This document has been modified by CARD Secretariat, deleting personal information that the original version contained, as indicated below, for the purpose of making it publicly available on CARD website.

Modified sections	Pages in the original document	Modifications made
Annex 6: list of interviewed rice stakeholders	60-61	Removed

FINAL
REPORT

2023

Monitoring Baseline Study of the National Rice Development Strategy (NRDS): The Coalition for African Rice Development (CARD)

Maputo, October 2023

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ACRONYMS AND ABBREVIATIONS

ASCAS	Accumulative Saving and Credit Associations
ATM	Mozambique Revenue Authority
CAIC	Chokwe Agro-Industrial Complex
CARD	Coalition for Africa Rice Development
CIAT	International Center for Tropical Agriculture
CIS	Chokwe Irrigation Scheme
FAO	Food and Agriculture Organization of the United Nations
GoM	Government of Mozambique
IAI	Integrated Agriculture Survey
IIAM	Mozambique Agricultural Research Institute
INE	National Institute of Statistics
INIR	National Institute of Irrigation
IRRI	International Rice Research Institute
ITC	International Trade Center
MADER	Ministry of Agriculture and Rural Development
MASA	Ministry of Agriculture and Food Security
M&E	Monitoring and Evaluation
MIC	Ministry of Industry and Trade
MT	Metric tons
NRDS	National Rice Development Strategy
PACEs	Small Commercial Producer
PEDSA	Agriculture Sector Development Strategy
PESOE	Economic and Social Plan and State Budget
PNA	National Rice Program
RBL	Low Limpopo Irrigation Scheme
ROSCA	Rotating Savings and Credit Groups
SPAE	Provincial Services of Economic Activities
SSA	Sub-Saharan Africa
USAID	United States Agency for International Development

ADZ	Zambezi Vale Development Agency

EXECUTIVE SUMMARY

The Coalition for Africa Rice Development (CARD) is implementing its second phase of the initiative starting in 2019 and aiming to double rice production from 28 million metric tons (MT) to 56 million MT by 2030. To achieve this goal, CARD established targets to be reached by each member countries through the implementation of their National Rice Development Strategies (NRDS). In this regard, CARD is supporting countries in the Monitoring and Evaluation (M&E) of the CARD and NRDS indicators.

The CARD M&E system comprises four global indicators, namely (i) quantity of paddy production (MT); (ii) quantity of harvested area under paddy production (hectares); (iii) paddy yield (MT per hectare); and (iv) rate of self-sufficiency in rice. In addition, it has other eight indicators grouped into four categories comprising of two indicators each, namely: (a) Resilience (irrigated area under paddy production and quantity of resilient rice seed varieties); (b) Industrialization (rice processing capacity and level of mechanization in rice production); (c) Competitiveness (market share of domestic rice and quantity of high yielding- rice seed varieties); and (d) Empowerment (access of rice growers to financial services and access of rice growers to technical training or services). This grouping of indicators is referred to as "RICE" approach.

These 12 CARD indicators (four global indicators plus eight RICE approach indicators) are added to the NRDS, which for Mozambique is referred to as the National Rice Program 2030 and known as the "*Programa Nacional de Arroz 2030* (PNA 2030) indicators. This report aims to materialize the CARD M&E objective and specifically establish the baseline values of the CARD and PNA 2030 indicators which is done through (i) description of the methodology for the calculation of the baseline values for the CARD and PNA indicators, and. (ii) establishment of the baseline values for the CARD and PNA indicators.

The methodology used to analyse the above objectives involved the description of the methodology used to calculate the value of each indicator followed by the collection and analysis of secondary and primary data. The analytical framework used included triangulation and data quality assessment. Additionally, in order to guide and replicate the same approach during the upcoming M&E activities, a Manual of Procedures for the Calculation of CARD and Mozambique Specific Indicators was developed and it is attached to this report. The manual expanded the explanations on the methodology described in this report by describing how the data were

collected including the respective sources and demonstrated using step by step process the calculation of the baseline value of each indicator. These explanations are aided by an Excel spreadsheet attached also to this report which contains the data and the mathematical procedures taken in each step.

The availability of data is the key factor for completing successfully the calculation of the value of each indicator. The lesson learned from calculating the baseline value of the indicators is regarding the need of having both secondary and primary data. The potential sources of secondary data are:

1. The annual monitoring report of Economic and Social Plan and State Budget known as *Relatório do Balanço do Plano Económico e Social e Orcamento do Estado (Balanço do PESOE)* and available at the Department of Monitoring and Evaluation under the Ministry of Agriculture and Rural Development's (MADER) Directorate of Planning and Policy;
2. National Institute of Statistics known as *Instituto Nacional de Estatística* (INE);
3. Food and Agriculture Organization of the United Nation (FAO);
4. Ministry of Industry and Trade known as *Ministerio da Industria e Comercio* (MIC);
5. M&E system of the SUSTENTA Program under the MADER's Directorate of Smallholder Agriculture through the Rice Focal Points; and
6. Integrated Agricultural Survey known as *Inquérito Agrário Integrado* (IAI), administered by MADER in close partnership with INE and available at the Department of Statistics under the MADER's Directorate of Planning and Policy.

The primary data are mainly sourced from:

1. Provincial Services for Economic Activities known as *Serviços Provinciais de Actividades Económicas* (SPAE) of the rice producing provinces through the Rice Focal Points;
2. The Seed Certification Laboratories (Maputo, Lionde, Chimoio and Namacurra);
3. The rice breeders based at Mozambique Agriculture Research Institute's, known as *Instituto de Investigação Agrária de Moçambique* (IIAM), research stations of Umbeluzi in Maputo province, Chokwe in Gaza province and Nicoadala and Namacurra in Zambezia province; and also based at the International Rice Research Institute (IRRI);
4. Rice processing factories across the country;
5. Low Limpopo Irrigation Scheme known as *the Regadio de Baixo Limpopo* (RBL) through the respective managers at Xai-Xai and Chokwe; and

6. Other key stakeholders such as the Zambezi Vale Development Agency known as *Agencia de Desenvolvimento do Vale do Zambezi* (ADZ).

The process of collecting secondary data involved contacting the stakeholders from the data sources listed above. These contacts were made after identifying the data demanded and both telephone and e-mail as well as physical contacts were made. The secondary data collection process in Mozambique demands having the appropriate credentials issued by MADER. Similar process was used for collecting the primary data. In addition, appropriate structured questionnaires were designed to collect primary data from the different sources listed above. As some of secondary data were also not available in a given dataset, structured questionnaires were also designed to collect secondary data and mainly from the Rice Focal Points. The produced questionnaires are attached to this report.

From the analysis performed and using the available data was possible to calculate all the baseline values of CARD and PNA indicators. Although the baseline values for PNA 2030 indicators regarding paddy yield produced under rainfed systems with and without input intensification were computed in this report, there is need to collect specific data in this regard for the computation of these indicators. The recommended baseline value for the CARD indicators presented in this report are as follows:

Category	Indicator	2030 Target value	Baseline value	Base year	Data source
CARD Overall Indicators	Quantity of paddy production (MT)	1,489,344	264,236	2022	PESOE annual monitoring report
	Harvested area under rice production (hectares)	570,272	248,000	2022	PESOE annual monitoring report
	Paddy yield (MT per hectare)	2.8	1.1	2022	Calculated using PESOE annual monitoring report
	Rate of self-sufficiency in rice (%)	100	19.8	2022	Quantities of exported milled rice from INE, of imported milled rice from USDA and of milled rice production from PESOE annual monitoring report
CARD Resilience Indicators	Irrigated area under rice production (hectares)	33,466	10,075	2022	SPAE (Gaza and Zambezia)
	Quantity of certified seed of resilient rice varieties (MT)	25,414	270.9	2022	Seed certification laboratories (Lionde, Manica and Namacurra)
CARD Industrialization Indicators	Rice milling capacity (%)	100	81.7	2022	Rice processors
	Level of mechanization in production				
	Number of tractors	WI	110	2022	MADER (Rice focal point)
	Number of harrows	WI	99	2022	MADER (Rice focal point)
	Number of ploughs	WI	102	2022	MADER (Rice focal point)
	Number of seedfertilizer applicators	WI	45	2022	MADER (Rice focal point)
	Number of combine harvesters	WI	102	2022	SPAE (Gaza, Sofala and Zambezia)

CARD Competitiveness Indicators	Market share of domestic rice (%)	100	2.1	2020	Quantities of exported milled rice from INE, of imported milled rice from USDA, and of domestic milled rice sales from IAI 2020
	Quantity of certified seed of high-yielding rice varieties (MT)	25,414	262.0	2020	Seed certification laboratories (Lionde, Manica and Namacurra)
CARD Empowerment Indicators	Rice growers with access to financial services (%)	WI	53.6	2020	IAI 2020
	Rice growers having access to technical training and service (%)	10.5	10	2022	SPAE (Gaza, Sofala and Zambezia)
CARD Price Indicators	Level of retail rice prices				
	Retail price of imported milled rice (USD per MT)	WI	916.5	2022	MIC
	Retail price of domestic milled rice (USD per MT)	WI	882.2	2022	Locally produced rice retailing companies

Notes: WI stands for without information

The key conclusions from this M&E exercise are summarized as follows:

1. Both secondary and primary data are generally available but appropriate stakeholders having the data should be contacted.
2. There is no single source of data for the computation of the value of all indicators and for some indicators more than one source should be considered and results compared and finally decision taken given the knowledge about rice industry in Mozambique.
3. Data should be improved for the calculation of values of PNA 2030 indicator regarding yield of rice produced under rain-fed systems with and without input intensification.
4. The rice focal points at all levels along with the rice breeders and the operators of rice processing factories and domestic rice sellers are key sources of data and knowledge needed to compute and assess the results of the M&E exercise.

The key challenges to mention are summarized as follows:

1. The data systems are still not effective and efficient. Better structured and coordinated data systems are nonexistent specifically for secondary data on (i) irrigated area by crop; (ii) quantities of seed of different generations (breeder, pre-basic, basic, and certified) by variety; (iii) number of extension agents assisting rice farmers; (iv) quantity of and harvested area under rain-fed paddy production with input intensification; (v) quantity of and harvested area under rain-fed paddy production without input intensification; and (vi) time series data on domestic retail price of domestically produced rice brands.

2. The quality of data regarding the quantity of imported milled rice is questionable as it is inconsistent with the current rice consumption requirements. This results from the fact that the Mozambique Revenue Authority, known as *Autoridade Tributaria de Mocambique* (ATM), captures with higher reliability the monetary values of imported and exported commodities compared to their counterpart tonnage, data on exported rice are also questionable; and
3. The system of data reporting from the district level to the province level rice focal points and finally to the national rice focal point is not effectively and efficiently working for some of the key required data for the assessment.

From the above shortcoming and for sustaining the following M&E exercises, it is recommended to:

1. The National Institute of Irrigation, known as *Instituto Nacional de Irrigacao* (INIR), collect data on irrigated area by crop and specifically the irrigated area under rice production throughout the country;
2. The National Seed Authority demand data on quantities of seed of various generations by variety throughout the country;
3. The Agriculture Promotion and Rural Extension Agency collect data on number of extension agents from both public and private sectors engaged in assisting rice farmers;
4. The MADER's Directorate of Small-scale Agriculture develop and operationalize data reporting system from the rice producing districts, provinces to the national level
5. The MADER's Directorate of Small-scale Agriculture establish a M&E system for CARD and PNA 2030 indicator guided by the results of the baseline M&E report;
6. The Ministry of Industry and Trade/Customs to track data on quantity and value of imported and exported rice; and
7. The Ministry of Industry and Trade to collect data on retail prices of locally produced rice brands.

The above recommendations are centered in improving data system and therefore the Rice Task Force is recommended to communicate the above recommendations to the respective institutions to implement them and also produce data base aiming to track all the required data for the M&E to be used by the different institutions (public and private) at all levels in the country. This should be accompanied by the identification of focal points in the different institutions to provide the required data and the list of data sources provided in this manual can be used for that purpose.

1 INTRODUCTION

Rice is the main produced cereal in Mozambique, second only to maize. Data from a nationally representative Agricultural Integrated Survey 2020 – referred to as *Inquérito Agrário Integrado* (IAI) 2020 from its Portuguese acronym and administered by Ministry of Agriculture and Rural Development (MADER) in partnership with National Institute of Statistics (INE) – show that harvested area allocated to rice production in the 2019/2020 cropping season amounted to 282.1 thousand hectares; ranking second only to maize with 2.3 million hectares and above other cereals such as sorghum with 259.0 thousand hectares and millet with 52.4 thousand hectares. Area suitable for rice production is estimated at 900.0 thousand hectares, but only about 31.0 percent of this area is actually cultivated. Rice is predominantly (99.8 percent) produced by smallholder farmers cultivating the crop in lowlands using mainly traditional rain-fed farming methods that have been passed down through generations for over 500 years (IRRI, 2018 and MADER, 2021).

The factors that normally are considered to determine the ecosystems where rice is grown are the water regime (deficit, excess or optimum), drainage (good or poor), temperature (optimum or low), soils (normal or with problems), and topography (plain or undulated). The main ecosystems currently recognized include: i) irrigated, ii) rain-fed lowland, iii) deep water, iv) upland, and, v) mangrove with tidal influence. Mozambique has three main rice production ecosystems: rain-fed lowlands, rain-fed uplands, and irrigated areas. The vast majority of rice is grown under rain-fed lowland ecosystems mainly located in Sofala and Zambezia provinces in Central Mozambique, and Nampula and Cabo Delgado provinces in Northern Mozambique.

The key rice-p roducing provinces are Zambezia (accounting for 31.3 percent of the aggregate rice production), Sofala (29.7 percent), Nampula (16.3 percent), Gaza (12.9 percent) and Cabo Delgado (6.7 percent); according to data from IAI 2020. These provinces account together for about 95 percent of the rice production in the country. Despite the existing potentials for rice production, its productivity is low. Ismael et al. (2021) documented an average paddy yield of around 1.2 metric tons (MT) per hectare, while MADER (2021) reported average paddy yield of about 0.6 MT per hectare for small- and medium -scale farmers. These figures are remarkably low compared to the average paddy yields of 4.2 MT per hectare in Asia.

According to the MADER (2022), the main constraints of the rice subsector, which contribute to low rice production and productivity among smallholder rice growers, include:

i) Low use of yield enhancing agricultural inputs, namely: (a) certified seed (4.9 percent of rice growers amounting to around 0.5 million smallholder farmers in the 2019/2020 agricultural season), (b) fertilizers (0.8 percent of rice growers), (c) pesticides (0.6 percent of rice growers), (d) machinery (7.5 percent of rice growers), and (e) irrigation (7.5 percent of rice growers);
ii) Low access to credit (0.8 percent);
iii) Low access to marketing support infrastructure and services that burden transaction costs (access roads, warehouses, electricity);
iv) Insufficient and limited access to financial services and technical assistance;
v) Poor water management capacity coupled with poor leveling of soil; and
vi) High levels of post-harvest losses.

Contrary to the limited productivity, consumption of rice has been increasing in Mozambique. MADER (2022) reported that the annual growth rate of rice consumption is about 8.6 percent, which is higher than that for other cereals such as maize (5.5 percent), wheat (7.4 percent), and sorghum (4.7 percent). This increasing demand coupled with low domestic production has created a rice deficit of about 300.0 thousand MT per year, which has been covered by imports from predominantly Asian countries. As of May 2021, the rice imports costed the country about 200.0 million American dollar (USD), which could have been saved if the country achieved self-sufficient in rice.

To reverse the mismatch between rice supply and demand, the Coalition for Africa Rice Development (CARD) is implementing an innitiative in sub-Saharan African (SSA) countries including Mozambique, which in its first phase aimed to double rice production in SSA countries by 2018. Mozambique was part of the first group of 23 countries that joined the CARD initiative from 2008 to 2018. As a result of the efforts undertaken by the Government of Mozambique (GoM), development partners and rice growers, production doubled from 206.3 thousand MT in the 2007/2008 cropping season to 412.6 thousand MT in 2017/2018 cropping season (MADER, 2022). This increase in rice production suggests that the target established by CARD, which was to double rice production in SSA in an environmentally sustainable manner within a period of 10 years, was achieved.

Given the growing rice demand, the target on duplicating production has been renewed and in global terms, the aim is to double rice production from 28 million MT to 56 million MT by 2030. For achieving self-sufficiency in rice, at the national level, CARD has supported SSA countries in the production and implementation of National Rice Development Strategies (NRDSs). Under the African Union framework for boosting agricultural development in the African continent, Mozambique developed the second generation of the Agriculture Sector Development Strategy (referred to as *Plano Estratégico para o Desenvolvimento do Sector Agrário* – PEDSA from its Portuguese acronym) 2030, which places rice as one of the priority value chains, whose production must be intensified with a view to reducing the import value by at least 33 percent by 2026 and achieve self-sufficiency by 2030. Mozambique also formulated the 2030 National Rice Program (referred to as *Programa Nacional de Arroz* – PNA from its Portuguese acronym), which aims to increase rice production of around 465.9 thousand MT in the 2021/2022 cropping season to about 1.5 million MT in the 2029/2030 cropping season, thus achieving the much-desired self-sufficiency in rice.

The second phase of the CARD initiative is supporting countries in the Monitoring and Evaluation (M&E) of their NRDSs, which for Mozambique is the PNA 2030. The CARD M&E system comprises four global indicators, namely (i) quantity of rice produced (MT); (ii) rice harvested area (hectares); (iii) paddy yield (MT per hectare); and (iv) rate of self-sufficiency in rice. In addition, it has other four categories of indicators, namely: (a) resilience (irrigated area under rice production and quantity of resilient rice seed varieties); (b) industrialization (rice processing capacity and level of mechanization in rice production); (c) competitiveness (market share of domestic rice and quantity of high-yielding rice seed varieties); and (d) empowerment (access of rice growers to financial services and access of rice growers to technical training or services). These indicators are added to the PNA 2030 indicators with targets to be monitored under PNA.

The specific objectives of this report are twofold: (i) present the methodology for the calculation of the baseline values for the CARD and PNA indicators, and. (ii) establish the preliminary baseline values for the CARD and PNA indicators.

The structure of the report is as follows; the present introductory section is followed by the overview of the M&E indicators. Section three presents the methodology detailing the procedures used for the calculation of the baseline values of the indicators and brief description of the data sources. The results and concluding remarks are presented in the last two chapters.

2 OVERVIEW OF THE MONITORING AND EVALUATION INDICATORS

The African countries including Mozambique are facing rice deficit depending substantially on imports to meet the respective domestic consumption. To overcome this deficit, Alliance for a Green Revolution in Africa (AGRA), Japan International Cooperation Agency (JICA) and New Partnership for Africa's Development (NEPAD) led the process of establishment of the Coalition for African Rice Development (CARD) to mainly respond to the increasing importance of rice production in Africa. The CARD initiative was successfully launched during the fourth Tokyo International Conference on African Development (TICAD IV) taken place in Yokohama from 28-30 May 2008. CARD is supporting the development of the rice sector in 32 SSA countries including Mozambique. The first phase of the initiative aimed at doubling rice production in SSA countries by 2018. The second phase, which started in 2019, renewed the target of further doubling rice production in SSA from 28 million to 56 million MT by 2030.

The CARD M&E is monitoring the progress of the initiative using four global indicators namely quantity of paddy produced (MT), harvested area under rice production (hectare), paddy yield (MT per hectare) and rate of self-sufficiency (%) in the 32 SSA CARD countries including Mozambique. In addition to these four global indicators, there are eight other indicators grouped into four categories with two indicators in each category (Resilience, Industrialization, Competitiveness, and Empowerment indicators); totalizing 12 indicators. This grouping of indicators is referred to as "RICE" approach. Table 2.1 presents the definitions, and the corresponding type of data needed, of the 12 CARD indicators, while Table 2.2 summarizes the Mozambique specific indicators.

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Table 2.1 Definition of CARD indicators covered in this report

Category	Indicator	Code	Definition	Data needed
CARD Overall Indicators	Quantity of paddy produced (MT)	O1	Sum of the quantity of paddy produced domestically at different ecologies	Secondary dada
	Harvested area under rice production (hectare)	O2	Sum of the area harvested of domestically produced paddy at different ecologies	Secondary data
	Paddy rice yield (MT per hectare)	O3	Average quantity of domestically produced paddy per unit of harvested area	Secondary data
	Rate of self-sufficiency in rice (%)	O4	Rate of coverage of rice needs by local production	Secondary data
CARD Resilience Indicators	Irrigated area under rice production (hectare)	R1	Sum of area under rice production with supplementary irrigation to mitigate the negative impacts of climate variability in rice production	Primary data
	Quantity of certified seed of resilient rice varieties (MT)	R2	Sum of quantity of certified rice seed varieties produced domestically with resilience characteristics, which are locally preferred	Primary data
CARD Industrialization Indicators	Rice milling capacity (%)	I1	Rate of the installed capacity of the medium and large processing factories to all operating processing factories	Primary data
	Level of mechanization in production	I2	Number of machines available for plowing and harvesting rice fields	
	Number of tractors	I2.1	Number of tractor used in rice land preparation	Secondary data
	Number of harrows	I2.2	Number of harrows used in rice land leveling	Secondary data
	Number of ploughs	I2.3	Number of ploughs used in rice plowing	Secondary data
	Number of seed-fertilizer applicators	I2.4	Number of seed-fertilizer applicators used in rice seed and fertilizer application	Secondary data
	Number of combine harvesters	I2.5	Number of combine harvester used in rice harvesting	Primary data
CARD Competitiveness Indicators	Market share of domestic rice (%)	C1	Percentage of the domestic rice in relation to the total rice at the retail shops	Primary/secondary data
	Quantity of certified seed of high-yielding rice varieties (MT)	C2	Sum of quantity of certified seed varieties of locally preferred varieties with high-yielding attributes, locally produced.	Primary data
CARD Empowerment Indicators	Rice growers with access to financial services (%)	E1	Percentage of rice farmers accessing financial services	Secondary data
	Rice growers with access to technical services and training (%)	E2	Percentage of rice farmers accessing technical services and training	Secondary data
CARD Price Indicators	Level of retail rice prices	P1	The annual average of retail rice prices	
	Level of retail rice price of imported rice	P1.1	The annual average of retail price of imported rice	Secondary data
	Level of retail rice price of locally produced rice	P1.2	The annual average of retail price of locally produced rice	Primary data

Table 2.2 Definition of the Mozambique specific indicators covered in this report

Category	Indicator	Code	Definition	Data needed
Mozambique Rice seed production indicators	Quantity of breeder rice seed (kg)	MZ1	Sum of quantity of breeder rice seed varieties produced domestically	Primary data
	Quantity of pre-basic rice seed (MT)	MZ2	Sum of quantity of pre-basic rice seed varieties produced domestically	Primary data
	Quantity of basic rice seed (MT)	MZ3	Sum of quantity of basic rice seed varieties produced domestically	Primary data
	Quantity of certified rice seed (MT)	MZ4	Sum of quantity of certified rice seed varieties produced domestically	Primary data
	Harvested area under certified seed production(hectare)	MZ5	Sum of the area harvested of domestically produced certified seed	Primary data
Mozambique Access to high yield agriculture inputs indicators	Quantity of fertilizer used in rice production (MT)	MZ6	Sum of the quantity of fertilizer by type used in rice production per year	Primary/secondary data
	Quantity of urea used in rice production (MT)	MZ6.1	Sum of the quantity of urea used in rice production per year	Primary/secondary data
	Quantity of NPK used in rice production (MT)	MZ6.2	Sum of the quantity of urea used in rice production per year	Primary/secondary data
	Quantity of herbicide used in rice production	MZ7	Sum of the quantity of herbicide by type used in rice production per year	Primary data
	Quantity of MCPA used in rice production (Liters)	MZ7.1	Sum of the quantity of MCPA used in rice production per year	Primary data
	Quantity of Propanil used in rice production (Liters)	MZ7.2	Sum of the quantity of Propanil used in rice production per year	Primary data
	Quantity of Roster used in rice production (Liters)	MZ7.3	Sum of the quantity of Roster used in rice production per year	Primary data
	Quantity of Vega used in rice production (Kg)	MZ7.4	Sum of the quantity of Vega used in rice production per year	Primary data
Mozambique Access to agricultural services indicators	Number of extension agents assisting rice growers	MZ8	Sum of extension agents assisting rice producers	Primary data
	Number of rice growers trained in the best production practices	MZ9	Sum of rice producer trained in the best production practices per year	Secondary data
	Number of equipment used in rice post-harvest handling	MZ10	Number of equipment used in rice production and post-harvest handling	
	Number of rice thresher	MZ10.1	Number of rice thresher used in rice threshing	Primary data
	Number of rice dryer	MZ10.2	Number of rice dryers used in rice post-harvest handling	Primary data
	Number of quality control labs	MZ10.3	Number of quality control labs used in rice post-harvest handling	Primary data
Mozambique Rice production and productivity indicators	Quantity of irrigated paddy produced (MT)	MZ11	Sum of the quantity of irrigated paddy domestically produced	Primary data
	Irrigated paddy yield (MT per hectare)	MZ12	Average quantity of domestically produced paddy under irrigation system per unit of harvested area	Primary data
	Quantity of rain-fed paddy under input intensification (MT)	MZ13	Sum of the quantity of paddy produced domestically under rain-fed systems with input intensification	Secondary data
	Quantity of rain-fed paddy under no input intensification (MT)	MZ14	Sum of the quantity of paddy domestically produced under rain-fed system with no input intensification	Secondary data
	Cultivated land under rain-fed rice with input intensification (hectare)	MZ15	Sum of the area with rice under rain-fed with intensification	Secondary data
	Cultivated land under rain-fed rice with no input intensification: (hectare)	MZ16	Sum of the area with rice under rain-fed with no intensification	Secondary data

	Rain-fed paddy yield with input intensification (MT per hectare)	MZ17	Average quantity of domestically produced paddy per unit of harvested area under rain-fed with intensification	Secondary data
	Rain-fed paddy yield with no input intensification (MT per hectare)	MZ18	Average quantity of domestically produced paddy rice per unit of harvested area under rain-fed with no intensification	Secondary data

3 METHODOLOGY

3.1 Data

The data used to compute the baseline values of the various indicators are from both secondary and primary sources as described above. The secondary data are gathered from various sources, namely (i) Integrated Agricultural Survey known as *Inquerito Agrario Integrado* (IAI) and administered by MADER in close collaboration with the National Institute of Statistics (INE) using internationally accepted data standards and protocols, (ii) public sector systems that collect administrative data, (iii) government and development partners early warning systems, (iv) Food and Agriculture Organization of the United Nations (FAO), (v) United States Department of Agriculture (USDA), and (vi) United States Agency for International Development (USAID), just to mention a few. The primary data were collected using questionnaires (presented in ANNEXES 1 through 5) administrated to the different rice stakeholders namely seed breeders (ANNEX 1); laboratories certifying rice seed namely Maputo in Maputo province, Chokwe in Gaza province, Chimoio in Manica province and Namacurra in Zambezia province (ANNEX 2); promoters of rice production, managers of irrigation schemes, rice producers (ANNEX 3); rice processors (ANNEX 4); and government entities at all levels (ANNEX 5). It is worth mentioning that using these questionnaires, the team collected data in three main rice producing provinces (Gaza, Sofala and Zambezia). The list of interviewed stakeholders by province including contact information is presented in ANNEX 6. For provinces not visited by the consultant team, the questionnaires were sent to government entities and especially the provincial rice focal points through the government system and especially the MADER's National Directorate for the Development of Smallholder Agriculture.

3.2 Global indicators

Quantity of paddy production: The quantity of paddy production is reported mainly in two sources, namely (i) the annual monitoring report of Economic and Social Plan and State Budget known as *Relatório do Balanço do Plano Económico e Social e Orcamento do Estado* (referred to as PESOE) for the agriculture sector, using administrative data with national coverage, produced by MADER and available at the Department of Monitoring and Evaluation of the MADER's Directorate of Planning and Policy, and (ii) the statistically nationally representative IAI. The PESOE annual monitoring reports are produced annually, while IAI data are basically available every two years due mainly to financial constraints although the survey is supposed to be administered annually.

Hence, because IAI data cannot be realibly used for annual M&E, we recommend to use the PESOE annual monitoring report as the data source for the quantity of paddy production. Therefore, we computed the baseline value for this indicator as the average country-wide quantity of paddy production, measured in MT and reported in the PESOE annual monitoring reports, for the 2019/2020, 2020/2021 and 2021/2022 cropping seasons. For the next M&E period, we recommend to take the quantity of paddy production for the 2022/2023 cropping season reported the PESOE annual monitoring report.

Harvested area under rice production: As in the case of the previous indicator, the data on harvested area can be obtained from both the PESOE annual monitoring reports and IAI. For the same reason presented for the previous indicator, we use the data gathered from the PESOE annual monitoring report to calculate the baseline value for the harvested area under rice production. The PESOE annual monitoring reports document both planned and realized area and the corresponding planned and realized production. We take the realized area as the harvested area and the realized production as the actual production from the harvested area. Therefore, we hereafter refer the realized area from PESOE annual monitoring reports as the harvested area in the computation of all indicators demanding data on the harvested area. Like in the case of the quantity of paddy production, the baseline value for the harvested area under rice production is computed as the average quantity of the harvested area, measured in hectares and gathered from the PESOE annual monitoring reports for the last three cropping seasons. For the next M&E period, we recommend to take the reported value of the quantity of the harvested area under rice production in the 2022/2023 cropping season from the PESOE annual monitoring report.

Paddy yield: This indicator is estimated by dividing the country-wide paddy production measured in MT by the corresponding harvested area under rice production measured in hectares for each of the last three cropping seasons, both gathered from the PESOE annual monitoring reports. We then take as the baseline value the average of the resulting three paddy yields. For the next M&E period, we recommend to compute the value of this indicator by dividing the quantity of paddy production in the 2022/2023 cropping season by the respective harvested area. Both values (quantity of paddy production and of harvested area under rice production) are to be extracted from the PESOE annual monitoring report.

Rate of self-sufficiency in rice: This indicator is derived as the ratio of the quantity of domestically produced milled rice to domestic rice consumption requirements, both measured in MT, for the last three years (2020, 2021 and 2022). Given that rice production statistics are reported in paddy equivalent, we multiplied the quantity of paddy production, gathered from the PESOE annual monitoring reports, by 0.63 to obtain the quantity of milled rice production for each of the last three years. Using the formula specified by the Food and Agriculture Organization of the United Nations (FAO), the self-sufficiency rate was calculated as:

$$\text{self-sufficiency rate} = \frac{prod}{prod + imp - \exp} \quad (1)$$

where $prod$ is the quantity of the domestic milled rice production (MT), imp is the quantity of imported milled rice (MT), and $\exp$ is the quantity of the domestic milled rice exported (MT). We take the baseline value for this indicator as the average rate of self-sufficiency over the last three years. Import and export data can be gathered from the National Institute of Statistics (INE) and the United States Department of Agriculture (USDA). Data from INE, sourced from the Mozambique Revenue Authority [known as *Autoridade Tributaria de Mocambique* (ATM)], revealed that milled rice imports amounted to 1,051 million MT in 2020, compared to 650.0 thousand MT reported by USDA. Comparing these estimates of milled rice imports, we concluded that INE data overestimate milled rice import because the reported estimate of milled rice imports is considerably higher than estimated milled rice consumption requirements (estimated at about 700.0 thousand MT) considering population size gathered from INE and per capita rice consumption estimated at 24 kilograms per year and gathered from FAO. Given that INE import data and especially the quantities of imported rice[1] are not reliable now, we recommend that USDA data be used. We furthermore point out that the Mozambique Ministry of Industry and Trade, known as the *Ministério da Indústria e Comércio* (MIC), reports rice import data also sourced from INE. Hence, AT, INE and MIC report the same amount of rice imports. Regarding milled rice exports, estimates from INE and USDA are comparable, and we recommend that INE data be used. For the next M&E period, we recommend that the reliability of INE import data be assessed again and the same methodology be employed.

3.3 Resilience indicators

Irrigated area under rice production: During the IAI 2020 interviews, farmers were asked whether they used yield-enhancing agricultural inputs (such as irrigation, fertilizer, improved seed,

[1] The customs and consequently MIC and INE track very well mainly trade data in terms of values and the quantity data are not reliable and only for rice but for all commodities.

pesticides) on their rice plots. Therefore, IAI is a possible source of data for irrigated area under rice production. However, IAI data are not reliable for this indicator as the data tend to overestimate the irrigated area under rice production. Additionally, IAI data as previously discussed are not available yearly to be considered reliable for an annual monitoring system. The National Institute of Irrigation, known as the *Instituto Nacional de Irrigação (*INIR), is also another source of data on irrigated area under rice production. However, INIR does not have data on irrigated area by crop. Therefore, INIR is recommended to collect data on irrigated land by crop for better understanding of the needs for irrigation for various crops and at the same time feed the data needs for different analysis on agriculture performance. Because of these shortcomings, we employ primary data collected in the main rice producing areas (Gaza, Sofala, and Zambezia) with irrigation schemes and especially from the rice focal points based at provincial directorates of economic activities known as *Servicos Provinciais de Actividades Economicas* (SPAE). The data used to estimate this indicator are sourced from SPAE Gaza and SPAE Zambezia. To compute this indicator, we add the amount of irrigated area under rice production, measured in hectares, from the last cropping season (2021/2022) provided by focal points at SPAE Gaza and SPAE Zambezia. The rice irrigation is done currently at land with operational irrigation infrastructure and the available data show that operational irrigation infrastructure used for rice production is available in Gaza (Low Limpopo Irrigation Scheme) and Zambezia (the Paz Irrigation Scheme in Mopeia). This proceedure is recommended for the next M&E period using the data for irrigated area under rice production in the 2022/2023 cropping season with possible adjustments of adding irrigated area under irrigation schemes in other rice producing provinces.

Quantity of certified seed of resilient rice varieties: Resilience is defined as the ability of the different rice varieties to be tolerant to the yield-reducing factors such as drought, salinity among others. Considering the above classification, according to the Mozambique Agricultural Research Institute (referred to as *Instituto de Investigação Agrária de Moçambique* [IIAM] from its Portuguese acronym), drought-tolerant rice varieties include CHUPA, NÉNÉ, M'ZIVA, MUCELO, OFOANHELA, and OZIVELIWA. Additionally, MACASSANE, M'ZIVA, LIMPOPO and SIMÃO rice varieties are resilient to lodging. Therefore, the quantity of resilient seed varieties denotes the sum of the quantities of the drought-tolerant and resistant to lodging certified seed varieties produced in the country.

The list of drought tolerant rice seed varieties is gathered from IIAM and International Rice Research Institute (IRRI), the two institutions that developed rice seed varieties in the country.

Data on rice seed can be obtained from the PESOE annual reports, Seed Department of the National Directorate for Agriculture Health and Biosafety and the National Seed Authority. However, these sources do not report the quantities of rice seed by variety. There is no readily available data from secondary sources on quantity of certified seeds of resilient rice varieties. One of the key recommendations is for the MADER through the PESOE annual reports, Seed Department of the National Directorate for Agriculture Health and Biosafety and the National Seed Authority to produce rice seed statistics by rice variety. Therefore, the data are collected from the seed certification laboratories of Maputo in Maputo province, Chokwe in Gaza province, Chimoio in Manica province and Namacurra in Zambezia province. These laboratories are responsible for monitoring the production of certified seeds including the respective certification and therefore are the reliable source of quantity of certified seed in the country. From these data, we summed the quantities of certified seed of the rice varieties classified as resilient to have the quantity of certified seed of resilient rice varieties. The baseline values correspond to the sum of the average of the produced certified seeds of the resilient varieties in the last three cropping seasons. For the next M&E period, the data should be collected from the seed certification laboratories for the quantities of the certified seed by varieties produced in the 2022/2023 cropping season and add the quantities of seed of varieties considered to be resilient to compute the indicator value. As stated above, if the PESOE annual reports, Seed Department of the National Directorate for Agriculture Health and Biosafety and the National Seed Authority start to produce rice seed statistics by rice variety, the data for the calculation of the value of this indicator can be obtained from these sources.

3.4 Industrialization indicators

Rice milling capacity: This indicator is calculated by dividing the installed capacity of medium- and large-scale rice processing factories by that of all (small-, medium- and large-scale) rice processing factories and then multiply by 100. First, we classified the rice processing factories as small-, medium- and large-scale considering their installed capacities measured in MT per hour. Thus, factories presented with installed processing capacity equal or greater than 2 MT per hour were classified as medium- and large-scale while the rest were classified as small scale. The data on processing capacity was collected from the respective rice processing factories. The processing factories were identified in rice producing areas with guidance from the rice stakeholders namely the rice focal point based at SPAE of the rice producing provinces (Gaza, Sofala and Zambezia) and the District Directors of Economic Activities of the rice producing districts in each province.

For the next M&E period, the data regarding the rice processing factories and the respective installed and effective capacities should be updated to compute the indicator value.

Level of mechanization in production: This indicator corresponds to the number of machines used in land preparation and harvesting operations in rice production. The production machines and equipment are tractors, harrows, ploughs and seed-fertilizer- applicators, while the harvesting and threshing machines are combine harvesters. Therefore, we estimate five sub indicators corresponding respectively to the sum of number of:

(i) Tractors used in rice production in the country;
(ii) Harrows used in rice production in the country;
(iii) Ploughs used in rice production in the country;
(iv) Seed fertilizer applicator used in rice production in the country; and
(v) Combine harvesters used in the rice harvesting in the country.

The data on the number of machines, equipment and implements described above except for the number of combine harvesters are collected from the Rice Focal Point at the MADER's Directorate of Small-scale Agriculture, while the number of combine harvesters is collected from the Rice Focal Points based at SPAE of the visited provinces (Gaza, Sofala and Zambezia). For the next M&E period, we recommend using the same source of data to compute the indicator value for the 2022/2023 cropping season.

3.5 Competitiveness indicators

Market share of domestic rice: As described above, most rice producers are smallholder farmers producing mainly for their own consumption and relatively small proportion of rice growers sell their surplus. Few medium and large rice producers including rice processing factories, promoters of rice production are oriented to sell the domestically produced rice. Domestic rice is mainly sold at informal markets by the smallholder farmers while rice processors and production promoters sell domestically produced rice in specific stores and most of these stores belong to these rice processors and production promoters. Examples are WANBAO RICE in Gaza province and TONGAAT HULETTS in Sofala province selling at their own stores. Retail stores and supermarkets sell always solely imported rice and thus it is not possible based on the survey to obtain data about the volumes of locally produced rice sold in these outlets. Thus, the market share of domestic rice was computed as follows:

$$\text{market share} = \frac{sales}{sales + imp - \exp} \tag{2}$$

where $sales$ denotes the quantity of the domestic milled rice sales (MT), imp is the quantity of imported milled rice (MT), and $\exp$ is the quantity of the domestic milled rice exported (MT). As previously discussed, import data are gathered from USDA, while export data are collected from INE. Finally, the quantity of locally produced rice sales is taken from IAI 2020. For the next M&E period, we recommend that the reliability of INE import data be assessed again and the same methodological approach be employed.

Quantity of certified seed of high-yielding rice varieties: According to interviewed rice breeders, high-yielding rice varieties are those with potential yield of at least 7.0 MT per hectare. High-yielding varieties include MACASSANE, TUMBETA, SIMAO, OFOANHELA, HUWA, OZIVELIWA, and TCHULULA. The list of high-yielding rice seed varieties was obtained from IIAM and IRRI; while the quantity of the certified high-yielding rice seed varieties produced in the country was obtained from the laboratories certifying rice seed of Maputo, Chokwe, Chimoio and Namacurra. To compute these indicators, we added the quantities of certified seed of the high yielding rice varieties produced in the country. The baseline values correspond to the sum of the average quantities of certified seed of high-yielding varieties in the last three cropping seasons. For the next M&E period, the data should be collected from the seed certification laboratories for the quantities of the certified seed by varieties produced in the 2022/2023 cropping season and add the quantities of seed of varieties considered to be of high yield to compute the indicator value. As stated above, if the PESOE annual reports, Seed Department of the National Directorate for Agriculture Health and Biosafety and the National Seed Authority start to produce rice seed statistics by rice variety, the data for the calculation of the value of this indicator can be obtained from these sources.

3.6 Empowerment indicators

Access of rice growers to financial services: This indicator is defined as the proportion of rice producers who have access to at least one financial service (credit, ROSCA, banking account, and mobile money services such as M-PESA, MKESH, eMOLA and *conta movel*). The institution responsible for agriculture extension could be the potential source of this data. However, the

Agriculture Promotion and Rural Extension Agency does not have data on farmers' access to financial services and this institution is recommended to collect this type of data for feeding the future M&E reports. Therefore, data on rice farmers' access to financial services are not readily available except from the IAI database. However, the IAI database is not available on annual basis due to financial constraints, as previously discussed. The alternative would be to conduct farmers' surveys on annual basis at rice producing areas, but it is expensive. Therefore, we recommend that IAI 2020 data be used to estimate this indicator given mainly that the interviewed rice growers are asked whether they had access to each one of the abovementioned financial services. Using IAI 2020 data, this indicator was obtained by dividing the number of rice producers who have access to at least one financial service by the total number of rice producers.

Percentage of rice growers with access to technical training and service: Comprehensive data on the number of the rice growers with access to technical training and service are available from the IAI 2020 database. However, IAI data are not annually published. To overcome this limitation, during our field visits, we gathered data, from the rice focal points based at SPAEs, regarding the number of rice growers who had access to technical training and services in the past three cropping seasons in the three main rice-producing provinces (Gaza, Sofala and Zambezia). And this indicator was then computed as the ratio of the number of rice growers who received technical training and service to the total number of rice growers in those three rice-producing provinces, and then multiply by 100. The same procedure should be applied for the next M&E period using data for the 2022/2023 cropping season.

Levels of domestic and imported retail rice prices in the domestic market: It represents the average monetary amount paid per MT (or equivalently per kg) of domestic and imported milled rice in the domestic retail markets. Statistics on agriculture commodity prices are produced by both MIC and the MADER's Market Information System known as *Sistema de Informacão de Mercados* (SIMA). However, these two public entities collect price data at different market levels. The MIC price data capture the most appropriate market level at which this indicator should be computed according to CARD guidelines. Therefore, the national average retail price of imported milled rice for year 2022 is taken from MIC. Given that MIC data do not report prices for domestically produced milled rice, the average retail price of domestic milled rice for year 2022 is collected during field visits and come from eight rice brands commercialized in the country. The sources of retail price of domestic milled rice are the respective rice processing factories and retail outlets selling those eight brands of rice. The prices are gathered in national currency (MZN) and they are converted to USD equivalent using monthly exchange rate for May 2023 (1 USD equals to 63.25 MZN) obtained from the Mozambique Central Bank. Similar procedure should be used for the next M&E period.

3.7 Mozambique specific indicators

3.7.1 Rice seed production

Mozambique produces domestically rice seed varieties and does not import them for rice production process except for experimental trials leading to the release of new rice seed varieties within the national seed system. Two main types of seed systems exist in the country: the formal system and the informal system. Under the formal system, Mozambique produces four categories of seeds (breeder, pre-basic, basic, and certified seed). A wide range of rice seed varieties have been produced in Mozambique, but some of them were discontinued. The main seed varieties currently produced within the formal seed system are: (i) MACASSANE, (ii) SIMÃO, (iii) TCHULULA, (iv) NÉNÉ, (v) CHUPA, (vi) TUMBETA, (vii) OZIVALIA, (viii) M'ZIVA, (ix) MUCELO, (x) OFANHELA, (xi) IITA 312, and (xii) LIMPOPO.

IIAM and IRRI are the organizations responsible for production of three categories of rice seed (breeder, pre-basic and basic seeds). These two organizations sometime partner with private sector seed companies for production of early generation seeds. In the past, early generation seeds were also produced by private seed companies (more specifically MIA company), but this company is no longer producing the early generation rice seeds. Additionally, early generation rice seed varieties are only produced in four locations, namely Umbeluzi in Maputo province, Chokwe in Gaza province, and Nicoadala and Namacurra in Zambezia province.

The informal seed system is dominated by smallholder farmers and farmers' associations including also private companies such as WANBAO RICE producing rice seed for own consumption, which is not certified. Therefore, in this context, the data on seed indicators will be collected from the formal seed system. The seed production indicators include: (a) quantity of breeder rice seed; (b) quantity of pre-basic rice seed; (c) quantity of basic rice seed; (d) quantity of the certified rice seed; and (e) area under certified rice seed production.

Quantity of breeder rice seed: The baseline value corresponds to the sum of the average quantities of breeder seed of the different rice varieties produced in the last three cropping seasons. As mentioned above, in Mozambique, rice seed varieties are produced in Umbeluzi in Maputo province, Chokwe in Gaza province, as well as Nicoadala and Namacura in Zambezia province. Data required to estimate this indicator were collected from IIAM and IRRI, especially from their respective breeders' database and reports using a specific questionnaire (ANNEX 2). For the next M&E period, the data should be collected from the IIAM and IRRI breeders in Umbeluzi in Maputo province, Chokwe in Gaza province, as well as Nicoadala and Namacura in Zambezia province for the 2022/2023 cropping season. If the PESOE annual reports, Seed Department of the National Directorate for Agriculture Health and Biosafety and the National Seed Authority start to produce early generation rice seed statistics by rice variety, the data for the calculation of the value of this indicator can be obtained from these sources.

The indicator value should be calculated as the sum of the quantities of breeder rice seed of all rice varieties produced across the country and reported by the IIAM and IRRI breeders in Umbeluzi in Maputo province, Chokwe in Gaza province, as well as Nicoadala and Namacura in Zambezia province for the 2022/2023 cropping season.

Quantity of pre-basic rice seed: As in the case of breeder rice seed, this indicator represents the sum of the quantities of prebasic- seed produced by IIAM and IRRI in Maputo province (Umbeluzi), Gaza province (Chokwe) and Zambezia province (Nicoadala and Namacura). Similarly, the baseline value corresponds to the sum of the average quantities of the pre-basic seed of the different varieties produced in the last three cropping seasons. For reasons described in the previous paragraphs, we used the same sources of the data as in the case of the quantity of breeder rice seed. Similarly, for the next M&E period, the data should be collected from the IIAM and IRRI breeders in Umbeluzi in Maputo province, Chokwe in Gaza province, as well as Nicoadala and Namacura in Zambezia province for the 2022/2023 cropping season. If the PESOE annual reports, Seed Department of the National Directorate for Agriculture Health and Biosafety and the National Seed Authority start to produce early generation rice seed statistics by rice variety, the data for the calculation of the value of this indicator can be obtained from these sources.

The indicator value should be calculated as the sum of the quantities of pre-basic rice seed of all rice varieties produced across the country and reported by the IIAM and IRRI breeders in Umbeluzi in Maputo province, Chokwe in Gaza province, as well as Nicoadala and Namacura in Zambezia province for the 2022/2023 cropping season.

Quantity of basic rice seed: As in the case of breeder and pre-basic rice seed, this indicator is calculated by summing the average quantities of basic seed produced by IIAM and IRRI in Maputo province (Umbeluzi), Gaza province (Chokwe) and Zambezia province (Nicoadala). The baseline value corresponds to the sum of the average quantities of the basic seed of the different varieties produced in the last three cropping seasons. For the same reasons described above, we used the same sources of the data as in the case of the quantity of breeder rice seed. Similarly, for the next M&E period, the data should be collected from the IIAM and IRRI breeders in Umbeluzi in Maputo province, Chokwe in Gaza province, as well as Nicoadala and Namacura in Zambezia province for the 2022/2023 cropping season. The indicator value should be calculated as the sum of the quantities of basic rice seed of all rice varieties produced across the country and reported by the IIAM and IRRI breeders in Umbeluzi in Maputo province, Chokwe in Gaza province, as well as Nicoadala and Namacura in Zambezia province for the 2022/2023 cropping season.

Quantity of certified rice seed: This indicator is computed by summing the quantities of certified rice seed of all rice varieties produced across the country. The baseline value corresponds to the sum of the average quantities of the certified seeds of the different varieties produced in the last three cropping seasons. The sources of the data for this indicator are the laboratories certifying seed production namely seed certification laboratories of Maputo in Maputo province, Chokwe in Gaza province, Chimoio in Manica province, and Namacurra in Zambezia province. The data were collected using a specific questionnaire (ANNEX 3). For the next M&E period, the data should be collected from the seed certification laboratories of Maputo, Lionde, Chimoio, and Namacurra for the 2022/2023 cropping season. The indicator value should be calculated as the sum of the quantities of certified rice seed of all rice varieties produced across the country and reported by these rice seed certification laboratories for the 2022/2023 cropping season.

Area under certified rice seed production: This is calculated as the sum of the area, measured in hectares, used to produce certified rice seed of all varieties across the country. The baseline value corresponds to the sum of the average quantities of the area used to produce certified seed of the different varieties in the last three cropping seasons. The required data to estimate this indicator are sourced from the laboratories certifying seed production and especially the seed certification laboratories of Maputo, Chokwe, Chimoio and Namacurra. For the next M&E period, the data should be collected from the seed certification laboratories of Maputo, Lionde, Chimoio and Namacurra for the 2022/2023 cropping season. The indicator value should be calculated as the sum of the area used to produce certified rice seed of all rice varieties produced across the country and reported by these rice seed certification laboratories for the 2022/2023 cropping season.

3.7.2 *Access to high-yielding agricultural inputs*

Access to agricultural inputs is measured in terms of the intensity of yield-enhancing agricultural input use (quantity applied on rice plots). IAI 2020 could be the most reliable data to estimate access to yield-enhancing agricultural inputs because the survey is nationally representative and administered by MADER in close partnership with INE using internationally accepted data standards and protocols. However, IAI 2020 does not collect data related to quantities of yield-enhancing agricultural inputs (fertilizer and pesticide) applied by farmers. The survey only asks whether farmers used a given yield-enhancing agricultural input (fertilizer and pesticide), which allows only to count the number of rice growers who used a given agricultural input. Given this data limitation (unavailability of quantities of each yield-enhancing agricultural inputs applied by farmers), data were collected using a questionnaire (see ANNEX 4), which was administrated to promoters of rice production (WANBAO RICE and LIAN FENG in Gaza province), managers of irrigation schemes (Baixo Limpopo Irrigation Scheme managers in Xai-Xai and Chokwe districts in Gaza province), rice provincial focal points (based at SPAE Zambezia), supervisors of the extension services as well as MADER, provincial and district directorates responsible for agriculture. The indicators for this category of Mozambique specific indicators are (i) quantity of fertilizer used in rice production and (ii) quantity of herbicide used in rice production.

Quantity of fertilizer used in rice production: This indicator represents the sum of the quantity of fertilizer (Urea and NPK) used in rice production. The indicator is calculated for each type of fertilizer, but not summing the quantities of various types of fertilizer**.** The data to compute this indicator were provided by the Baixo Limpopo Irrigation Scheme managers in Xai-Xai and Chokwe districts in Gaza province and the Rice focal points based at SPAE Zambezia and SPAE Sofala. The data were given in terms of the quantity of fertilizer used per hectare and the amount of area to which fertilizer was applied. Therefore, the quantity of fertilizer used was computed by multiplying the quantity of fertilizer used per hectare by the respective amount of the area to which fertilizer was applied. This process was performed for the data gathered in Gaza province, while the data from Zambezia and Sofala provinces were given in terms of total amounts. For the next M&E period, we recommend using the same procedures collecting data for the 2022/2023 cropping season using the sources listed above.

Quantity of herbicide used in rice production: It is the sum of the quantity of herbicide (MCPA, Propanil, Roster and Vega) used in rice production. The indicator is calculated for each type of herbicide, but not summing the quantities of various types of herbicides. Similarly, the data to compute this indicator were provided by the Baixo Limpopo Irrigation Scheme managers in Xai-Xai and Chokwe districts in Gaza province and the rice focal point based at SPAE Zambezia. For the case of Sofala province, the data on quantity of herbicide used in production were not disaggregated by crop and therefore not included in the calculation of this indicator. The data were given in terms of the quantity of herbicide used per hectare and the amount of area to which herbicide was applied. Therefore, the quantity of herbicide used was computed by multiplying the quantity of herbicide used per hectare by the respective amount of the area to which herbicide was applied. This process was performed for the data gathered in Gaza province, while the Zambezia data were given in terms of total amounts. For the next M&E period, we recommend using the same procedures collecting data for the 2022/2023 cropping season using the sources listed above.

3.7.3 Access to agricultural services

For this purpose, agricultural services comprise extension services including training, financial services, and mechanization services. Below we describe how the baseline values for indicators related to access to agricultural services are estimated.

Number of extension agents assisting rice growers: Three providers of extension services to farmers exist in Mozambique: (i) the Government through the public network; (ii) the private sector essentially for crops promoted by this sector such as cotton, sugar cane, tobacco, and rice; and (iii) non-governmental organizations (NGOs) through the implementation of development activities. Existing statistics on the number of extension agents are not disaggregated by crop; therefore, estimation of the number of extension agents especifically assisting rice farmers is not possible. Although, the rice focal points of the districts producing rice know the number of extension agents supporting rice farmers, the actual data system is not yet being organized in the manner of having the number of extension agents supporting rice farmers. This calls for enhancing the data system in terms of number of extension agents supporting rice farmers through establishing a reporting mechanism by which the rice focal points of rice producing districts collect data and submit to the national focal point. While statistics on the number of extension agents by province and district exist for the public sector, they do not exist for the private sector. In this context, we calculate the number of extension agents assisting rice farmers as the sum of the number of the publicsector extension agents across rice producing districts. We use information from IAI 2020 and PNA to identify rice producing districts.

Our methodological approach could lead to overestimation of the number of extension agents assisting rice growers for at least two main reasons. First, extension agents operating in rice producing districts assist not only rice growers but also growers of other crops grown in each district. Second, but related to the first, some extension agents within each district operate in locations in which rice is not grown. To correct to this potential overestimation, the consultant team in collaboration with MADER (including provincial rice focal points) collected data on the number of extension agents who especifically assist rice growers in the three main rice producing areas (Gaza, Sofala and Zambezia provinces). The source of data are the rice focal points based at SPAE of the visited provinces (Gaza, Sofala and Zambezia) and the district directors of economic activities of the districts producing rice in these three provinces as well as the managers of irrigation schemes. We computed this indicator by summing the number of extension agents assisting rice producers in the three visited rice-producing provinces.

Number of rice growers trained in the best production practices: Extension agents transfer knowledge regarding best production practices to rice growers. During the IAI 2020 interviews, farmers were asked if they received extension services. However, IAI data are not annually published, which can limit the yearly monitoring of this indicator. Due to this limitation, the data used to compute this indicator were collected during field visits to the main rice producing areas especially from rice focal points based at SPAE of the three visited provinces. To compute this indicator, we summed all rice producers who benefited from technical training at the rice producing provinces of Gaza, Sofala and Zambezia in the last cropping season. We recommend using the same procedure to compute the value of this indicator in the future M&E missions.

Number of equipments used in postharvest handling: This indicator corresponds to implements and equipments used in the rice post-harvest handling, such rice dryers, rice thresher, and quality control labs. This indicator is categorized into three sub indicators corresponding respectively to the sum of the number of:

- *(i)* Rice dryer used in rice post-harvest handling;
- (ii) Threshers used in rice post-harvest handling; and
- (iii) Rice quality control labs used in rice post-harvest handling.

The source of data are the rice focal points based at SPAE of the visited provinces of Gaza, Sofala and Zambezia. For the next M&E period, we recommend that the same approach be used.

3.7.4 Rice production and productivity

During the IAI 2020 interviews, farmers were asked whether they used yield enhancing agricultural inputs (such as irrigation, fertilizer, improved seed, and pesticides) on their rice plots. This information allows to classify farmers as those who used irrigation and those who did not. This classification allows to compute rice production and productivity indicators among farmers who irrigated their plots versus those who did not. Furthermore, using these questions related to yield enhancing agricultural input usage, we define rice production under input intensification as rice production systems in which rice farmers used both improved rice seed and fertilizer. Like in the case of irrigation, this classification of rice production system allows to compute rice production and productivity indicators among farmers using system with input intensification and those without input intensification. It is important to mention that IAI is the sole data source from which rice growers can be classified according to their level of use of yield enhancing agricultural inputs (with input intensification and without input intensification). However, IAI data is not collected regularly and therefore, we recommend the secondary data from SPAEs, PESOE, SUSTENTA to compute the values for the indicators listed below as described in the following sections.

Quantity of irrigated paddy production: This indicator is computed by summing the quantity of locally produced paddy under irrigation. The baseline value for this indicator was computed by averaging the quantity of paddy produced under irrigation. The data were sourced from SPAE Gaza.

Irrigated paddy yield: This indicator was estimated by dividing total irrigated paddy production by total harvested area under irrigated rice production for the past three cropping seasons. The average of the resulting irrigated paddy yield across the three cropping seasons was used as the baseline value for this indicator. The source of the data was the rice focal point based at the SPAE Gaza.

Quantity of rain-fed paddy produced under input intensification: This indicator represents the sum of the quantity of paddy production, measured in MT, across rice plots and rice growers who did not irrigate their plots but used input intensification (improved rice seed plus fertilizer). MADER is implementing SUSTENTA program through which farmers and especially the Small Commercial Emergent Farmers and Small Farmers are given improved inputs (seed and fertilizer) for rice production and also MADER focal point noted that the majority of these farmers produce rice under rain-fed. Therefore, the SUSTENTA data is used for the calculation of quantity of rain-fed paddy produced under input intensification. The calculation is done through averaging the quantity of paddy produced by these farmers in the last two cropping seasons (2020/2021 and 2021/2022).

Quantity of rain-fed paddy produced with no input intensification: This indicator is calculated as the sum of the quantities of rain-fed paddy production, measured in MT, across rice plots and rice growers who did not use input intensification (no use of improved rice seed nor fertilizer). The majority of rice producers in the country produce rice under rain-fed and does not use improved inputs (seed and fertilizer). Therefore, the data on quantity of rice reported in the PESOE annual reports represent largerly and significantly the quantity of paddy produced under rain-fed and without input intensification and it is used to compute the baseline value of this indicator. The calculation is done by computing the computing the arithmetic average of the quantity of paddy produced in the last three cropping seasons (2019/2020; 2020/2021 and 2021/2022). The result is adjusted to better reflect rain-fed paddy production with no input intensification by subtracting the quantity of paddy obtained through the arithmetic average above by the quantity of paddy production under rain-fed and input intensification, which the calcualtion methodology is explained in the above indicator and the quantity of paddy production under irrigation, which calculation methodology is explained in the indicator ***Quantity of irrigated paddy production*** presented above

Harvested area under rain-fed paddy production with input intensification: Like in the case of paddy production with input intensification presented above, , this indicator was computed by averaging the harvested area, measured in hectares, under rain-fed rice production across Small Commercial Emergente Farmers and Small Farmers under SUSTENTA program of the last two cropping seasons (2020/2021 and 2021/2022).

Harvested area under rain-fed paddy production with no input intensification: Like in the case of paddy production with no input intensification, using PESOE annual report data sourced from MADER, this indicator represents the average of harvested area, measured in hectares, under rice production reported under PESOE in the last three cropping seasons (2019/2020; 2020/2021 and 2021/2022). The results are adjusted to better reflect harvested area of rain-fed paddy with no input intensification by subtracting the harvested area obtained under PESOE by the harvested area of ain-fed paddy under input intensification, which methodology of calculation is explained in the above indicator and the harvested area of paddy under irrigation, which methodology of calculation is explained in the indicator ***Irrigated area under rice production*** presented above.

Rain-fed paddy yield with input intensification: The baseline value of this indicator is computed as the ratio between the quantity of rainfed paddy produced under input intensification and harvested area- under rain-fed paddy production with input intensification.

Rain-fed paddy yield with no input intensification: The baseline value of this indicator is computed as the ratio between the quantity of rainfed paddy produced under no input intensification and harvested area- under rain-fed paddy production with no input intensification.

4 RESULTS

4.1 Global indicators

Quantity of paddy production: Data summarized in Table 4.1 reveal that an average of about 264.2 thousand MT of paddy were produced during the 2019/2020 and 2021/2022 agricultural seasons. We take this as the baseline value. This indicator could alternatively be estimated using data from IAI 2020. Data from IAI 2020 show that paddy production amounted to 137.3 thousand MT in the 2019/2020 agricultural season, which is way below the estimated production of 340.8 thousand MT in the same agricultural season gathered from the PESOE annual monitoring report. For this indicator, data from the PESOE annual monitoring report appear more reliable than IAI 2020. Furthermore, and PESOE data are available annually, while IAI data are not.

Table 4.1 Rice production and productivity

Agricultural season	Paddy production (MT)	Harvested area (hectares)	Paddy yield (MT per hectare)	Data source
2019/2020	340,800	262,000	1.3	PESOE
2020/2021	206,115	226,500	0.9	PESOE
2021/2022	245,792	255,499	1.0	PESOE
Average	**264,236**	**248,000**	**1.1**	

Harvested area under rice production: As shown in Table 4.1, this indicator is estimated at about 248.0 thousand hectares over the 2019/2020 through 2021/2022 agricultural seasons. This average estimate represents the baseline value. Like in the case of paddy production, data from IAI 2020 indicate lower estimated harvested area under rice production (208.2 thousand hectares) than data from the PESOE annual monitoring report (262.0 thousand hectares) in the 2019/2020 agricultural season. Again, for this indicator, we find data from the PESOE annual monitoring report more reliable than that from IAI 2020.

Paddy yield: As shown in Table 4.1 above, paddy yield averaged 1.1 MT per hectare during the 2019/2020 through 2021/2020 agricultural seasons, which is the baseline value. Using data from IAI 2020, we found an average paddy yield of 0.6 MT per hectare in the 2019/2020 agricultural season, which is lower than yield computed using data from the PESOE annual monitoring report for the same agricultural season (1.3 MT per hectare). Once again, for this indicator, data from the PESOE annual monitoring report appear more reliable than that from IAI 2020.

Rate of self-sufficiency in rice: Data from PESOE annual monitoring reports, summarized in Table 4.2, reveal that the smallholder farmers' total production of milled rice averaged about 166.5 thousand MT between 2020 and 2022. Over the same period, according to data from USDA and INE, Mozambique, on average, exported 1,715 MT of milled rice and imported 670.0 thousand MT, being a net importer of rice. These USDA and INE trade data complemented with milled rice production data from the PESOE annual monitoring reports reveal that the baseline value for the rate of self-sufficiency in rice is estimated at 19.8 percent (average of the period 2020 through 2022) as illustrated in Table 4.2. This implies that Mozambique depends heavily on rice imports to satisfy its consumption needs.

Table 4.2 Rice production, import, export and self-sufficiency rate

	2020	2021	2022	Average	Data source
Quantity of milled rice production (MT)	214,704	129,852	154,849	166,468	PESOE
Quantity of imported milled rice (MT)	650,000	660,000	700,000	670,000	USDA
Quantity of exported milled rice (MT)	1,514	1,546	2,085	1,715	INE
Self-sufficiency rate (%)	24.9%	16.5%	18.2%	19.8%	

4.2 Resilience indicators

Irrigated area under rice production: Data on irrigated area are collected through field work. The results of the field work reveal that irrigated area under rice production in the 2021/2022 cropping season amounted to 9,910 hectares in Gaza province and 165 hectares in Zambezia province. The sum of these areas yields a total of 10,075 hectares of irrigated area under rice production in the 2021/2022 cropping season (Table 4.3). The IAI 2020 data overestimates the amount of irrigated land under rice production and therefore is not used in this report. Rice irrigation is done at land with operational irrigation infrastructure and the available data show that operational infrastructure used for rice production is available in Gaza (Low Limpopo Irrigation Scheme) and Zambezia (the Paz Irrigation Scheme in Mopeia) provinces. Therefore, the baseline value for the irrigated area under rice production is 10,075 hectares.

Table 4.3 Irrigated area under rice production

Indicator	Baseline value (2022)	Data source
Irrigated area under rice production (hectare)	10,075	SPAE Gaza and SPAE Zambézia

Quantity of certified seed of resilient rice varieties: Table 4.4 presents the quantity of certified seeds produced in the last three cropping season by variety. It should be noted that the resilient rice varieties that are tolerant to drought are CHUPA, NÉNÉ, M'ZIVA, MUCELO, OFOANHELA, and OZIVELIWA and those tolerant to lodging include MACASSANE, M'ZIVA, LIMPOPO and SIMÃO. However, the production of certified seed is not currently occurring for all these resilient rice varieties (see Table 4.4). Using the average quantity of certified seed of the resilient rice varieties in the last three cropping seasons, the base value for this indicator is 270.9 MT.

Table 4.4 Quantities of certified seed of rice resilient varieties by cropping season

Variety	Agricultural season			Total	Average
	2019/2020	2020/2021	2021/2022		
	Production (MT)				
MACASSANE	137.1	142.0	380.4	659.5	219.8
SIMÃO	30.0	42.5	54.0	126.5	42.2
NENE		5.0		5.0	5.0
LIMPOPO	3.9			3.9	3.9
Total	**171.0**	**189.5**	**434.4**	**794.9**	**270.9**

Source: Seed certification laboratories of Gaza, Manica and Zambezia provinces

4.3 Industrialization indicators

Rice milling capacity: We employed data (installed capacity for 15 rice milling factories operating in the country) presented in Table 4.5 and collected during field visit to estimate this indicator. From these data and using a cut-off of 2.0 MT per hour, we classify factories into two categories: small-scale millers (seven rice milling factories with installed capacity less than 2.0 MT per hour) and medium-to-large-scale millers (eight rice milling factories with installed capacity equal or greater than 2.0 MT per hour). Based on this classification, the installed processing capacity of the medium-to-large-scale millers are estimated at about 37.5 MT per hour, against an installed processing capacity of about 8.5 MT per hour among small-scale millers; with an aggregate installed capacity of around 46.0 MT per hour. It is worth pointing out that the aggregate annual installed processing capacity is much greater than the domestic rice production (305.9 thousand MT versus 264.2 thousand MT). Using the available data presented in Table 4.5, the baseline value for the industrial processing capacity (medium-to-large-scale millers) as a share of the total processing capacity (medium-to-large-scale plus small-scale millers) is 81.5 percent.

Table 4.5 Installed rice milling capacity

Indicator	Baseline value (2022)	Data source
Processing capacity: Total (MT per hour)	46.0	Rice millers
Processing capacity: Medium-to-large-scale factories (MT per hour)	37.5	Rice millers
Processing capacity: Small-scale factories (MT per hour)	8.5	Rice millers
Share of industrial processing capacity (%)	81.5%	

Level of mechanization in rice production: The level of mechanization is measured by the number of tractors, harrows, ploughs, seed-fertilizer applicators and combine harvesters engaged in rice production. Required data to estimate the mechanization related to these indicators are collected from MADER and especially the rice focal person except for the number of combine harvesters in rice production, which were collected from the 13 rice producing districts distributed in three main rice producing provinces (Gaza, Sofala and Zambezia) during field visits. The tractors are of the following brands LS, MASSEY FERGUSON, CASE, JOHN DEER and DEUTZ-FAHR. The interviewed actors of the rice value chain reported that the tractors used in the rice production have been suitable for the type of soil used in rice production including puddling and levelling due mainly to the fact that puddling has been discontinued and plowing and sowing are done on dry land with about 120 kg per hectare of seed. The baseline values for these indicators, as presented in Table 4.6, are as follows: 110 for tractors, 99 for harrows, 102 for ploughs, 45 for seed-fertilizer applicators and 102 for combine harvesters.

Table 4.6 Level of mechanization in rice production

Indicator	Baseline value (2022)	Data source
Number of tractors in rice production	110	MADER (Rice focal point)
Number of harrows	99	MADER (Rice focal point)
Number of ploughs	102	MADER (Rice focal point)
Number of seed-fertilizer applicator	45	MADER (Rice focal point)
Number of combine harvesters in rice production	102	SPAE (Gaza, Sofala, Zambezia)

4.4 Competitiveness indicators

Market share of domestic rice: As discussed earlier, data from INE show that imported milled rice amounted to 1,051 million MT in 2020 compared to 650.0 thousand MT reported by USDA. Also as previously discussed, data from INE appear to overestimate the amount of imported milled rice compared to data from USDA. The market share of domestic rice stands at less than 1.0 percent when we use import data from INE compared to 2.1 percent when we use import data from USDA. These findings suggest that INE data lead to substantial underestimation of this indicator. Hence, we use USDA data to compute this indicator. The baseline value for this indicator is presented in Table 4.7 showing that domestic rice represents only 2.1 percent of the rice sold in the market. Once again, this finding emphasizes the significantly high reliance on imported rice to meet consumption needs.

Table 4.7 Market share of domestic rice

Item	Baseline value (2020)	Data source
Quantity of domestic milled rice sales (MT)	14,204	IAI 2020
Quantity of imported milled rice (MT)	650,000	USDA
Quantity of exported milled rice (MT)	1,514	INE
Market share of domestic rice (%)	2.1%	

Quantity of certified seed of high-yielding rice varieties: This indicator represents the sum of the quantity of all certified seed of high yielding rice varieties produced in the country. MACASSANE and SIMÃO rice varieties are considered high yielding varieties with potential yield of 7.8 MT per hectare and 10.2 MT per hectare, respectively. Therefore, the baseline value of the quantity of certified seed of high yielding rice varieties is 262.0 MT, the sum of the average of produced certified seed of the two varieties (MACASSANE with 219.8 MT and SIMÃO with 42.2 MT) in the last three cropping seasons (Table 4.8).

Table 4.8 Production (MT) of certified seed of high-yielding rice varieties

Variety	Agricultural season			Total	Average
	2019/2020	2020/2021	2021/2022		
MACASSANE	137.1	142.0	380.4	659.5	219.8
SIMÃO	30.0	42.5	54.0	126.5	42.2
Total	**167.1**	**184.5**	**434.4**	**786.0**	**262.0**
Average	**83.6**	**92.3**	**217.2**	**393.0**	**131.0**

Source: Seed certification laboratories of Gaza, Manica and Zambezia provinces

4.5 Empowerment indicators

Access of rice growers to financial services: The baseline value for this indicator is estimated at 53.5 percent, which results from the ratio between the number of rice farmers having access to at least one financial service (268,950) and the total number of rice farmers (502,255) as shown in Table 4.9. The top three financial services in terms of the proportion of users among rice growers in the 2019/2020 agricultural season are M-PESA with 48.0 percent of users, banking accounts with 18.9 percent, and ROSCA with 16.8 percent. Only 0.8 percent of rice growers had access to credit. Annex 7 presents the definition of the financial services presented in Table 4.9.

Table 4.9 Access to financial services

Indicator	**Baseline value (2022)**	**Data source**
Share of rice growers who have access to financial services (%)	53.6%	IAI 2020
Number of rice growers having access to at least one financial service	268,959	IAI 2020
Number of rice growers having access to credit	3,944	IAI 2020
Number of rice growers having access to MPESA	240,859	IAI 2020
Number of rice growers having access to bank accounts	95,124	IAI 2020
Number of rice growers having access to ROSCA	84,466	IAI 2020
Number of rice growers having access to MKESH	1,301	IAI 2020
Number of rice growers having access to eMOLA	13,016	IAI 2020
Number of rice growers having access to *conta movel*	17,541	IAI 2020
Total number of rice growers	502,255	IAI 2020

Share of rice growers with access to technical services and training: During field visit in the main rice producing provinces (Gaza, Sofala and Zambezia) we found about 32.9 thousand rice growers who received agricultural training and services out of the 330.5 thousand rice growers, corresponding to 10 percent baseline value of the percentage of rice growers with access to agriculture training and services (Table 4.10). The same table presents the total number of rice growers and those who had access to agriculture training and services in the last cropping season by province.

Table 4.10 Access to agricultural training and services

Province	Number of rice growers		Trained rice grower as a share of total	Source
	Total	Trained		
Gaza	9,468	723	8%	SPAE Gaza
Sofala	17,500	6,248	36%	SPAE Sofala
Zambezia	303,500	25,956	9%	SPAE Zambezia
Total	**330,468**	**32,927**	**10%**	

Levels of domestic and imported milled rice prices in the domestic market: Retail price data from the Ministry of Industry and Trade (MIC) show that imported milled rice are classified into two main groups: high quality referred to as *Extra* and low quality referred to as *arroz corrente*. According to these data, summarized in Table 4.11, during the period between 2021 and 2022, imported milled rice *Extra* was sold at an average price of 64.4 MZN per kg (equivalent of 1.02 USD per kg) in the three main urban retail markets of the country (Maputo, Beira, and Nampula), while the low-quality imported milled rice *arroz corrente* sold at 51.6 MZN per kg (equivalent of 0.82 USD per kg). To establish the baseline value for this indicator, we averaged retail prices of both types of imported milled rice across the three main urban markets between 2021 and 2022. Thus, as shown in Table 4.11, the baseline value for the retail price of imported milled rice was estimated at 58.0 MZN per kg (equivalent of 0.92 USD per kg).

Table 4.11 Retail price of imported milled rice (MZN per kg)

Market	Year		Average
	2021	2022	
	High quality: *Extra*		
Maputo	81.1	70.0	75.6
Beira	61.0	62.9	62.0
Nampula	50.0	61.1	55.6
Average	**64.0**	**64.7**	**64.4**
	Low quality: *Arroz corrente*		
Maputo	64.3	55.4	59.9
Beira	49.6	46.5	48.1
Nampula	47.9	45.8	46.9
Average	**53.9**	**49.2**	**51.6**
	Combined: *Extra and arroz corrente*		
Maputo	72.7	62.7	67.7
Beira	55.3	54.7	55.0
Nampula	49.0	53.5	51.2
Average	**59.0**	**57.0**	**58.0**

Source: Ministry of Industry and Trade

Table 4.12 presents the data on the retail price of the domestic milled rice brands. As shown in this table, the baseline value of the retail price of the domestically produced milled rice is estimated at 55.8 MZN per kg (equivalent to 0.88 USD per kg). The source of data are the respective rice processing factories. Our findings summarized in Table 4.11 and Table 4.12 reveals that domestically produced milled rice is more expensive than the low-quality imported milled rice, but less expensive than the high-quality imported milled rice (55.8 MZN per kg versus 51.6 MZN per kg versus 64.4 MZN per kg). This finding suggests that the domestically produced milled rice is less price competitive than the low-quality imported milled rice but more price competitive than high-quality imported milled rice. This could be associated with the fact that consumers are willing to pay a premium for the relatively better quality of the domestically produced milled rice compared to the high-quality imported milled rice.

Table 4.12 Retail prices of domestically produced milled rice

District	Company	Brand	Price (MZN /25kg)	Price (MZN /kg)
Chokwe	LIA	TIA LIA	1,500	60
Xai Xai	WANBAO	WANBAO	1,250	50
	LIAN FENG	AMIZADE	1,250	50
Buzi	LIAN AGRICULTURE DEVELOPMENT AFRICA	BUZI RICE	1,100	44
Dondo	TONGAAT HULLET	HULETTS RICE	1,250	50
Nicoadala	TIA RUQUIA	TIA RUQUIA RICE	1,500	60
	IMPER	OKALELAMO	1,800	72
Maganja da Costa	PROIMAC	LICUNGO RICE	1,500	60
Average			**1,393.8**	**55.8**

Source: Rice processing factories

4.6 Mozambique specific indicators

4.6.1 Rice seed production

Quantity of breeder rice seed: Table 4.13 presents the quantities of early generation rice seed by variety and cropping season. We compute the baseline value for this indicator as the sum, across rice varieties, of the average quantities of breeder rice seed produced in the 2020/2021 and 2021/2022 cropping seasons. As shown in Table 4.13, the baseline value of the quantity of breeder rice seed is estimated at 464 kg.

Quantity of pre-basic rice seed: Like in the case of breeder rice, the baseline value of the quantity of pre-basic rice seed is the sum, across rice varieties, of the average quantities produced in the 2020/2021 and 2021/2022 cropping seasons. Therefore, the baseline value for this indicator is 6,126 kg (Table 4.13).

Quantity of basic rice seed: The baseline value of the quantity of basic seed is computed as the sum, across rice varieties, of the average quantities produced in the 2020/2021 and 2021/2022 cropping seasons. Hence, the baseline value for ths indicator, as shown in Table 4.13, is estimated at 51,833 kg, which corresponds to 51.8 MT.

Table 4.13 Quantity of early generation rice seed by variety and cropping season

Variety	Agricultural season		Average
	2020/2021	2021/2022	
	Breeder seed (kg)		
MACASSANE	261	161	211
TIO TAKA	40	50	45
VASOMAT	50	40	45
HUWA	30	40	35
SIMÃO	69	87	78
MOZ114	50	50	50
TCHULULA			
Total	**500**	**428**	**464**
	Pre-basic seed (kg)		
MACASSANE	3,189	3,115	3,152
TIO TAKA			
VASOMAT			
HUWA			
SIMÃO	2,212	2,535	2,374
MOZ114			
TCHULULA	600		600
Total	**6,001**	**5,650**	**6,126**
	Basic seed (kg)		
MACASSANE	51,400	40,100	45,750
TIO TAKA			
VASOMAT			
HUWA			
SIMÃO	9,800	700	5,250
MOZ114			
TCHULULA	883		883
Total	**62,083**	**40,800**	**51,883**

Source: IIAM breeders in Umbeluzi, Chokwe, Nicoadala and Namacurra

Quantity of certified rice seed: Table 4.4 on page 27 presents the data of quantity of certified seed of rice varieties in the last three cropping seasons. Using the sum, across rice varieties, of the average quantities of certified rice seed produced in the last three cropping seasons, we conclude that the baseline value for this indicator is 287.4 MT.

Area under certified rice seed production: Table 4.14 presents the amounts of the area used to produce certified seed by rice variety. Using the sum, across rice varieties, of the average quantities of the area used for production of certified rice seed in the last three cropping seasons, we conclude that the baseline value for this indicator is 326.9 hectares.

Table 4.14 Area used for production of certifiied rice seed

Variety	Agricultural season			Total	Average
	2019/2020	2020/2021	2021/2022		
MACASSANE	144.1	87.5	553.7	785.3	261.8
MOCUBA	27.0	8.0		35.0	17.5
SIMÃO	30.0	15.0	50.0	95.0	31.7
NENE		2.0		2.0	2.0
LIMPOPO	14.0			14.0	14.0
Total	**215.1**	**112.5**	**603.7**	**931.3**	**326.9**

Source: Seed certification laboratories of Gaza, Manica and Zambezia provinces

4.6.2 Access to high-yielding agricultural inputs

Quantity of fertilizer used in rice production: Data from the *Regadio de Baixo Limpopo* (RBL) indicate that during the 2021/2022 cropping season, 300 kg of urea per hectare were applied in 2,510 hectares and 200 kg of urea per hectare was applied in 2,390 hectares in Xa-Xai area. The RBL data also indicate that during the same cropping season, 200 kg of urea per hectare was applied in 1,446 hectares and 100 kg of urea per hectare was also applied in 3,984 hectares in Chokwe area. Multiplying the quantity of fertilizer applied per hectare by the respective total area, we conclude that the total quantities of urea applied in the last season in Xai-Xai and Chokwe were 1,231 MT and 687.6 MT, respectively (see Table 4.15).

Table 4.15 Quantity of fertilizer used in rice production

Type of fertilizer	Quantity (MT)	Source of data
Urea	1,231.0	RBL Xai-Xai
Urea	687.6	RBL Chokwe
Urea	241.0	SPAE Zambézia
Urea	155.9	SPAE Sofala
Total urea	**2,315.5**	
NPK	172.0	SPAE Zambézia
NPK	350.0	SPAE Sofala
Total NPK	**522.0**	

The quantities of NPK and urea applied in Zambezia province in the 2021/2022 cropping season were 172 MT and 241 MT, respectively. Table 4.15 presents the total quantities of fertilizer used in rice production in the 2021/2022 cropping season. As shown in this table, the quantities of urea and NPK used in rice production in the three provinces (Gaza, Sofala and Zambézia) are 2,315.5 MT and 522 MT, respectively. MADER reports the distribution of 305.7 MT of NPK and 167.7 MT of urea under SUSTENTA program. The SUSTENTA distributed inputs went to the Small Commercial Emergent Farmers and Small Farmers covered by the program and these are few and therefore not being a representative sample. Therefore, we believe that the baseline values for quantity of NPK and urea are 2,315.5 MT and 522 MT, respectively, calculated from field visit.

Quantity of herbicides used in rice production: Different types of herbicide namely MCPA, Propanil, Roster and Vega are used in rice production. At the RBL in Xai-Xai, Propanil and MCPA are used. The data collected from RBL Xai-Xai show the rate of usage of 3 liters per hectare and 7 liters per hectare of MCPA and Propanil, respectively. In the 2021/2022 cropping season, the herbicides MCPA and Propanil were applied in 1,400 hectares at RBL Xai-Xai. Therefore, the total quantities of MCPA and Propanil used at RBL Xai-Xai amounted to 4,200 liters and 9,800 liters, respectively. The RBL Chokwe reported to have used 712 liter of Roster; 13,125 liters of Propanil, and 3,937.5 liters of MCPA in the 2021/2022 cropping season. In Zambezia province, 153 kg of Vega were applied in rice production in the 2021/2022 cropping season. Table 4.16 presents the quantities of herbicide used in rice production in the 2021/2022 cropping season. MADER reports the distribution of 1,318Kg of herbicide for small sample of farmers composed of Small Commercial Emergent Farmer and Small Farmer. Therefore, we believe that the data provided in Table 4.16 (8,137.5 litters for MCPA; 22,925 litters for Propanil; 712 liters for Roster and 153 kg for Vega) are the baseline values for herbicide application.

Table 4.16 Quantity of herbicide used in rice production

Type of herbicide	Unit	Quantity	Source of Data
MCPA	Liters	4,200	RBL Xai-Xai
MCPA	Liters	3,937.5	RBL Chokwe
Subtotal	**Liters**	**8,137.5**	
Propanil	Liters	9,800	RBL Xai-Xai
Propanil	Liters	13,125	RBL Chokwe
Subtotal	**Liters**	**22,925**	
Roster	Liters	712	RBL Chokwe

Vega	Kilograms	153	SPAE/Focal Point Zambezia

4.6.3 Access to agricultural services

Number of extension agents assisting rice growers: Using the secondary data from MADER and specifically the Fund for Agriculture Promotion and Rural Extension, the baseline value for the number of extension agents assisting rice growers is 976 (nine hundred and seventy six). However, from around 13 visited districts producing rice of the three provinces (Gaza, Sofala and Zambezia) we found about 274 (two hundred and seventy-four) extension agents assisting rice producers. For the baseline value we consider data from the three visited provinces, that is, 274 (two hundred and seventy-four) extension agents. It is because the number reflects only the extension agents who assist rice producers. This indicator could be slightly underestimated.

Number of rice growers trained in the best production practices: During field visits in the three main rice producing provinces (Gaza, Sofala and Zambezia) we found about 32.9 thousand producers that were trained in good rice production practices, while IAI 2020 revealed the existence of 42.1 thousand producers trained in rice production practices in the 2019/2020 cropping season. The result collected from the three provinces is below by 21.7 percent compared to the data from IAI 2020. This is because, IAI data reflect the whole country, however their frequency is limited because they are not published regularly at annual basis. Therefore, as a baseline value for this indicator, we used data from field visit to be the baseline value. Hence, the baseline value for this indicator is 32.9 thousand rice growers (see Table 4.10 on page 31).

Number of equipments used in post-harvest handling: This indicator corresponds to implements and equipments used in rice post-harvest handling, such as rice dryers, rice thresher, and quality control labs. The baseline values for the above indicators are shown in Table 4.17.

Table 4.17 Equipment used in rice post-harvest handling

Indicator	Baseline value (2022)	Data source
Number of rice dryers	6	SPAE (Gaza, Sofala, Zambezia)
Number of rice threshers	4	SPAE (Gaza, Sofala, Zambezia)
Number of quality control labs	6	SPAE (Gaza, Sofala, Zambezia)

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4.6.4 *Rice production and productivity*

Quantity of irrigated paddy production: The baseline value for this indicator calculated using SPAE Gaza data is 45,034 MT, as shown in Table 4.18 . Note that we only considered data from Gaza because it is the province with available data disaggragated by type of irrigation (irrigated and not irrigated).

Irrigated paddy yield: Table 4.18 reveals that irrigated paddy yield averaged 4.2 MT per hectare over the 2019/2022 agricultural seasons; which is the baseline value for this indicator. IAI 2020 data show that irrigated paddy rice yield averaged 0.9 MT per hectare in the 2019/2020 agricultural season, which is way below average yield of 4.2 MT per hectare reported by SPAE Gaza. For this indicator, we believe that SPAE data are more reliable than IAI 2020 data.

Table 4.18 Irrigated paddy production and productivity

Agricultural season	Paddy production (MT)	Harvested area (hectares)	Paddy yield (MT per hectare)	Data source
2019/2020	46,440	10,177	4.6	SPAE Gaza
2020/2021	48,416	11,824	4.1	SPAE Gaza
2021/2022	40,245	9,910	4.1	SPAE Gaza
Average	**45,034**	**10,637**	**4.2**	

Quantity of rain-fed paddy produced under input intensification: As shown in Table 4.19, based on SUSTENTA data provided by MADER, the baseline value for this indicator is estimated at 397.2 MT.

Quantity of rain-fed paddy produced with no input intensification: Data from PESOE annual monitoring report sourced from MADER show that the baseline value for this indicator is estimated at 218,805MT (see Table 4.19).

Harvested area under rain-fed paddy production with input intensification: Table 4.19 shows that 155.4 hectares of area were allocated to rain-fed rice production with input intensification, which is the baseline value for this indicator.

Harvested area under rain-fed paddy production with no input intensification: According to PESOE annual monitoring report data produced by MADER, as presented in Table 4.19, the baseline value for this indicator is 237,769 hectares.

Table 4.19 Rain-fed rice production and productivity across production systems

Item	Baseline value (2022)		Data source
	Input intensification	No input intensification	
Paddy production (MT)	397.2	218,805	MADER
Harvested area (hectare)	155.4	237,769	MADER
Paddy yield (MT per hectare)	2.6	0.92	MADER

Rain-fed paddy yield with input intensification: Data from MADER and especially SUSTENTA program show that rain-fed paddy yield with input intensification stood at 2.6 MT per hectare in the last two crop seasons, which is the baseline value for this indicator (see Table 4.19).

Rain-fed paddy yield with no input intensification: Table 4.19 also indicates that the baseline value for this indicator is 0.92 MT of paddy per hectare.

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5 CONCLUSIONS

Mozambique is rice deficit country since the domestic production is lower than domestic consumption and this deficit has been growing over time due to the growing consumption over time. To revert this situation, the government with partnership from CARD developed the National Rice Program 2030 which aims to duplicate rice production and eliminate rice deficit by 2030. In addition to this global goal, the National Rice Program has a set of indicators to be monitored during the implementation of this program. Within the perspective of monitoring the National Rice Program, this study aims to: (i) present the methodology for the calculation of the baseline values for the NRDS, and. (ii) establish the preliminary baseline values for the National Rice Program. The methodology for the calculation of each indicator was explained above including the data and their respective sources. The baseline values of the CARD indicators calculated using the above explained methodology and data are presented in Table 5.1. Table 5.2 presents the baseline values for the Mozambique specific indicators. These baseline values reported along with their respective base year, that is, the timeline of the data used to compute the baseline values, the data source, frequency and reliability for availability of the data. These baseline values should be considered as the starting point from which the National Rice Program should be evaluated in terms of its performance towards achieving the targets over time.

Tables 5.1 and 5.2 present also the 2030 target value for the respective indicators. However, there are indicators without information for establishing the 2030 target values and these indicators are CARD indicators on level of mechanization (number of tractors, harrows, ploughs, seed fertilizer applicators, combine harvesters; CARD empowerment indicators (percentage of rice growers with access to financial services); CARD price indicators (retail price of imported milled rice and eetail price of domestic milled rice,); and Mozambique specific indicators on quantity of roster used in rice production, quantity of vega used in rice production, number of rice thresher, number of rice dryers, and number of quality control labs.

The 2030 target value for the paddy yield (MT per hectare) was calculated as the weithed average of the 2030 target yield per hectare of paddy rice under irrigation, 2030 target yield per hectare of rain-fed paddy rice with input intensification and the 2030 target yield per hecatre of rain-fed paddy rice with no input intensification. The weights are the proportions of the 2030 target value of production of the paddy rice produced under these three systems. Data on the 2030 target yield per hecatre and well as production of the paddy rice produced under these systems were taken from the National Rice Program.

The 2030 target value of percentage of rice growers having access to technical training and service was computed as the ratio between the 2030 target value of number of farmers foreseen to have acess to financial services repoted in the National Rice Program (34,800) and the actual number of rice producers reported in this baseline (330,468). The 2030 target value for the rest of the indicators were taken from the National Rice Program.

Table 5.1 Baseline values of the CARD indicators

Category	Indicator	2030 target value	Baseline value	Base year	Data source	Frequency
CARD Overall Indicators	Quantity of paddy production (MT)	1,489,344	264,236	2022	PESOE annual monitoring report	Annual
	Harvested area under rice production (hectare)	570,272	248,000	2022	PESOE annual monitoring report	Annual
	Paddy yield (MT per hectare)	2.8	1.1	2022	Calculated using PESOE annual monitoring report	Annual
	Rate of self-sufficiency in rice (%)	100	19.8	2022	Quantities of exported milled rice from INE, of imported milled rice from USDA and of milled rice production from PESOE annual monitoring report	Annual
CARD Resilience Indicators	Irrigated area under rice production (hectare)	33,466	10,075	2022	SPAE (Gaza and Zambezia)	Annual
	Quantity of certified seed of resilient rice varieties (MT)	25,414	270.9	2022	Seed certification laboratories (Lionde, Manica and Namacurra)	Annual
CARD Industrialization Indicators	Rice milling capacity (%)	100	81.7	2022	Rice processors	Annual
	Level of mechanization in production					
	Number of tractors	WI	110	2022	MADER (Rice focal point)	Annual
	Number of harrows	WI	99	2022	MADER (Rice focal point)	Annual
	Number of ploughs	WI	102	2022	MADER (Rice focal point)	Annual
	Number of seed-fertilizer applicator	WI	45	2022	MADER (Rice focal point)	Annual
	Number of combine harvesters	WI	102	2022	SPAE (Gaza, Sofala and Zambezia)	Annual
CARD Competitiveness Indicators	Market share of domestic rice (%)	100	2.1	2020	Quantities of exported milled rice from INE, of imported milled rice from USDA and of domestic milled rice sales from IAI 2020	Annual (INE) and biannual (IAI)
	Quantity of certified seed of high-yielding rice varieties (MT)	25,414	262.0	2020	Seed certification laboratories (Lionde, Manica and Namacurra)	Annual
CARD Empowerment Indicators	Rice growers with access to financial services (%)	WI	53.6	2020	IAI 2020	Biannual
	Rice growers having access to technical training and service (%)	10.5	10	2022	SPAE (Gaza, Sofala and Zambezia)	Annual
CARD Price Indicators	Level of retail rice prices					
	Retail price of imported milled rice (USD per MT)	WI	916.5	2022	MIC	Annual
	Retail price of domestic milled rice (USD per MT)	WI	882.2	2022	Locally produced rice retailing companies	Annual

Notes: WI stands for without information.

Table 5.2 Baseline values of the Mozambique specific indicators

Category	Indicator	2030 target value	Baseline value	Base year	Data source	Frequency
Mozambique Rice seed production indicators	Quantity of breeder rice seed (kg)	151.4	464	2022	IIAM and IRRI rice breeders	Annual
	Quantity of pre-basic rice seed (kg)	9,460	6,126	2022	IIAM and IRRI rice breeders	Annual
	Quantity of basic rice seed (kg)	542,000	51,833	2022	IIAM and IRRI rice breeders	Annual
	Quantity of certified rice seed (MT)	25,414	287.4	2022	Seed certification laboratories (Lionde, Manica and Namacurra)	Annual
	Harvested area under certified seed production (hectare)	317,674	326.9	2022	Seed certification laboratories (Lionde, Manica and Namacurra)	Annual
Mozambique Access to high yield agriculture inputs indicators	Quantity of fertilizer used in rice production (MT)					
	Quantity of urea used in rice production (MT)	13,468	2,315.5	2022	RBL (Gaza), SPAE (Sofala and Zambezia)	Annual
	Quantity of NPK used in rice production (MT)	6,693	522	2022	SPAE (Sofala and Zambezia)	Annual
	Quantity of herbicide used in rice production					
	Quantity of MCPA used in rice production (Liters)	100,398	8,137.5	2022	RBL (Gaza)	Annual
	Quantity of Propanil used in rice production (Liters)	267,728	22,925	2022	RBL (Gaza)	Annual
	Quantity of Roster used in rice production (Liters)	WI	712	2022	RBL (Gaza)	Annual
	Quantity of Vega used in rice production (Kg)	WI	153	2022	SPAE Zambezia	Annual
Mozambique Access to agricultural services indicators	Number of extension agents assisting rice growers	380	274	2022	SPAE (Gaza, Sofala and Zambezia)	Annual
	Number of producers trained in the best production practices	34,800	32,927	2022	SPAE (Gaza, Sofala and Zambezia)	Annual
	Number of equipment used in rice post-harvest handling					
	Number of rice thresher	WI	4	2022	SPAE (Gaza, Sofala and Zambezia)	Annual
	Number of rice dryer	WI	6	2022	SPAE (Gaza, Sofala and Zambezia)	Annual
	Number of quality control labs	WI	6	2022	SPAE (Gaza, Sofala and Zambezia)	Annual
Mozambique Rice production and productivity indicators	Quantity of irrigated paddy rice produced (MT)	184,063	45,034	2020	SPAE Gaza	Annual
	Irrigated paddy rice yield (MT/ha)	5.5	4.2	2022	SPAE Gaza	Annual
	Rain-fed paddy production: input intensification (MT)	1,239,977	397.2	2022	MADER/SUSTENTA data set	Annual
	Rain-fed paddy production: No input intensification (MT)	65,305	218,805	2022	PES annual monitoring report	Annual
	Harvested area under rain-fed rice production: Input intensification (hectare)	495,991	155.4	2022	MADER/SUSTENTA data set	Annual
	Harvested area under rain-fed rice production: No input intensification (hectare)	40,815	237,769	2022	PESOE annual monitoring report	Annual
	Rain-fed paddy yield: Input intensification (MT per hectare)	2.5	2.6	2022	MADER/SUSTENTA data set	Annual
	Rain-fed paddy yield: No input intensification (MT per hectare)	1.6	0.92	2022	PESOE annual monitoring report	Annual

Notes: WI stands for without information.

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ANNEX 1: BREEDER QUESTIONNAIRE

Questionnaire for IIAM and IRRI breeders in Umbeluze, Chokwe and Nicoadala research stations.

Please fill the table below regarding early generation seeds.

Varieties	Quantity (kg)		
	breeders seed	pre-basic seed	basic seed
IR64			
ITA 312			
BR IRGA 409			
BR IRGA 417			
MACASSANE			
M'ZIVA			
TUMBETA			
HUWA			
NENE			
SIMAO			
MUCELO			
OFOANHELA			
OZIVELIWA			
TCHULULA			
CHUPA			
MAMIMA			
MOCUBA			
LIMPOPO			

ANNEX 2: CERTIFIED SEED PRODUCING COMPANIES QUESTIONNAIRE

Please fill the table below regarding the amount of and land area allocated to certified rice seed production.

Varieties	2019/2020		2020/2021		2021/2022	
	Quantity (MT)	Land area (hectares)	Quantity (MT)	Land area (hectares)	Quantity (MT)	Land area (hectares)
IR64						
ITA 312						
BR IRGA 409						
BR IRGA 417						
MACASSANE						
M'ZIVA						
TUMBETA						
HUWA						
NENE						
SIMAO						
MUCELO						
OFOANHELA						
OZIVELIWA						
TCHULULA						
CHUPA						
MAMIMA						
MOCUBA						
LIMPOPO						

ANNEX 3: PRODUCER QUESTIONNAIRE

Questionnaire number | | | | | | | | |

Data | | /| | | / 202 | |

Interviewee name ______________________ Phone number ______________

Production system ☐ Irrigated ☐ Rain-fed

Input	Did you use [INPUT] in the 2021/2022 cropping season? 1 = Yes and 2 = No	Quantity applied	
		Amount	Unit
NPK			
Urea			
Propanil			
MCPA			
Roster			

Equipment	Did you own [EQUIPMENT] in the 2021/2022 cropping season? 1 = Yes and 2 = No	Number used in rice production
Tractor		
Combine harvesters		

ANNEX 4: PROCESSOR QUESTIONNAIRE

Please fill the table below regarding rice processing capacity.

Rice milling factory	District	Installed capacity (MT per year)	Effective capacity (MT per year)	Installed capacity (MT per hour)

ANNEX 5: GOVERNMENT QUESTIONNAIRE

Please fill the table below regarding provision of technical assistance and training in rice production.

Province	District	Number of extension agents assisting rice growers	Number of rice growers trained in production practices
Cabo Delgado	Balama		
	Montepuez		
	Namuno		
	Mocimboa da Praia		
	Muidumbe		
	Quissanga		
Niassa	Mecanhelas		
Nampula	Angoche		
	Larde		
	Liupo		
	Memba		
	Mogovolas		
	Moma		
	Mongicual		
Zambezia	Gilé		
	Gurué		
	Ile		
	Luabo		
	Lugela		
	Maganja da Costa		
	Milange		
	Mocuba		
	Mopeia		
	Morrumbala		
	Nicoadala		
	Pebane		
Sofala	Beira		
	Búzi		
	Caia		
	Dondo		

Inhambane	Govuro		
	Homoine		
	Inharrime		
	Morrumbene		
	Panda		
	Zavala		
Gaza	Bilene		
	Chibuto		
	Chokwe		
	Chongoene		
	Limpopo		
	Manjacaze		
	Xai-Xai		
	Zongoene		
Maputo	Magude		
	Manhiça		
	Marracuene		
	Matutuine		

Please fill the table below regarding usage of equipment and implements in rice production.

Province	District	Number of equipment or implement				
		Tractors	Combine harvesters	Threshers	Harrows	Ploughs
Cabo Delgado	Balama					
	Montepuez					
	Namuno					
	Mocimboa da Praia					
	Muidumbe					
	Quissanga					
Niassa	Mecanhelas					
Nampula	Angoche					
	Larde					
	Liupo					
	Memba					
	Mogovolas					
	Moma					
	Mongicual					
Zambezia	Gilé					
	Gurué					
	Ile					
	Luabo					
	Lugela					
	Maganja da Costa					
	Milange					
	Mocuba					
	Mopeia					
	Morrumbala					
	Nicoadala					
	Pebane					
Sofala	Beira					
	Búzi					
	Caia					
	Dondo					
Inhambane	Govuro					
	Homoine					
	Inharrime					
	Morrumbene					
	Panda					

	Zavala					
Gaza	Bilene					
	Chibuto					
	Chokwe					
	Chongoene					
	Limpopo					
	Manjacaze					
	Xai-Xai					
	Zongoene					
Maputo	Magude					
	Manhiça					
	Marracuene					
	Matutuine					

Please fill the table below regarding usage of equipment and implements in rice production.

Province	District	Number of equipment or implement		
		Seed-fertilizer applicator	Rice dryer	Quality control labs
Cabo Delgado	Balama			
	Montepuez			
	Namuno			
	Mocimboa da Praia			
	Muidumbe			
	Quissanga			
Niassa	Mecanhelas			
Nampula	Angoche			
	Larde			
	Liupo			
	Memba			
	Mogovolas			
	Moma			
	Mongicual			
Zambezia	Gilé			
	Gurué			
	Ile			
	Luabo			
	Lugela			
	Maganja da Costa			
	Milange			
	Mocuba			
	Mopeia			
	Morrumbala			
	Nicoadala			
	Pebane			
Sofala	Beira			
	Búzi			
	Caia			
	Dondo			
Inhambane	Govuro			
	Homoine			
	Inharrime			
	Morrumbene			
	Panda			

	Zavala			
Gaza	Bilene			
	Chibuto			
	Chokwe			
	Chongoene			
	Limpopo			
	Manjacaze			
	Xai-Xai			
	Zongoene			
Maputo	Magude			
	Manhiça			
	Marracuene			
	Matutuine			

Please fill the table below regarding usage of fertilizer.

Province	District	Quantity of fertilizer applied (MT)		
		NPK	Urea	
Cabo Delgado	Balama			
	Montepuez			
	Namuno			
	Mocimboa da Praia			
	Muidumbe			
	Quissanga			
Niassa	Mecanhelas			
Nampula	Angoche			
	Larde			
	Liupo			
	Memba			
	Mogovolas			
	Moma			
	Mongicual			
Zambezia	Gilé			
	Gurué			
	Ile			
	Luabo			
	Lugela			
	Maganja da Costa			
	Milange			
	Mocuba			
	Mopeia			
	Morrumbala			
	Nicoadala			
	Pebane			
Sofala	Beira			
	Búzi			
	Caia			
	Dondo			
Inhambane	Govuro			
	Homoine			
	Inharrime			
	Morrumbene			
	Panda			
	Zavala			

Gaza	Bilene			
	Chibuto			
	Chokwe			
	Chongoene			
	Limpopo			
	Manjacaze			
	Xai-Xai			
	Zongoene			
Maputo	Magude			
	Manhiça			
	Marracuene			
	Matutuine			

Please fill the table below regarding usage of herbicide.

Province	District	Quantity of herbicide applied (MT or liters)			
		MCPA	Propanil	Roster	
Cabo Delgado	Balama				
	Montepuez				
	Namuno				
	Mocimboa da Praia				
	Muidumbe				
	Quissanga				
Niassa	Mecanhelas				
Nampula	Angoche				
	Larde				
	Liupo				
	Memba				
	Mogovolas				
	Moma				
	Mongicual				
Zambezia	Gilé				
	Gurué				
	Ile				
	Luabo				
	Lugela				
	Maganja da Costa				
	Milange				
	Mocuba				
	Mopeia				
	Morrumbala				
	Nicoadala				
	Pebane				
Sofala	Beira				
	Búzi				
	Caia				
	Dondo				
Inhambane	Govuro				
	Homoine				
	Inharrime				
	Morrumbene				
	Panda				
	Zavala				

Gaza	Bilene				
	Chibuto				
	Chokwe				
	Chongoene				
	Limpopo				
	Manjacaze				
	Xai-Xai				
	Zongoene				
Maputo	Magude				
	Manhiça				
	Marracuene				
	Matutuine				

ANNEX 6: LIST OF INTERVIEWED RICE STAKEHOLDERS

REMOVED

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ANNEX 7: DEFINITION OF FINANCIAL SERVICES

Financial service	Definition
Bank accounts	It is a financial account maintained by a bank or other financial institution in which the financial transactions (cash deposits and cash withdraw) between the bank and a customer are recorded. The bank account is facilitated by banking institutions such as: Banco Internacional de Moçambique (BIM), Banco Comercial e de Investimentos (BCI), Banco Letshego, Mozabanco etc.
Credit	This refers to a loan for agricultural purposes, given to the household or a member in cash or in kind, by a bank, government entity, non-governmental organization (NGO) or other dedicated organization.
MPESA	M-PESA is a mobile phone-based money transfer service, payments and micro-financing services. It is offered by the mobile network company - Vodacom
ROSCA	Are informal savings and loan systems involving a group of people who meet regularly to contribute financially and receive the contributions in a rotating cycle.
MKESH	MKesh is a mobile phone-based money transfer service, payments and micro-financing services. It is offered by the mobile network company - TMcel.
eMOLA	E-Mola is a mobile phone-based money transfer service, payments and micro-financing services. It is offered by the mobile network company - Movitel
Conta movel	Conta movel is the term used locally to refer to a service provided by banks that allows financial transactions to be carried out remotely using a mobile device.