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A HISTORICAL ANALYSIS OF RICE COMMERCIALISATION IN ETHIOPIA: THE CASE OF THE FOGERA PLAIN

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ACRONYMS

ACSI	Amhara Credit and Saving Institute
AdARC	Adet Agricultural Research Centre
APRA	Agricultural Policy Research in Africa
ARARI	Amhara Regional Agricultural Research Institute
AsARC	Assosa Agricultural Research Centre
ASE	Amhara Seed Enterprise
Br	Ethiopian Birr
CARD	Coalition for Africa Rice Development
CIDA	Canadian International Development Agency
CSA	Central Statistical Agency
EARO	Ethiopian Agricultural Research Organisation
EDGET	Ethiopians Driving Growth through Entrepreneurship and Trade
EIAR	Ethiopian Institute of Agricultural Research
EMERTA	Ethiopians Motivating Enterprises to Rise in Trade and Agri-Business
EPID	Extension and Project Implementation Department
ERCA	Ethiopian Revenues and Customs Authority
ESE	Ethiopian Seed Enterprise
FDRE CSA	Federal Democratic Republic of Ethiopia Central Statistical Agency
FNRRTC	Fogera National Rice Research and Training Centre
FTC	Farmers' Training Centre
GARI	Gambella Agricultural Research Institute
IAR	Institute of Agricultural Research
IDS	Institute of Development Studies

IRRI	International Rice Research Institute
IRTP	International Rice Testing Programme
JAPC	Jigna Agricultural Producers' Cooperative
JARC	Jimma Agricultural Research Centre
JICA	Japan International Cooperation Agency
MARC	Mehoni Agricultural Research Centre
MEDA	Mennonite Economic Development Associates
MoA	Ministry of Agriculture
MoANR	Ministry of Agriculture and Natural Resources
MoARD	Ministry of Agriculture and Rural Development
NERICA	New Rice for Africa
NGO	non-governmental organisation
NRRTC	National Rice Research and Training Centre
PARC	Pawe Agricultural Research Centre
TARC	Tepi Agricultural Research Centre
WARC	Werer Agricultural Research Centre
WARDA	West Africa Rice Development Association

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INTRODUCTION

This paper presents a historical analysis of rice commercialisation and its impacts on local livelihoods and rural economies in Ethiopia, drawing insights from the experience of the Fogera Plain, a dynamic farming area in Amhara Region to the west of Lake Tana. The commercialisation of rice in Fogera following its introduction into Ethiopia in the 1970s is strongly associated with several key factors: (1) the existence of suitable agro-ecologies and the quest of successive governments to address food insecurity and improve agricultural production; (2) the compatibility of rice with local farming systems and traditional foods, especially with the preparation of *'injera'* (traditional flat bread); (3) the economic incentives for its production related mainly to higher productivity in relation to better unit prices versus other cereal crops; (4) the emergence of processors acting as pull factors for rice commercialisation; (5) government concerns about increasing rice imports to meet rising consumer demand, which has put pressure on scarce foreign currency reserves; and (6) the favourable public policy environment and support of international development partners to promote research and development (R&D) efforts to increase rice production.

In this background paper, we analyse the evolution of rice commercialisation in relation to these six aspects on the Fogera Plain, one of the regions with the largest expansion of rice production and processing in the country. We also review historical trends in the introduction of rice in different parts of the country, the changing nature of rice farming systems and some of the associated initiatives that have enhanced these trends.

The compatibility of rice with the local farming system in Fogera, particularly the crop-livestock system, its use as flour in the making of traditional foods, especially *injera,* and the emergence of a diverse set of value chain actors involved in rice processing and marketing, has enhanced the expansion and intensification of rice production and its commercialisation in the region.

Given the ever-increasing importance of rice in terms of domestic production, value addition, and increasing share of imports, a *National Rice Research and Development Strategy* was put in place in Ethiopia in 2010 (MoARD 2010). Since then, a number of activities have been implemented, mainly related to the establishment of a new National Rice Research and Training Centre (NRRTC) at Fogera *woreda,*[1] which is due to open in 2018. These efforts played an important role in the rice commercialisation process.

A slight increase in domestic production was linked mainly to increased productivity levels as 17 upland, 5 lowland, and 7 irrigated better-performing rice varieties were released by the national research system (MoANR 2016). The data from the Central Statistical Agency (CSA) indicates that there has been a slight decrease in the total amount of land allocated nationally to rice – from about 48,000 ha in 2010 to about 46,000 ha in 2016. However, over the same period, the number of farmers engaged in rice production rose from about 126,000 to 134,000 and productivity levels showed a considerable increase, with the average yield level rising from 2.16 t/ha to 2.79 t/ha (FDRE CSA 2010, 2016).

Despite this increase in domestic production, rice imports have increased dramatically from 2010 to 2016. According to ERCA data (2010, 2016),[2] imports of rice have increased from 43,247.69 t in 2010 with a value of about US$25.76 million to 311,827.08 tonnes in 2016 with a value of US$170.69 million, which is about Br3.75 billion. This alarming trend requires policy attention, given the burden of imports on the country's meagre foreign currency reserves and the huge potential for boosting domestic production.

This background paper begins with a brief overview of the history of rice introduction into the country, assesses the extent of agro-ecological suitability for the production of the crop, and then examines the current status of rice research and development based on a review of relevant literature and secondary data. This is followed by a presentation of the results from a reconnaissance study on rice commercialisation carried out by the authors and local partners in the Fogera Plain during 2017–18, which considered: (1) the changing dynamics of the farming system, trends in rice production, processing, and marketing practices and support services, and (2) rice commercialisation and the

observed livelihood outcomes. The conclusion provides a brief summary of the key trends and findings, along with a list of emerging research questions.

2 THE INTRODUCTION OF RICE, ITS AGRO-ECOLOGICAL SUITABILITY, AND CONTRIBUTION TO FOOD SECURITY

2.1 Rice and its linkage with food security

The introduction of rice in Ethiopia is linked to the quest to address different challenges of different public interventions (food security and resettlement) during the Derg regime. The expansion of rice even after 1991, following the fall of the Derg, was driven by the same concerns. Accordingly, the introduction of rice in different parts of the country was linked to these public programmes and initiatives, which were supported by some international development partners (Table 1). These early introductions happened in three places that subsequently followed different development paths: the Gambella, Pawe, and Fogera areas (Asmelash 2014; Sendeku 2005; Bekur 1997).

2.1.1 Gambella area

The first was a joint effort, between the then Institute of Agricultural Research (IAR) and Extension and Project Implementation Department (EPID) of the Ministry of Agriculture, testing upland rice varieties[3] to explore the potential of the Gambella area in 1973. This was followed by the International Rice Research Institute (IRRI) International Rice Testing Programme (IRTP) at Gambella in 1982, and two improved varieties from India were tested. Recognising the need for research, the Abobo Agricultural Research Centre (AbARC) was established in 1985 to conduct rice research, which is still operational under the regional Gambella Agricultural Research Institute (GARI). The establishment of the centre was targeted to support the resettlement programme of the then government, where a huge population, mainly from the Wollo and Tigray areas, was resettled.

2.1.2 Pawe area

Parallel to the intervention in the Gambella area, there was a resettlement programme and the introduction of rice to the Pawe area which was linked with the establishment of the Pawe Agricultural Research Centre (PARC) in 1985 and the Italian-supported Tana Beles Project in 1988. However, these efforts did not continue and rice production in the area remained insignificant until recently, due to civil unrest and the destruction of the germ plasm, which was maintained by the PARC. It was in 1993 that rice research was formally reinstated through the reconstruction of the research centre which has resulted in the formal release of the M-55 rice variety for the Pawe area in 1998.

2.1.3 Fogera Plain area

The introduction of rice into the Fogera region followed another path. One of the agricultural interventions during the Derg regime was the promotion of farmers' cooperatives, where certain international experts from different socialist bloc countries were invited to strengthen the capacity and boost the performance of established cooperatives. Among these experts were North Korean scientists, who were placed in the Fogera Plain to support two established farmers' cooperatives, namely the Jigna Agricultural Producers' Cooperative (JAPC) in Dera woreda and the Shaga Agricultural Producers' Cooperative in Fogera *woreda*. These experts observed the existence of wild rice-growing in the area, which served as an indication that the region would be suitable for rice cultivation.

The Korean experts, together with the experts in the South Gondar Department of Agriculture, started research on rice through the introduction of a rice variety from North Korea, by engaging members of the stated cooperatives in the early 1980s. During that period, the area was known for food insecurity which was linked to long periods of flooding and also low productivity of the staple crops that were grown in the area (mainly teff). Due to limited knowledge about rice among local communities, it was with the members of the cooperatives that rice production began by the farmers being forced to produce rice. It took several years before the cooperative members showed an interest in producing the new rice varieties. The formal effort of promoting production was discontinued when farmers' cooperatives were dismantled in 1991. With the move of the agricultural expert from the South Gondar Department of Agriculture to the Adet Agricultural Research Centre (AdARC) in the early 1990s, formal research on rice started in the Fogera Plain. The initial research effort entailed the evaluation and multiplication of the rice variety introduced by the North Korean scientists, and the provision of seeds to farmers at the Jigna and Shega *kebeles,* where the initial introduction of rice had been made. In 1993, there were about 30

farmer households who started growing rice (Gebey et al. 2012; Takele 2010). The popular variety is generally known as 'X-jigna' and is considered 'local' as it comes from the kebele name 'Jigna' where the North Koreans originally introduced their new rice variety.

Through these initiatives, different varieties were then being cultivated without formal variety release and registration. It was at this time that both the Abobo Agricultural Research Centre (AbARC) in Gambella and PARC at Pawe were established and started formal rice research, as one of the national agricultural research programmes within the then Institute of Agricultural Research (IAR) (EARO 2000). It was in 1998 that the first variety called Pawe 1 (M-55) was released (MoANR 2016). As rice started to be one of the most important crops in the Fogera Plain, AdARC started rice research, which was linked to the recruitment of an Ethiopian National, Getachew Afework, who worked with the North Korean experts. In recognition of his contribution, an upland rice variety released in 2007 by AdARC was named after him: Getachew (AD-1).

Though the initial national rice research coordination was handled by PARC, AdARC, which was mandated for the Fogera Plain, coordinated rice research nationally. It was in 2012, when the federal government established the National Rice Research and Training Centre (NRRTC) in Fogera as one of the federal research centres, that the mandate of national coordination moved from Adet.

2.2 Agro-ecological suitability

The overall agro-ecological suitability for rice production was estimated considering indicators related to soils (texture and soil depth), mean annual temperature, annual rainfall, slope, and altitude. Accordingly, it is estimated that the country is endowed with about 30 million ha (5.6 million ha highly suitable and about 25 million suitable) for rain-fed rice production (MoARD 2010). In addition, rice can be grown in irrigated areas. Studies show that there are ten river basins in the country, with a potential of about 3.7 million ha of land where irrigated rice can be produced (Awulachew et al. 2007). The possibility of growing rice in both rain-fed and irrigated agro-eco-systems of both lowland

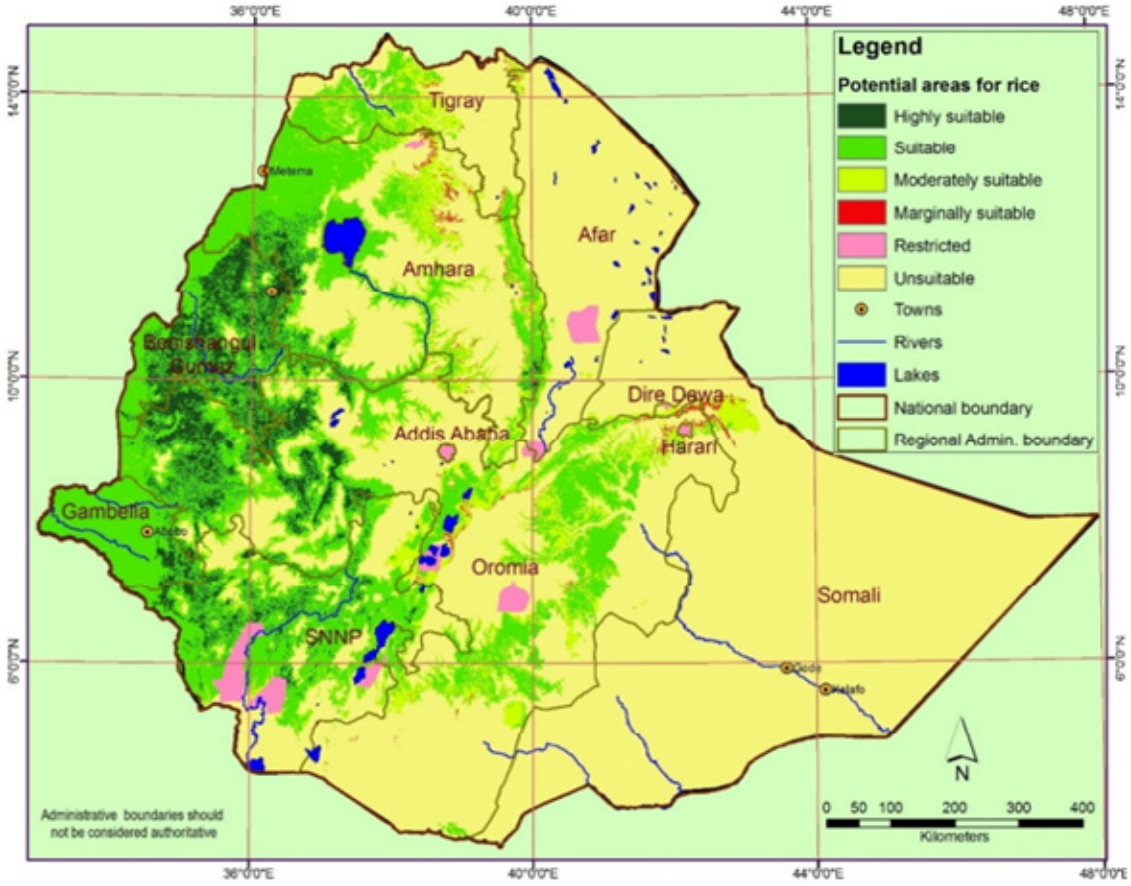
Table 1 Chronology of the introduction of rice to the Fogera region

Period	Rice-related event/location	Actors	Achievement
1973	Rice testing in Gambella, which marks the start of rice research in Ethiopia	Institute of Agricultural Research/ EPID	Upland rice variety 'EX Pokwo' tested
1982	Trials on irrigated rice for yield nursery for medium duration at Gambella	IRRI International Rice Testing Programme (IRTP)	Lines RP1125-1548-1-4-3 and RP1125-1526-2-2-3 from India were tested
1984–91 1996–98	Testing of improved rice varieties and training for local experts on variety development at Gambella	Japan International Cooperation Agency(JICA)volunteers	Promotion of rice as staple cereal as well as cash crop
1985	Start of publicly funded formal rice research with the establishment of the Pawe and Abobo Research Centres	Pawe Agricultural Research Centre (PARC) and AboboAgriculturalResearch Centre (AbARC)	Promotion of large-scale rice production linked with the massive resettlement programme in both the Pawe and Gambella areas
1988	Large-scale rice production	Tana BelesProject	Adaptation trials on Upland rice and identified IAC-164, IAC-147, and IRAT-216 as promising
1993	Reinitiating rice research for Pawe area	PARC	Formal release of Pawe 1 (M-55) variety for Pawe area in 1998
1991	Initiation of rice research at Fogera Plain	AdetAgriculturalResearch Centre (AdARC)	Started rice variety release in 1999 (Gumara, Tigabe, and Kokit)
2010	National strategy for rice research and development in Ethiopia	Ministry of Agriculture and Rural Development (MoARD)	National strategy (2010–19)
2012	Establishment of National Centre of Excellence for rice research	National Rice Research and Training Centre (NRRTC) atFogera	Domestic capacity building in research

Source: Authors' own, 2018.

and intermediate areas demonstrates the opportunity the crop creates for poverty reduction in these target ecologies (Figure 1).

Figure 1 Agro-ecological suitability map for rain-fed rice production



Source: MoARD, 2010

3 STATUS OF RICE RESEARCH AND DEVELOPMENT IN ETHIOPIA

Rice R&D in Ethiopia received due attention following the considerable expansion of small-scale farmer-led rice production, recognition of the potential of production in the country, and the quest for rice import substitution, given the huge increase in the amount of imports over time. This is manifested in the development of the *National Rice Research and Development Strategy* in 2010 by the Government of Ethiopia (MoARD 2010). In the following section, we present the historical trends in the development of formal rice research in the country, alongside rice sector development efforts linked to the commercialisation of the sector.

3.1 Rice research

In 1985, formal rice research started with the establishment of the Pawe and Abobo research centres linked to settlement programmes, despite prior testing for the adaptability of rice varieties as early as 1975. The start of formal research also marks the start of commercial rice production under small-scale farming. This was followed by the engagement of rice research by AdARC following the introduction of rice by North Korean scientists, and the promising results of rice production. The Abobo, Adet, and Pawe Research Centres were under the former Institute of Agricultural Research (IAR), which was renamed as the Ethiopian Agricultural Research Organisation (EARO) in 1997, which is now the Ethiopian Institute of Agricultural Research (EIAR). This was linked to the establishment of regional agricultural research institutes and the move of the Abobo and Adet research centres to be managed by the Gambella Agricultural Research Institute (GARI) and the Amhara Regional Agricultural Research Institute (ARARI), respectively. Initially, PARC had the mandate to coordinate rice research nationally, which was moved to AdARC following decentralisation. With the establishment of a National Centre of Excellence for rice at Fogera in 2013, the mandate moved to the National Rice Research and Training Centre (NRRTC).

In general, Ethiopia's rice research is connected to Africa Rice (the former West Africa Rice Development Association (WARDA)) and the International Rice Research Institute (IRRI) through direct engagement in germ plasm exchange, variety testing, and capacity building. A project called EthioRice, supported by the Japan International Cooperation Agency (JICA), has been engaged both technically and financially to make the NRRTC fully functional in terms of technology generation and capacity building since 2015.

Over time, the number of research centres engaged in rice research has increased, with a considerable number of rice varieties being released. Even though there are diverse rice agro-ecologies, the *National Rice Research Strategy* (2016–30) targets three major rice-growing ecosystems, namely rain-fed lowland, rain-fed upland, and irrigated. The first two ecosystems are mandated for the FNRRTC, PARC, the Assosa Agricultural Research Centre (AsARC), the Jimma Agricultural Research Centre (JARC), and the Tepi Agricultural Research Centre (TARC). The mandate for the irrigated ecosystem has been assigned to the Gode Pastoral and Agro-Pastoral Research Centre, the Werer Agricultural Research Centre (WARC), and the Mehoni Agricultural Research Centre (MARC) (EIAR 2017). The overall responsibility of national rice research coordination is given to the FNRRTC.

Since the start of rice research, the national research system has released 17 varieties for upland agro-ecology, 5 varieties for lowland agro-ecology, and 7 for irrigated agro-ecology (MoANR 2016). The release of these varieties is associated with the close collaboration of the National Rice Research Programme with Africa Rice and the IRRI. Recognising the importance of rice research, Ethiopia became a formal member of Africa Rice in 2016. In addition, Ethiopia has been a member of the Coalition for Africa Rice Development (CARD) initiative since 2010, which targets the support of African countries to boost rice production and productivity.

3.2 Extension services and trends in rice production practices

Different approaches and practices of the extension services have been provided as one of the public services in the development of the agricultural sector. In general, the extension services are guided by the respective extension packages developed by the MoANR (Ministry of Agriculture and Natural Resources) at federal level, which are demonstrated through Farmers' Training Centres (FTCs) and model farmers by

the development agents that are found at *kebele* level, the lowest administrative unit (MoANR 2017). The rice extension package provides the list of technological options in terms of varieties, land preparation, chemical and other fertiliser application, cropping systems, plant protection, harvesting, and post-harvest management (MoARD 2015).

4 THE FOGERA PLAIN AND RICE COMMERCIALISATION

4.1 Rice commercialisation and dynamism in rice-based farming systems

There are two rice production agro-ecologies in the Fogera Plain – wetland (or lowland) and upland rice – both of which are cultivated under rain-fed conditions. Farmers categorise these agro-ecologies as *'Wedek meret'* for the wetland rice production and *'Goba meret'* for the upland rice production. Both agro-ecologies present different dynamism in terms of farming systems. The overall dynamism of the farming systems in Fogera Plain in both farming systems was assessed based on farmers' perception of using proportional pilling techniques of average importance for the livelihoods of farm households.

4.1.1 Farming systems dynamism in the wetlands *(Wedek meret)*

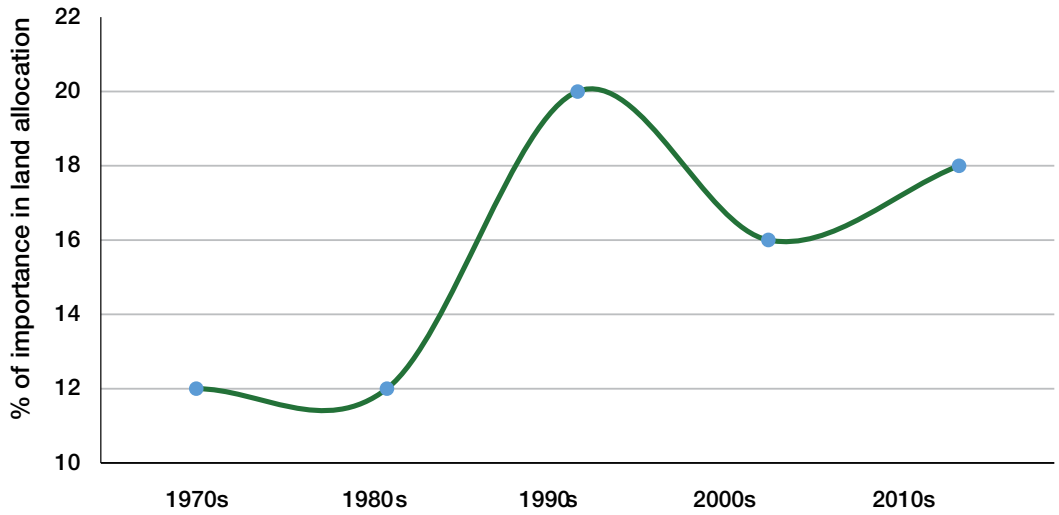
The wetlands were areas where rice was first introduced into the region. Before that time, land use was dominated by extensive grazing of the indigenous Fogera cattle breed, which has a large frame, copes with waterlogged conditions, and is one of the best native milk cows in Ethiopia. The area used to be largely characterised by swamps in the rainy season for about a quarter of the year, after which it was devoted almost exclusively to grazing.

The identification of wild rice by the North Korean scientists in the wetlands of the Fogera Plain, and the subsequent introduction of a cultivated rice variety, shifted the dominant land use activity from cattle grazing to rice cultivation. As the rice cultivation expanded (Figure 2), the land used for grazing of the Fogera cattle and production of other crops began to shrink, resulting in significant changes in local farming systems. According to focus group discussions with local farmers, the following trends were observed.

As rice has grown in importance in the farming system, there has been a significant decline in the production of niger seed, chickpea, wheat, and oats in the wetlands. The production of niger seed in the wetlands ended towards the end of the 1990s following the expansion of rice production. Teff production also declined dramatically, but still exists in pocket areas, given the traditional attachment to the crop and the relatively high price it fetches in local markets (Figure 3).

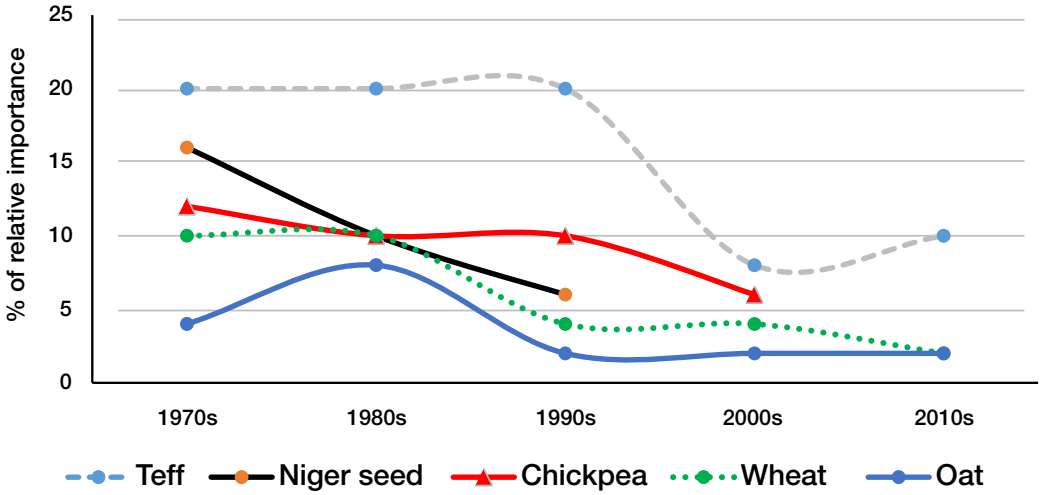
The second trend found in the farming system is related to the emergence of grass pea production and a gradual increase in area coverage (Figure 4). This is linked to the fact that grass pea serves as a good successor crop to rice, allowing double- or triple-cropping, along with its role in improving soil fertility. The nature of cultivation of the grass pea with rice has allowed farmers to consider

Figure 2 The increasing importance of rice in the wetlands of the Fogera Plain



Source: Authors' own, based on data from focus group discussion with stakeholders, 2017.

Figure 3 The declining trend of importance of selected crops in the wetland of Fogera

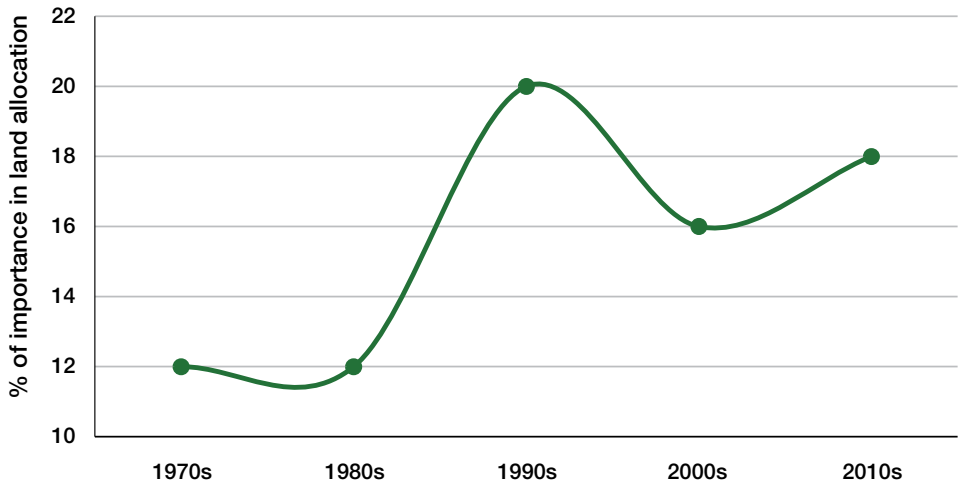


Source: Authors' own, based on data from focus group discussion with stakeholders, 2017

it as a second crop. In this regard, farmers practise two approaches. The first is intercropping with rice and the second is planting grass pea before the rice fully matures, where the grass pea grows further after the rice is harvested.

sizes. As rice cultivation has expanded, farmers have started to move their cattle to upland areas in search of feed, which has led to interbreeding with upland cattle and the deterioration of the genetic quality of the Fogera breed. This phenomenon has raised concerns about

Figure 4 Increasing trend in the importance of grass pea in the wetlands of Fogera

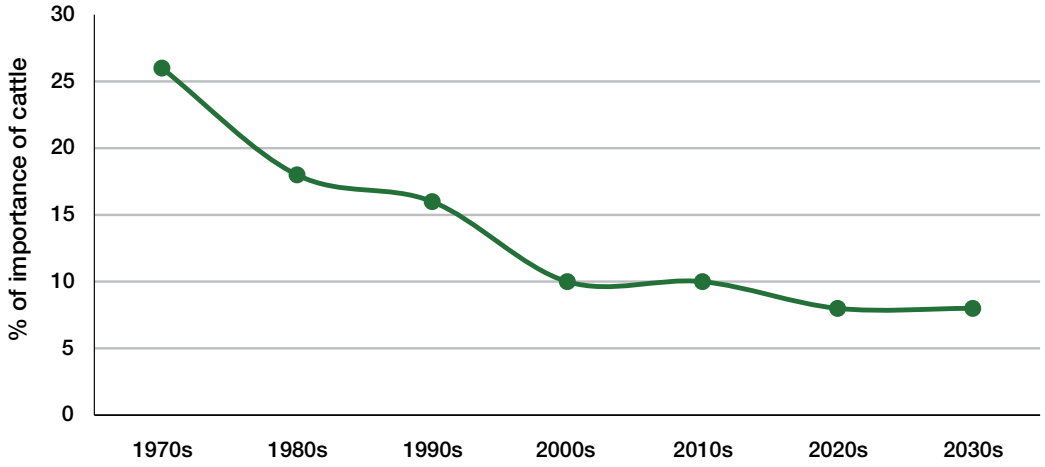


Source: Authors' own, based on data from focus group discussion with stakeholders, 2017.

The third trend is related to the gradual decline in the importance and contribution of cattle-rearing for the livelihoods of farmers in the wetland areas of the Fogera Plain (Figure 5). This is associated with a decline of grazing land available. The Fogera breed, one of the best local breeds in the country for both milk and meat, which used to dominate the herd composition in the area due to its capacity to adapt in waterlogged areas, has started to diminish in terms of number and also breed purity. Over the last three decades, the replacement of communal grazing lands with privately held lands for rice production has prompted farmers to reduce herd genetic erosion for the Fogera cattle as cross-breeding has continued over time. In sum, the expansion of rice production in the wetlands of the Fogera Plain over the last four decades has resulted in declining grazing lands, a shrinking of the cattle population, and the genetic deterioration of the Fogera breed.

The fourth trend observed in Fogera is related to the emergence of new crops such as vegetables and maize in the wetlands, which is associated with the expansion of irrigation in the wetlands (Figure 6). As farmers' income from rice has increased, they have started to invest mainly in supplementary irrigation for

Figure 5 Declining importance of cattle in the wetlands of Fogera



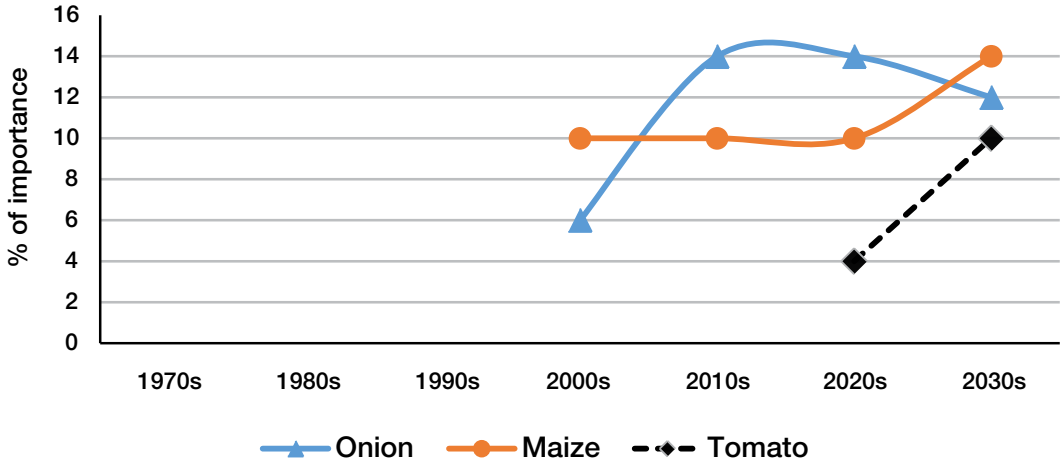
Source: Authors' own, based on data from focus group discussion with stakeholders, 2017.

rice production. This has in turn created the opportunity for the production of other crops 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. The Office of Agriculture has also played an important role in the promotion of household-level investment in irrigation systems. Normally farmers use irrigation to supplement rain-fed rice production and fully for onion, tomato, and maize, which is often undertaken after the harvesting of rice and grass pea. This has provided more opportunities for diversification for the farmers and generation of supplementary incomes.

The last trend noted is the emergence of new agricultural practices in the wetlands that are associated with the production of new crops, mainly grass pea and vegetables linked to the expansion of rice production. These practices include double- and triple-cropping systems, which are practices rarely known before the introduction of rice some three decades ago. Double-cropping is related to the production of rice followed by grass pea, chickpea, maize, or oats, while triple-cropping is in areas where there is access to irrigation, and by which farmers produce vegetables after double-cropping.

These trends indicate that farmers in the wetlands of the Fogera Plain have increased their level of commercialisation through (1) increased rice production and marketing, (2) engagement in commercial crops such as vegetables, and (3) diversification of crop production for improved commercial orientation and livelihood options, such as vegetables, grass pea, chickpea, and maize. At the same time, there has been a significant decline in communal grazing land for the region's indigenous cattle, and a measurable drop in the production of teff.

Figure 6 Trends in the emergence of new crops in the wetlands of Fogera



Source: Authors' own, based on data from focus group discussion with stakeholders, 2017.

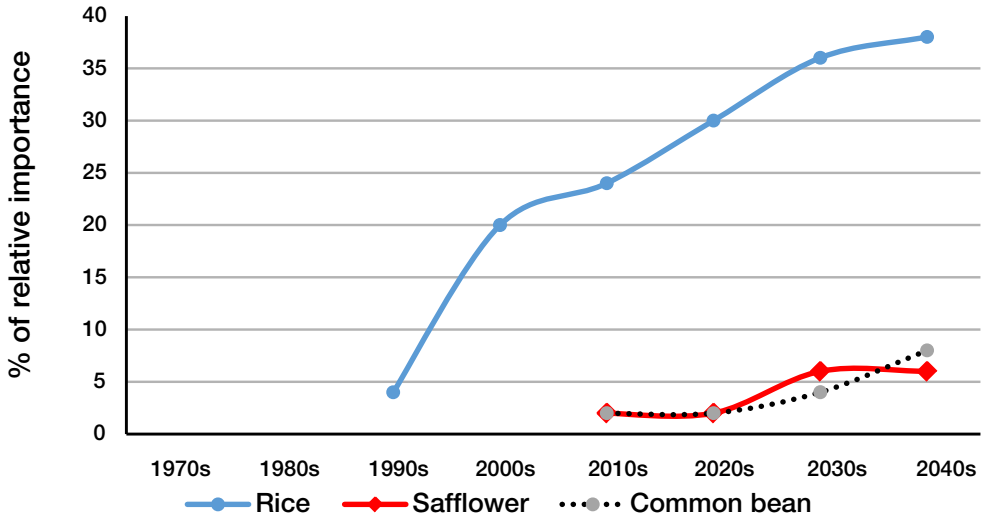
4.1.2 Farming systems dynamism in the uplands *(Goba meret)*

Rice production in the uplands began recently in 2006, following the introduction of upland rice varieties by the national research system (there were four upland rice varieties released before – see MoANR 2016), and with the benefits of rice production felt by farmers, in the wetlands with plots of land in the upland areas of the Fogera Plain. In general, upland areas used to be characterised by mixed crop-livestock farming systems where diverse types of crops are produced. With the expansion of rice in the upland areas of the Fogera Plain (Figure 7), the following trends were observed.

The first trend is related to the considerable decline in the production of teff and sorghum from cereals, niger seed from oil crops, and lentil from pulses, due to the shift in land allocation to rice (Figure 8). This is reported to be due to the relatively high economic returns that rice provides per unit area versus other crops.

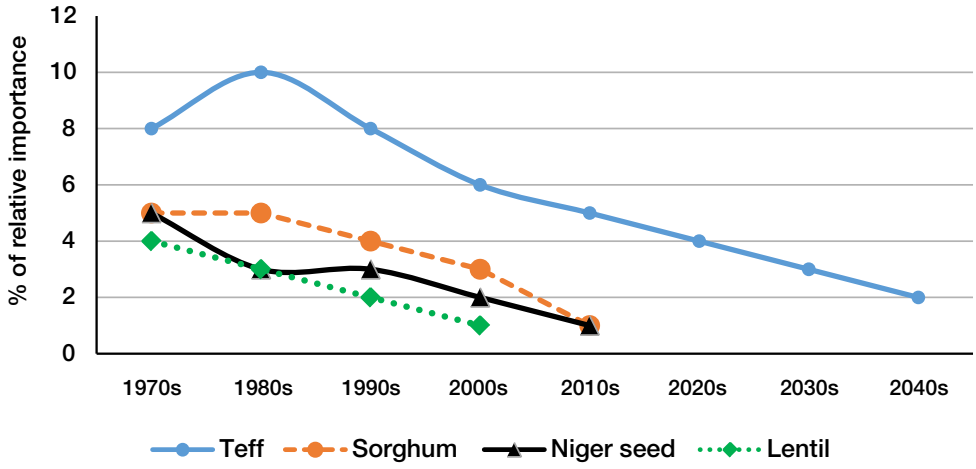
The second trend is the relative increase in the production of grass pea, finger millet, maize, and chickpea and the introduction of common beans, which is reported to be associated with the expansion of rice (Figure 9). Farmers reported that these crops are good successor crops after rice favouring double-cropping practices.

Figure 7 The increasing importance of rice, safflower, and common beans in the uplands of the Fogera Plain



Source: Authors' own, based on data from focus group discussion with stakeholders, 2017.

Figure 8 Declining trends in the importance of crops in the uplands of Fogera

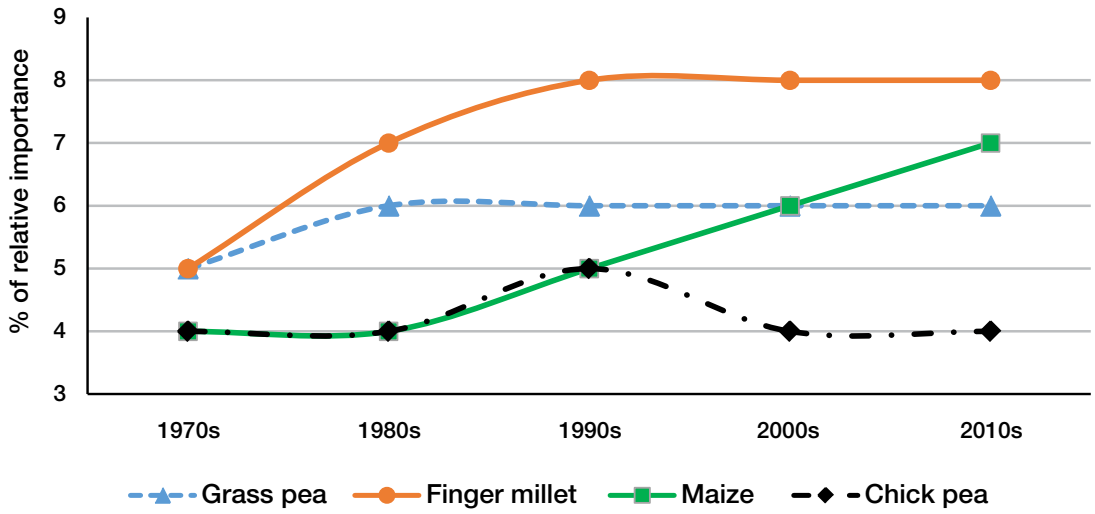


Source: Authors' own, based on data from focus group discussion with stakeholders, 2017.

The last trend is the considerable decline in livestock production in the uplands of the Fogera Plain. The expansion of rice is also linked to the expansion in overall crop production associated with population pressure, and has demonstrated a trend of considerable decline in the importance of livestock (Figure 10).

production in the Fogera Plain are X-Jigna and Gumara, which have been under production for several years. X-Jigna is a variety considered as local, and which was introduced to the area in the early 1980s. The New Rice for Africa (NERICA) varieties are still on their way to being adopted.

Figure 9 Increasing trend in the importance of selected crops in the uplands of Fogera



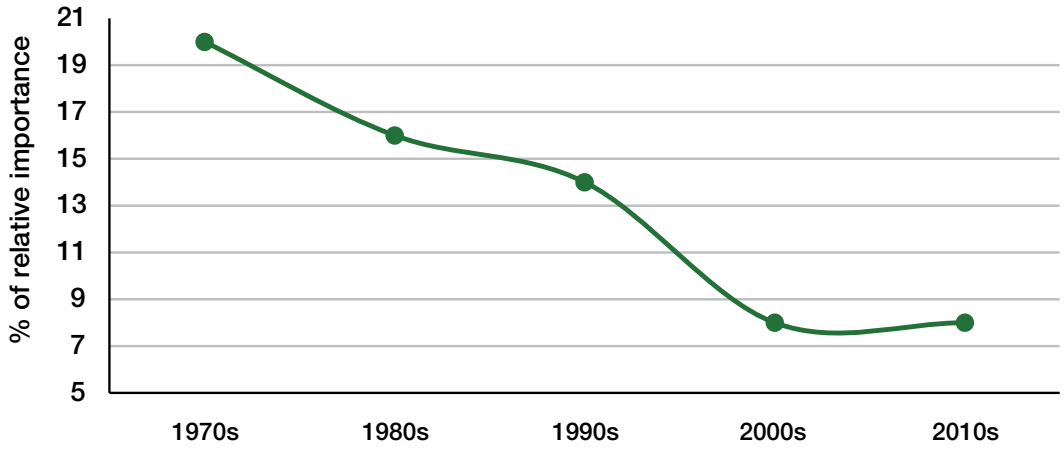
Source: Authors' own (2017).

4.2 Rice production practices

In the Fogera Plain, farmers have their own production practices which they have developed over recent decades, and which shows diversity in the adoption of recommended practices and use of rice-related technologies as promoted by government extension services. The assessment indicates that although there are different varietal options, the popular variety under

The most common source of seed for rice was recognised to be market and direct farmer-to-farmer seed exchange. Farmers sell rice at the market to which other farmers also have access and purchase as seed. Research centres and cooperatives are also essential sources of improved rice variety seeds. Once the farmers get the initial seeds from other sources, they maintain the seed from their own production for subsequent seasons. A study in the Fogera area shows

Figure 10 Declining trend of importance of livestock in the uplands of Fogera



Source: Authors' own, based on data from focus group discussion with stakeholders, 2017.

that the primary source of rice seed for 88 percent of farmers is the local market. Another source of seed was reported to be the Office of Agriculture, which promotes improved rice varieties through its regular extension programmes. The study also identified common problems related to access to improved variety seeds (reported by 24 percent of the farmers), varietal mixture (74 percent), physical impurity (41 percent), and poor germination (19 percent) (Meron 2016). In recognition of these challenges, a number of initiatives have been implemented through the public extension programme and different development partners, including MEDA (Mennonite Economic Development Associates) and AgroBIG (the Agro-Business-Induced Economic Growth Programme), to ensure availability and access to quality seed of farmer-preferred improved varieties of rice.

Farmers practise both broadcasting and row planting of rice (direct row seeding or transplanting). Farmers interviewed during the reconnaissance survey estimate that more than 80 percent of rice producers have adopted row planting, though expert estimates show the extent could be much lower. They also explained that pre-germination planting is becoming a popular innovation by farmers, to facilitate growth and early maturity. Even though it is not yet common, transplanting is practised by a small but growing number of farmers (about 5 percent), especially linked with row planting.

One of the most labour-intensive operations in rice production is weeding, which is severe, especially in the wetlands, requiring engagement of the whole household, including children aged 7 years and above, while well-to-do farmers engage hired labour. Weeding is typically done three to four times per season and farmers estimate that this alone accounts for about half of the total cost of production. Apart from hand-weeding which is practised by all farmers, chemical application is also practised by less than 10 percent of producers. The use of simple hand tools, such as the sickle, is also one of the mechanisms by which nearly half of the rice-grower farmers remove weeds from rice fields.

The productivity of rice is determined by the extent of management practices employed by farmers, such as timeliness and frequency of weeding, the use of improved varieties, row planting, bund construction, the use of fertiliser, and others. Even though the national average productivity of rice is estimated at 2.8 t/ha (FDRE CSA 2017), it is reported to be more than 4 t/ha in the Fogera Plain. Over time, the quantity of rice being sold at the market is increasing, mainly driven by rising prices due to growing demand. This has stimulated further farmer investment in production and the area cultivated under rice in both wetlands and uplands. According to discussions with Office of Agriculture experts, the rice area and production are increasing at a rate of 10 percent per annum.

The quantity of inorganic fertiliser applied to rice fields was reported to be a key factor in enhancing productivity levels. However, discussions with farmers indicated that most of the producers did not apply the recommended quantity of fertiliser, due to the perception that flooding-caused erosion in the uplands brings nutrient-rich silts to the wetlands. Because of this, they believe that their rice fields are fertile and that they should apply a lesser amount of fertiliser despite the fact that this has not been supported by research findings. Some of the studies conducted in the Fogera Plain have also reported that rice producers in Fogera District used very small amounts of inorganic fertiliser (Takele 2010). Reports suggest that the most significant weather-related factors affecting rice production in Fogera are flooding and frost in the wetlands, and erratic and insufficient rainfall in the uplands.

Even though rice production in the wetlands is reported to be replacing livestock grazing in the lowlands, its straw is highly valued as livestock feed. Many rice producers use rice straw as animal feed and some also report using it for mattress-making and roof-thatching for animal sheds. According to the report by Meron (2016), about 22 t of rice straw can be produced from 1 ha of land. One t of rice straw costs about Br800 and farmers can generate a gross income of more than Br17,000 from 1 ha of land.

Not only is rice straw used as animal feed, but also rice middling, a by-product from rice milling. Rice middling is better quality animal feed than straw, with a high market value. According to the report by Meron (2016), 18 kg of husk and 2 kg of bran can be produced as a by-product from 100 kg of paddy rice. Furthermore, 30 kg of rice bran, which is mainly used for animal fattening, can be obtained from polishing 100 kg of paddy rice. Local people often use rice husk for fuel as well.

Today, rice is viewed as the most strategic crop in the Fogera area as it allows double- and triple-cropping in a year. Most farmers produce grass pea through inter-planting in rice fields, and chickpea and lentil by planting immediately after rice (Figure 11). They perceive these practices as having two advantages: (1) improving soil fertility and (2) enhancing income through the addition of a second crop.

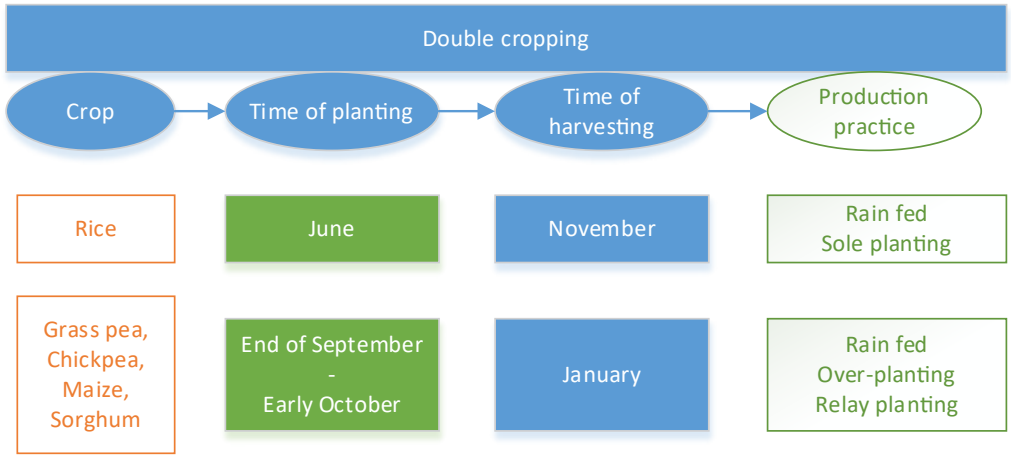
Those farmers who have access to irrigation reported that they were able to produce a third crop in the same field, mainly vegetables (Figure 12). After rice, the sowing

of grass pea is the most common practice reported by more than 80 percent of the farmers interviewed, while close to 30 percent said that they sow chickpea after rice. Rice is planted in June and harvested in November. To ensure adequate moisture, farmers interplant grass pea towards the end of September in the fields during the grain-filling stage of rice. By the time rice is harvested in November, the grass pea has already germinated. After the harvesting of grass pea towards the end of January, some farmers with access to irrigation also plant vegetables, such as onion and tomato in February, which are often harvested in May, before commencement of the next season of rice planting in June.

4.3 Rice processing

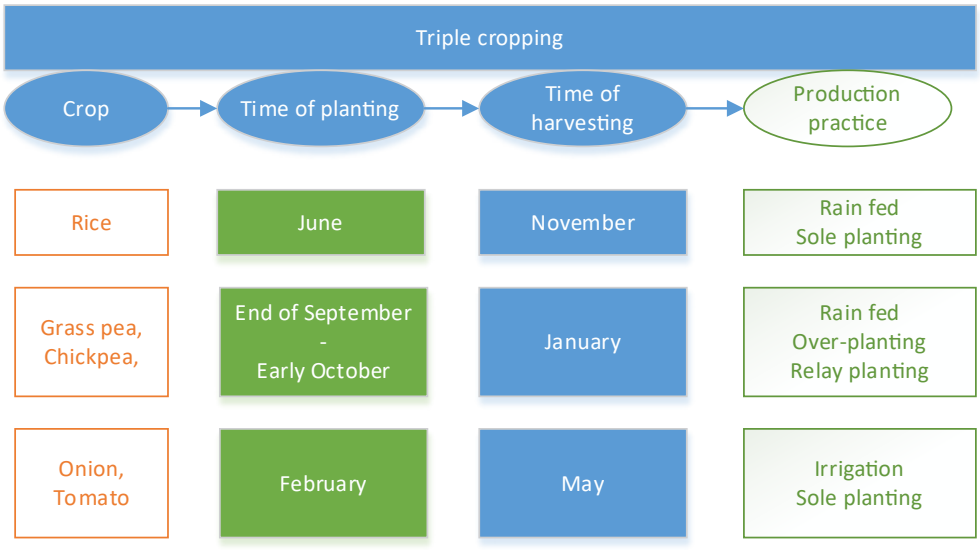
The nature of the rice crop demands processing related to de-husking and milling before it is ready for consumption. When rice was first introduced into the Fogera area, farmers used to process it using traditional methods that are commonly used for other cereals – i.e. by using locally available hand tools made of wood, and grain mills made of stone. Gradually, private operators with grain-milling machines moved into the area and began to process the paddy rice, which were not designed specifically for rice processing. It was in 1987 that the Ministry of Agriculture introduced an appropriate rice-processing machine to the area

Figure 11 Double-crop practices under rain-fed conditions



Source: Authors' own.

Figure 12 Triple-cropping practices under irrigation



Source: Authors' own.

through a producers' cooperative, which was the first attempt to demonstrate to local rice producers how paddy rice can be de-husked and milled efficiently.

The first individual to start providing rice-processing services to the rice-producing farmers was Addis Yebrie, who installed a processing facility at Woreta Town in Fogera in 1990. This was followed by Mohammed Eshete at Yefag kebele of Libo Kemkem District, who subsequently installed a processing facility.

processed products (de-husked rice), which enables them by default to dominate the marketing and to set prices. They buy both processed and unprocessed products from the farmers and once the farmers have got the rice-processing service from the processors, unless they are going to consume the products, they often sell the de-husked rice to the same processor. All processors located in towns usually set similar prices and charge similar fees for their processing services, avoiding price competition.

Table 2 Number of rice processors in the Fogera Plain by woreda and operator type

		District			
Indicator	Location/ownership	Libo Kemkem	Fogera	Derra	Total Fogera Plain
Number of rice processors	Urban areas	23	70	18	111
	Rural areas	3	3	2	8
	Total	26	73	20	119
Number of rice processors by operator type	Private operators	25	72	20	117
	Cooperative managed	1	1	-	2
	Total	26	73	20	119

Source: Authors' own, based on data from 2017 survey.

The number of processors that provided services to the farmers increased to ten by 2009 and to 26 by 2017 only in Libo Kemkem District, which is one of the three districts in the Fogera Plain. The number of registered rice processors as of November 2017 was 119 in the Fogera Plain (Table 2) (this figure has since increased to 143 processors as of September 2018). These impressive trends show the increased demand among rice farmers for value addition and have created a major local business opportunity. The majority of rice processors provide paddy rice de-husking and cleaning of bran, and a limited number of processors provide a rice-grain-milling service.

About 87 percent of the machines providing rice-processing services to the rice producer farmers were found to be old and inefficient. Consequently, farmers complained about the poor service they received from the processors as the processed grain from these machines is generally of a low quality. Only 13 processing machines identified during this study were built for rice processing, with the capacity to provide additional services such as grain-milling. Other milling machines were originally built for the milling of grains only. Grading of the processed product is not a common practice in the area.

Rice processors are not only service providers in the rice value chain; they also act as buyers and traders of the

Rice-processing charges are often determined based on the relationship between the farmers and processors. In general, service charges are based on the sale arrangement between the farmer and the processor for the processed product and by-product. The different options for sale arrangements are presented in Table 3 with the type of service provided, service charges levied, and the farmers' preferences. In general, service charges are the function of the form of the business arrangement a farmer has established with a local processor. These are influenced by the type of produce sold – either as paddy or processed rice or, in some cases, by-product – and the nature and extent of the relationship they have built with the processor.

Some processors are also involved in the provision of credit to farmers, who are often short of finance during the rice-growing season. These arrangements allow processors who provide credit to buy the rice at the prevailing price at the time of harvest, which is often low.

With the diverse type of services provided by processors, farmers reported the considerable extent of breakage of rice grain in the course of de-husking, which largely causes quality deterioration and reduces marketability. In addition, farmers also reported the frequent misconduct of processors in determining the weight of rice.

Table 3 Processing service arrangements and practices

Service provided	Product exchange relationship	Service charge	Remark
De-husking	Farmers do not sell the de-husked rice	0.40 ETB/kg	• Farmers demand the service for the purpose of making injera • Limited role for farmers' commercial orientation • Processors have limited interest in providing such a service as the husk is a burden for them • Often the service is provided to maintain business relationship
De-husking and polishing	Farmers do not sell the de-husked rice, but sell the husk with bran	0.30 ETB/Kg	• Processors prefer the arrangement • High possibility of poor de-husking by processors to increase the volume of husk with bran
	Farmers sell the de-husked rice and the husk with bran	Free service	• Possibility of poor de-husking by processors which increases the volume of husk and bran • Processors prefer the arrangement • Less preferred by producers
Purchase of paddy rice	Own-product processing		• The most preferred arrangement for processors

Source: Authors' own, based on data from 2017 survey.

The main reasons for grain breakage and a low recovery percentage of milled rice, which is reported to be 75 percent for de-husked rice (brown rice) and 65 percent for milled rice (white rice), are related to:

- **The quality and efficiency of the machinery:** this is related to the unavailability of standard milling machines that reduce the extent of breakage of rice during de-husking and milling, and also the use of very old and inefficient machines.
- **The inadequacy of the skill of machine operators:** in general, the machine operators, who are often owners themselves, are not formally trained. This sometimes leads to poor-quality processing of the grain.
- **Deliberate action by processors in gaining price advantage:** this is one of the most common practices in the rice market where the price of poorly milled rice and better milled rice are more or less the same, as most consumers use the milled rice to make flour rice for injera. The processors, who also act as buyers of the milled rice, buy the poorly milled rice at a lower price but later sell it at a higher price as rice flour.
- **The poor quality of paddy rice supplied by farmers:** this often lacks uniformity in grain size and lack of proper moisture content. Processors complain that this creates a challenge to make adequate adjustments of their machines to process the grain consistently, leading to high levels of breakage and loss. In general, farmers adapt rice-drying based on their familiar drying practices for teff and wheat, where teff and wheat grain need to be well dried. In the case of rice, appropriate moisture is around 15 percent, but rice harvested in Fogera seems to have a moister content of around 10 percent. This is mainly due to late harvesting, and being kept in the field for a long time after it is harvested.

Farmers also reported that processors exhibit misconduct in determining the weight of rice supplied as paddy, but also as de-husked and milled rice. In general, weighing machines are not calibrated accurately (if at all), which allows processors to gain an unfair advantage by deliberately under-estimating the weight of the rice supplied by producers. The contribution of processors in facilitating the commercialisation of smallholder rice farmers through the different forms of service provision requires further investigation, especially in relation to which types of farmers are benefiting and which are losing out.

4.4 Trends in rice marketing practices

Linked with the shift of rice from a typical food crop, particularly in the early years of its introduction in the lower wetlands of Fogera Plain to a cash crop in both the wetland and upland areas, the type and number of actors engaged in the rice value chain has increased

considerably. This has provided diverse options for the farmers in terms of value addition and marketing channels, which is reported to enhance the commercial orientation of smallholders. Previous studies show that from 2010 to 2016, the proportion of produced rice sold has increased from about 75 percent to 98 percent (Takele 2010; Meron 2016), which indicates that the crop in the Fogera Plain has become a key cash crop.

The marketing practices of smallholder rice farmers in terms of type of product sold, time of sale, access to market information, storage practices, and role in price setting is summarised in Table 4. The key issues related to the marketing practices presented are: (1) how the different practices benefit farmers, (2) how the different practices are related to the commercial orientation of farmers, and (3) how the provision of market information influence smallholder farmers' marketing practices.

Marketing practices are also related to the variousmarketing channel options that have developed over the years. Three issues were found to be important in influencing the channels. These are (1) the requirement for the producers to obtain the services of processors if they want to sell milled rice, (2) the dual role of processors as millers and traders, and (3) the limited incentives for quality product, which is influencing the product-type options and marketability. The quality of processed rice does not provide price incentives as the broken rice is also more or less equally priced to the higher quality, de-husked rice.

Figure 13 presents the marketing channelsfor rice in the Fogera Plain. Interviews with rice farmers revealed that most of the rice farmers sell to local processors.

However, an emerging trend shows that the role of paddy rice collectors and par-boilershas increased over time as alternative marketing options for farmers. Some processors operate as traders in addition to the processing service they provide, and they channel the processed rice either through brokers or directly to wholesalers and retailers. The processed rice marketing through brokers is often sold to wholesalers in distant markets such as Gonder, Dessie, Mekele, and Addis Ababa.

Produce par-boiled rice packed in different size Table 5 outlines the key actors involved in rice marketing in Fogera, with a brief description of their characteristics and the main roles they play.

Table 4 Rice producers' marketing practices

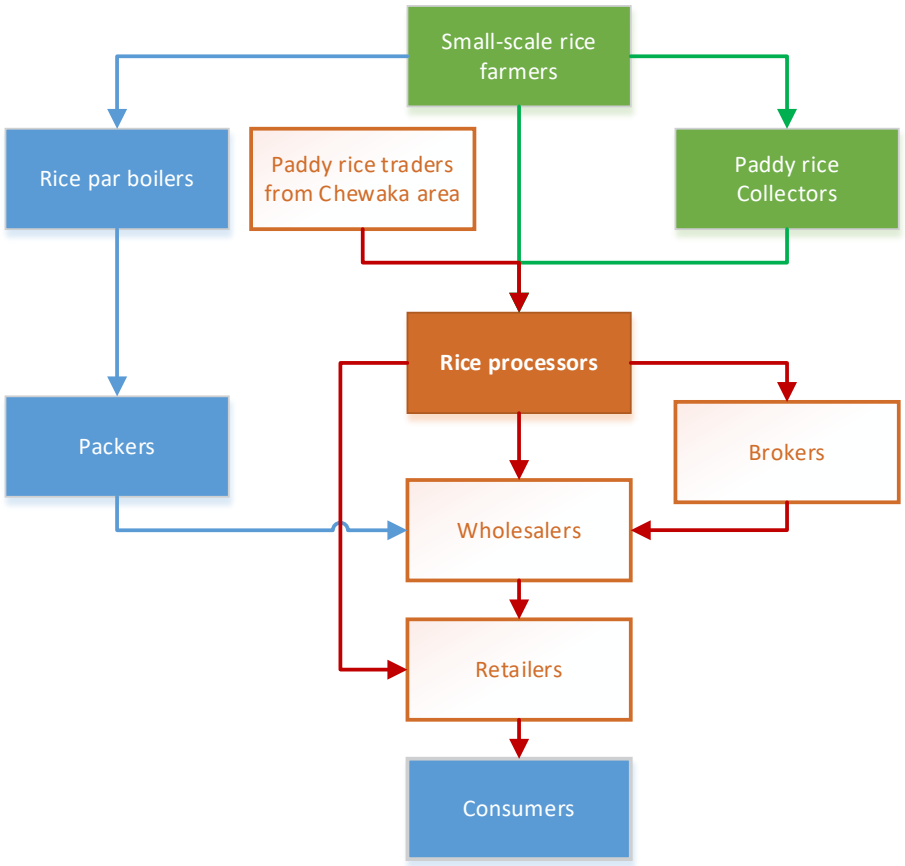
Indicator	Common practice
Type of product sold by farmers	• Farmers sell either paddy rice or milled rice. It is estimated that the higher proportion of farmers sell after getting the paddy processed.
Time of sale	• Most of the rice producers sell rice immediately after harvest,primarilylinked to challenges of storage mainly during the months of October, November, and December.
Access to market information	• Price data posted on kebele-level notice boards based on price data collected every Saturday by the District Trade Office. • Information from processors, traders, and cooperatives can be accessed viatelephones or direct visits.
Storage practices	• Very few farmers store rice using locally made storage structures, such as silos or plastic bags, potentially increasing post-harvest losses
Price setting	• Processors often offer a flat price, irrespective of the quality of the finished product • In general, farmers are 'price takers'; however, better access to mobile phones has increased their bargaining power innegotiating prices with different processors and buyers.

Source: Authors' own, based on data from 2017 survey.

4.5 Support services and actors

In addition to the direct actors within the rice sector, there are a number of support service providers mainly engaged in facilitating innovation in the sector through research, demonstration, and capacity development for farmers and other actors. A detailed list of actors along with the main services provided is provided in Table 6.

Figure 13 Rice marketing channels in the Fogera Plain



Source: Authors' own.

Table 5 Characteristics and role of actors in rice marketing channels

Actor	Characteristics	Role
Paddy rice collectors	Village-level operation on behalf of processors	• Operate as aggregators • Often they are themselves rice producers
Processors	Private processors	• Provision of processing services (de-husking, bran cleaning, and milling) • Purchase main product and by-products (operate as traders)
	Cooperatives	• Provision of processing services (de-husking, polishing, and milling)
Traders	Wholesalers and retailers	• Market processed rice to other traders in distant markets or to local consumers • There is an emerging trend that paddy rice traders from Chewaka sell to processors in Fogeraespecially when there is short local supply
Brokers	Operate on commission basis	• Link processors with wholesalers including those in distant markets • Also facilitate transport services
Par-boilers and packers	Emerging actors	• Produce par-boiled rice packed in different size

Source: Authors' own, based on data from 2017 survey.

Table 6 Support service providers in the Fogera Plain and type of services

Area of support	Organisations	Details of support provided
Improved rice varieties and demonstration	Fogera National Rice Research and Training Centre (FNRRTC)	• Generates and demonstrates new improved rice varieties and appropriate agronomic practices to farmers • Provides pre-basic seeds to seed producer enterprises and seed producer cooperatives • Empowers rice farmers, agriculture experts, and other stakeholders in providing various types of trainings on improved practices of rice production and management • Conductsdifferent types of rice-based studies and generates information that can be used for further research, development, and policy revision or formulation
Access to quality seed of improved varieties	Public seed enterprises (Amhara and Ethiopian Seed Enterprises – ASE and ESE)	• Though limited, supply certified seed of improved varieties mainly through cooperatives
	Seed producers' cooperatives	• Produce seed of preferred varieties • Often produce seed under contract arrangement with public seed enterprises
Access to other inputs	Private operators	• Supply farm tools, agro-chemicals, and rice milling machine (such as Robit International Business Group Plc)
	Cooperatives	• Chemical fertilisers and other agro-chemicals
Extension	MoANR(FTCs, *woreda,* zone, and regional Bureau of Agriculture and natural resources)	• Provide extension services to rice farmers, such as trainings on improved practices, create access to improved varieties, close supervision, and farm-level supports • Provide market information on price of rice • Links rice farmers with other stakeholders, such as seed producers, research centres, NGOs, etc.
	Development supported projects (EMERTA, Agro-BIG, MEDA) and NGOs (SasakawaGlobal 2000 and others)	• Build the capacity of farmers and cooperatives through donation of rice milling machines and various types of farm tools • Provide ranges of knowledge and skill enhancing trainings for rice farmers, agriculture experts, and other stakeholders • Introduce new technologies, such as rice par-boiling techniques and value addition, and others
Access to finance	Amhara Credit and Saving Institute (ACSI)	• Provide access to credit services for farmers to purchase inputs, such as fertiliser and seed
	Processors	• Pre-finance rice production

Source: Authors' own, based on data from 2017 survey.

5 RICE COMMERCIALISATION AND GENDER PERSPECTIVES

Research into rice production generates a number of interesting insights with respect to gender and labour. All household members (men, women, and youths) play important roles in the production of rice, from land preparation to processing. Even though family labour is engaged in the majority of operations, the involvement of hired labour is also substantial, especially for semi-commercial farmers.

Table 7 presents the typical roles and responsibilities ofhousehold members in rice production and marketing. Seed cleaning requires the skills of women and girls and it is considered to be their primary responsibility. The same is true in activities related tostorage and par-boiling. On the other hand, tillage, broadcasting, and top dressing of fertiliser, pest control practices, harvesting, irrigation, and drying are identified to be the responsibility of adult men and male youths.

The roles for youth (both boys and girls) are substantial in rice production alongside their parents. In the Fogera area, children from the age of seven are engaged in various farming operations depending on their physical capacity. At age 14, boys are able to plough land, while girls shoulder considerable responsibilities within the household.

In spite of the substantial contribution of women to rice production, operations, sales, and control of incomes from the sale of rice largely remains the domain of men. Furthermore, cash income is controlled by men, which has both positive and negative consequences. On the positive side, many men have invested profits from rice sales into improvements forthe farm (e.g. irrigation, oxen). On the negative side, some men have also spent their surplus on unproductive activities, such as drinking alcohol, which was reported to bean increasingly common practice as they visit nearby towns to socialise.

Table 7 Gender roles in rice production

Gender groups	Extent of responsibility			
	Sole roles	Higher involvement	Equally shared roles	Less participation
Women	Seed cleaning	Pre-germination, constructing rice storage structures, par-boiling	Bund construction, row planting, transplanting, row fertiliser application, weeding,	Land clearing, pest control, irrigation, rouging, harvesting, drying, hipping, threshing, rice marketing
Men	Tillage, sowing/ broadcasting, top dressing, winnowing	Land clearing, pest control, irrigation, rouging (removal of unwanted rice varieties), harvesting, drying, hipping, preparation of threshing field, threshing, rice marketing	-	Pre-germination, constructing rice storage structures, par-boiling
Youth (girls)	Seed cleaning	Pre-germination, roughing, making local rice storage, par-boiling	-	Land clearing, drying, hipping
Youth (boys)	Tillage, sowing/ broadcasting, top dressing, winnowing	Land clearing, pest control, irrigation, roughing, hipping	-	Pre-germination, constructing rice storage structures, par-boiling

Source: Authors' own, based on data from 2017 survey.

6 RICE COMMERCIALISATION AND AGRARIAN CHANGEIN THE FOGERA PLAIN

With the gradual shift of the rice crop as food security to rice crop as a cash crop, several changes have occurred in a number of key areas, including:(1) prevailing production systems, (2) the type and use of agricultural technologies, (3)the type of farmers, (4) rural household members' involvement in off-farm employment, and (5) rural markets and rural–urban linkages.

Changes in production systems: as indicated above, the introduction of rice and its commercialisation has changed the production system, especially in the wetlands of the Fogera Plain, from livestock-dominated to rice-dominated production systems over the last three decades. With the increased capacity of farmers to invest in irrigation, vegetable production has begunand expanded considerably, which is allowing triple-crop production over a year.

Changes in the type and use of agricultural technologies: farmers reported an increased use of modern agricultural technologies such as higher quality seed of preferred varieties, agro-chemicals (chemical fertiliser, herbicides, and pesticides), and irrigation technologies (water wells and water pumps). As a result, they have increased yields per unit of land and labour. However, there have been reports that this intensification of productionis having a negative impact on soil fertility, leading many farmers to adopt the intercropping of nitrogen-fixing grass pea and some to apply increasing amounts of urea and other artificial fertilisers to sustain their yields.

Changes in the type of farmers: with the expansion of rice production and its commercialisation, there has been a gradual differentiation of farm households in terms of their income levels, farming practices, andassociated investments in their own agricultural lands, and the diversification of their off-farm business engagements. On-farm investments have includedthe expansion of irrigation facilities involving the development of water wells and purchase of diesel water pumps, particularly for the production of high-value horticulture (mainly onion and tomato) and seed crops. Off-farm activities includetrading, agro-processing, andtransport services, where many enterprising farmers have purchased three-wheel vehicles locally known as *'Bajaj',* agricultural product transport vehicles locally called *'Isuzu',* public transport vehicles, mainlyminibuses, and the construction of houses as rental properties in nearby urban centres.

The differentiation in business engagements is related to the shift of local farmers into becoming farmer traders, who are engaged in the paddy rice trade in addition to rice production,or local processors who invest in rice processing. Considering these changes, it is possible to categorise rice farmers in the Fogera Plain into three major types: (1) those who produce and sell rice as their major household activity to sustain their livelihoods, (2) those who produce rice as a commercial activity by investing in agricultural technologies such as improved agro-inputs and investment in irrigation facilities, and (3) those who invest in rice production who use their agricultural income to invest in off-farm businesses (trading, processing, transport, rental properties, etc.). Changes in federal agricultural policies, especially the land redistribution policy of 1998, also contributed to the overall change in the type of rice farmers in the Fogera Plain.

Emergence of a dynamic rural labour market: the expansion and intensification of rice production in Fogera is associated with the emergence of a thriving off-farm labour market. Demand for unskilled rural labour for land preparation, cultivation, weeding, harvesting, product sorting and loading, and other similar activities have grown considerably. Older farmers reported that younger family members without land have found good opportunities in the rural labour market as daily or contract labourers. Labour demand at peak periods of the agricultural calendar (e.g. weeding, harvesting) is so high that migrant labourers are also being attracted to the region. The rural wage ranges from about Br50 per day during harvesting to Br100 per day during weeding. The wage variability is due to the shortage of labour during weeding time, as it overlap with the weeding time of sesame, a much higher paying casual labour in the lowland areas of the north-western part of the country.

Changes in rural markets and rural–urban linkages: the rural input and output markets in the Fogera

Plain have been expanding as rice production and commercialisation has increased and demand for rice and rice products has grown. A dynamicland market has emerged (mainly related to land rent), as well as rural agricultural product markets, private rural services (input suppliers, transport providers, processors, etc.), and brokerage locally called 'Delala'. Though rural land sale is prohibited by law, land rental has become a common practice in the area. Farmers reported that during the 2017 production year, the average land rent was roughly Br12,000 per ha (US$500 per ha). Given the expansion of rural roads, most of the farmers now have the option to sell their agricultural produce in nearby urban centres, giving them the opportunity to secure better prices whencompared to spot sales to local brokers and village markets with a relatively smallnumber of buyers and limited market information. These increased rural–urban linkages have also led to the growth of new transport services to move people and agricultural produce to and from nearby towns, as well as the growth of restaurants, coffee houses, and goods shops.

These changes, driven by the expansion of rice production and commercialisation, have led the Fogera Plain from being considered by both government officials and local people as a land of persistent poverty and food insecurity to a land of surplus with diverse livelihood options. This is the main reason why farmers in the region call rice 'our white gold'.

7 CONCLUSION

7.1 Key trends and findings

The introduction of rice to Ethiopia in general, and tothe Fogera Plain in particular, and the associated commercialisation has resulted in ensuring that food security and positive agrarian changes through increasesin the domestic consumption of rice considerably outweighs the increase in domestic production at national level. In recognising the importance of rice due to the existence of production potential, the compatibility of the crop with the traditional production systems, the benefits related to higher productivity levels and prices, and the quest for import substitution to reduce the burden on foreign currency, rice has received considerable attention in the country's R&D efforts.

The two major agro-ecologies in the Fogera Plain are the wetlands, called locally *'Wedek meret'*, and the upland areas known locally as *'Goba meret'*. The farming systems in both areas have gone through major socioeconomic and agricultural transformations since the introduction of rice. These are related to the change in the composition of type of crops grown, and the introduction of double- and triple-cropping per year and their associated production practices. There has also been a marked change in the importance of livestock, especially the decline in the indigenous Fogera cattle breed, as communal grazing lands have given way to individual plots for rice.

Farmers, in general, have three options for marketing: they can sell to local collectors/farmer traders, rice par-boilers, orlocal processors. The results indicate that the majority of farmers sell their rice mainly to the latter group. Farmers reported that although they often built up long-term relationships with selected processors, they were not always happy with the arrangement due to the poor quality of the finished product, resulting in lower prices for their rice. Some farmers also accused processors of manipulating their scales, leading to inaccurate estimates for the volume of rice bought and sold.

The rapid growth of rice production in the region has stimulated the emergence of a dynamic processing sector, with linkages inboth rural and urban areas. The data show that there were 119 processors operating in late 2017 with a legal licence in the three districts of the Fogera Plain. Processors in the area play a dual role where they provide processing services to farmers andalso act as wholesalers of the processed rice. This has created a very unique role for processors in regard to rice commercialisation in the area.

A number of public agencies, development partners, and NGO actors are engaged in support of rice sector development in the Fogera Plain. The services they provide include: (1) the generation and dissemination of improved rice varieties and appropriate agronomic practices, (2) ensuring better access to quality seed of improved varieties and other inputs, (3) provision of extension services, and (4) facilitation of access to finance. With these trends, a number of observable changes have occurred in the region related to shifts in local production systems (in terms of levels of intensification, diversification, and commercialisation), the type of agricultural technologies used (including new seeds, fertiliser, irrigation, etc.), and the rapid growth of rural markets and rural–urban linkages.

Overall, rice farmers in the Fogera Plain can be categorised into three groups. The first group comprises those farmers who are engaged in rice production with limited change in practices in the production process. The second group are those who have invested to intensify the rice production process and to be more commercially oriented. The third group are those who have expanded their business activities, in addition to rice production, to other investments outside agriculture, such as rice processing, rural transport, trading, rental housing in urban areas, and others.

7.2 Emerging research questions and issues

With the expansion of rice production and its commercialisation, there are a number of issues and questions that require further investigation:

- What are the input and output levels of commercialisation of the different types of rice farmers?
- What are the key factors that influence rice

farmers' decisions to commercialise and diversify their business activities?

- What are the key factors associated with the decline in the importance of livestock in the Fogera Plain? Has commercialisation of rice contributed to the decline or are there other factors?
- How can farmer-led innovationsin rice production, such as intercropping of pulses and the shifts in production systems, be linked with practices recommended by research and extension services? How do these services align with the ongoing rice sector development? How has the uptake of double- and triple-cropping (in conjunction with rice commercialisation) affected the labour and income-control relationships between farm household members?
- How is the prevailing land tenure system supporting or hindering the commercialisation of rice in the area? And who are the winners and losers in rice commercialisation in relation to land? Is land being consolidated for the purpose of rice cultivation? Has the land market become much more dynamic since the introduction of rice?
- What is the extent of adoption of improved technologies and practices and its association with rice commercialisation? What is the performance of the informal and formal rice seed system and its association with adoption of technologies and rice commercialisation?
- How are the different marketing practices of farmers influencing the commercialisation process and farmers' livelihood outcomes – for adult men and women and for young people?
- How are rice processors influencing the rice commercialisation process in the area? What are their key operations and practices? Which practices affect the positive and negative livelihood outcomes of rice processors?
- What are the crucial public services, policies, and regulations that hinder or enhance rice commercialisation? Which groups of farmers are benefiting from these services, policies, and regulations and which are not?

8 ANNEX

8.1 Descriptions of the Fogera Plain by woreda

The Plain of Fogera comprises three woredas, namely Dera, Fogera, and Libo Kemkem woreda. The total rural kebele administrations of the woredas are 104 in number (31 kebeles of Libo Kemkem, 37 kebeles of Fogera, and 36 kebeles of Dera woreda). About 48 percent of the kebele administrations (50 rural kebele administrations) are rice-growing kebeles. The status of rice and other crop production in the three woredas is briefly described as follows.

Libo Kemkem *woreda* has 31 rural *kebele* administrations; out of 31 kebeles, 18 kebeles produce rice (8 kebeles produce upland and eight kebeles produce lowland). The woreda has a total of 46,604 farm households, of which 42,014 are male-headed and 4,590 are female-headed households. Farmers participating in rice farming are 17,384, of which 17,006 are male-headed and 378 are female-headed households. The woreda covered 34.253 ha of land with different crops in the meher season of 2017. From the total area of land covered by crop, 76.73 percent of cultivated land was covered by the following five major crops (see Annex Table 1).

Fogera *woreda* has 33 rural kebele administrations, of which 27 kebeles produce rice. From those kebeles, 21 kebeles produce lowland rice and six kebeles produce upland rice.The woreda has a total of 47,440 households, of which 40,918 are male-headed and 6,522 are female-headed households. In Fogera woreda, 21,945 ha of land were covered with rice in 2017. The total number of farm households participating in rice farming was 40,968, of which 40,579 were male-headed and 390 were female-headed households. The woreda covered 59,513 ha of land with different crops in the meher season of 2017. From the total area of land covered by crops, 91.69 percent of cultivated land was covered by the following five major crops (Annex Table 2).

Dera *woreda* has 36 rural kebele administrations, of which 5 kebeles produce lowland rice. In the woreda, 3,920 ha of land was covered with rice in 2017. The total number of farmers participating in rice farming was 10,682, of which 9,451 were male-headed and 1,231 were female-headed households. The woreda covered 65,308 ha of land with different crops in the meher season of 2017. From the total area of land covered by crops, 79.36 percent of cultivated land was covered by the following five major crops (Annex Table 3).

The major crops being grown in the Fogera Plain are rice, grass pea, teff, maize, and wheat. Over the past decade, rice has become the dominant crop in both area coverage and importance to the household livelihood of the farm community. Of the kebele administrations in the area, 36 kebeles are producing lowland rice and 14 are producing mainly upland varieties.

Annex Table 1 Major crops and number of farmers in Libo Kemkem woreda

No.	Crop type	Area covered in hectares	Household heads engaged in crops production			Remark
			Male-headed	Female-headed	Total	
1	Teff	15,354	35,231	2,356	37,587	1
2	Maize	15,177	38,501	5,623	44,124	2
3	Finger Millet	11,764	26,531	3,425	29,956	3
4	Wheat	5,611	13,450	1,250	14,700	4
5	Rice	3,920	9,451	1,231	10,682	5
		51,826				

Note: the total number of households in the woreda is 10,682 and participation in crop production can have multiple responses. Source: Data collected from the Libo Kemkem *woreda* Office of Agriculture report, 2017 (unpublished).

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ENDNOTES

1 Woreda is a term equivalent to ‘district’ and represents an administrative unit made up ofkebeles in Ethiopia.

2 Data accessed at www.erca.gov.et/index.php/search-hs-code.

3 These were lines RP1125-1548-1-4-3 and RP1125-1526-2-2-3.

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