhancing private extension in each of the hubs.	160,000	160,000	160,000	160,000	160,000	Private
Develop the marketing systems for the crops produced under rice-based production	Promote farmers' cooperatives for efficient aggregation and enhancing farmers bargaining power.	Support cooperatives engagement in marketing, 5 coops/year/hub.	400,000	400,000	400,000	400,000	400,000	GoE and DPs
	Provide marketing extension service.	1) Promote contract farming, 5 coops/year/hub. 2) Estimated cost: above.						

Annex 9: Budget breakdown for subcomponent: Promotion of the development of rice processing industry to ensure competitiveness of domestic rice

Investment Areas	Activities	Assumptions/ estimates	Year I	Year II	Year III	Year IV	Year V	Source of finance
Modernization of the rice processing industry.	Facilitation of market linkage between processing machine manufacturers/importers with processors.	Facilitate importation of standard rice processing equipment relevant for modernization.	40,000					GoE and DPs
		Organize processing equipment market fair events at hub level.	20,000	20,000	20,000	20,000	20,000	GoE and DPs
	Development of incentive mechanism for use of improved processing machines.	Facilitate innovative access to finance (lease financing).	20,000	20,000	20,000	20,000	20,000	GoE and DPs
	Development of standard guidelines for licensing of rice processing businesses.	Setting up licencing standards and create awareness at federal and regional level.	20,000	20,000	20,000	20,000	20,000	GoE and DPs
Promotion of establishment of rice processing services in the new areas.	Introduction of rice processing services through business incubation including the youth.	Business incubation in rice processing for youth as pull factor, 5 businesses per hub.	2,200,000	2,200,000	2,200,000	2,200,000	2,200,000	Private

Annex 10: Budget breakdown for subcomponent: Modernization of paddy and milled rice marketing system

Investment Areas	Activities	Assumptions/estimates	Year I	Year II	Year III	Year IV	Year V	Source of finance
Modernization of paddy and milled rice marketing system.	Establishment of paddy marketing system that incentivize both rice farmers and processors for production and processing of quality paddy and milled rice.	Introduce paddy and milled rice quality standards for price differentiation.	30,000					GoE and DPs
		Awareness creation about standards and enforcement.	40000	40,000	40,000	40,000	40,000	GoE and DPs
	Facilitation of market linkage between paddy producers with the already established state-of-the art rice processing industries.	Promote group marketing (cooperatives) for enhancing contract farming.	80,000	80,000	80,000	80,000	80,000	GoE and DPs
		Established processing companies to enter contract farming.	48,000,000	48,000,000	48,000,000	48,000,000	48,000,000	Private
	Facilitation of the consideration of rice in the Ethiopian Commodity Exchange (ECX) platform.	Ensure the consideration of both paddy and milled rice in ECX platform.	100,000					Private

Annex 11: Budget breakdown for subcomponent: Facilitation of evidence-based rice import regulation

Investment Areas	Activities	Assumptions/ estimates	Year I	Year II	Year III	Year IV	Year V	Source of finance
Facilitation of evidence-based rice import regulation.	Setting regulatory measures of rice import considering; (i) Phytosanitory issues, (ii) extent of dumping prices from exporting countries, and (iii) needed domestic rice competitiveness.	1) Regulatory measures of rice import. 2) Estimated cost: 20000 USD/year.	20,000	20,000	20,000	20,000	20,000	GoE and DPs

Annex 12: Budget breakdown for component: Coordination Capacity development, Cross-cutting themes, and MEL

Investment Areas	Activities	Assumptions/estimates	Year I	Year II	Year III	Year IV	Year V	Source of finance
Governance and Coordination	NRFP management unit/program coordination office (PMU/PCO).	Staffing of the national office.	120,000	120,000	120,000	120,000	120,000	GoE and DPs
	NRFP Steering Committee (SC).	Facilitation of the operation of SC.	20,000	20,000	20,000	20,000	20,000	GoE and DPs
	Regional - NRFP management unit/ program coordination office (PMU/ PCO).	Staffing of regional office.	360,000	360,000	360,000	360,000	360,000	GoE and DPs
	Regional - NRFP steering committee (SC).	Facilitation of the operation of regional SC.	60,000	60,000	60,000	60,000	60,000	GoE and DPs
Strengthening institutional and individual capacity.	Most of these activities are mainstreamed in the other component.	Coordination office facility and transport.	890,000					
ME&L	Baseline survey.	Undertake baseline values for the set KPIs in each hub.	120,000					GoE and DPs
	Annual ME&E.	Annual estimation of KPIs for each hub.	80,000	80,000	80,000	80,000	80,000	GoE and DPs

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