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
Appendix 5: List of Persons/Professionals Interviewed During the Study	72-73	Removed

Monitoring, Formulation, and Implementation of National Rice Development Strategy (NRDS) in Malawi

BASELINE STUDY REPORT

January, 2023

Submitted to:
Japan International Cooperation Agency (JICA) & the
Coalition for African Rice Development (CARD) Secretariat

RESEARCH TEAM
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EXECUTIVE SUMMARY

The Baseline Study for the Monitoring, Formulation, and Implementation of the National Rice Development Strategy (NRDS) in Malawi was conducted by Creativity Entrepreneurs (CE), a Malawi-based consulting firm. This was accomplished with concerted efforts and support from JICA Malawi, the Department of Crop Development, the CARD secretariat, and other stakeholders on the rice value chain. The output of the study provides input for the development of the Malawi National Rice Development Strategy.

The main purpose of the baseline was to generate data, contacts, and a manual that will provide a platform for future data collection and monitoring of the Malawi National Rice Development Strategy data with minimum effort and cost.

The study captured data and information associated with rice production, productivity, Resilience, Industrialization, Competitiveness, Empowerment, and Marketing. This was in line with the Coalition for African Rice Development (CARD)'s standard Monitoring and Evaluation indicators. The captured indicators are essential inputs for developing the National Rice Development Strategy. The following are the findings of the baseline study

The study mainly focused on quantitative data with pre-defined primary and secondary study outcomes. The data was analyzed to synthesize information that responded to the 12 CARD M&E monitoring indicators and the 36 parameters for developing the Malawi National Rice Development Strategy. Different data collection methods were used to capture data and information for the study including document review, access to secondary data, individual interviews, and a mini-market survey among others. A sample of 62 members was drawn from the Water Users Associations of Hara, Lifuwu, Bwanje, and Likangala Schemes. Thereafter, the collected data were analyzed using MS Excel and SPSS. The following Table contains an overview of the results for each of the 12 M&E indicators:

Indicator Code (Title)	Baseline Figure	Baseline Year	2030 Projection	Type of Data	Data Source/s	Method to get BF
O1: Production	112,313MT	2019	163,685	Secondary Data (APES)	• Agro-Economics Survey Offices • Department of Crops Development (DCD)	Production data for each ecology should be collected and added up to reach the national figure.
O2: Area Harvested	63,971Ha	2019	82,621Ha		• Agro-Economics Survey Offices • DCD	Production data for each ecology should be collected and added up to reach the national figure.
O3: Yield	1.756MT/Ha	2019	2,069MT/ Ha		• Agro-Economics Survey Offices • DCD	The average National yield level was calculated by dividing the National total quantity of rice harvested (MT) by the National Total area (Ha) harvested with paddy.
O4: Self Sufficiency	0.98 (98%)	2019	1.00 (100%)	Secondary Data	• Data from the Ministry of Trade and Industry	The team used the following formula for calculating Self-Sufficiency.(SS)= {Qty produced / (Qty produced + Qty imported - Qty exported)}
R1: Area under Irrigation	4306 Ha	2019	5000Ha	Secondary Data	• APES Data from Agro-Economic Surveys.	Extracting the figure directly from Round 3 Main APES data file.

R2: Quantity of high-yielding seeds	37.4 MT	2019	50MT	Secondary Data	Seed Services Unit of DARS, MoA.	Summation of quantities of seeds produces for each resilient variety.
I1: Level of industrial mills	Capacity Ratio of 1:2 =(0.5) =50%	2022	0.75 (75%)	Secondary & Primary Data	• Department of Crops Development. • Mill owners	Calculated the capacity ratio using the following formula: = (installed capacity of medium and large mills/Installed capacity of all functional mills).
I2: Mechanization ratio	Tractors-28: Cono Weeders-63: Power Tillers-52: Combine Harvesters-0	2019	Tractors-50: Cono Weeders-100: Power Tillers-75: Combine Harvesters-0	Primary Data	• DCD. • District Agriculture Offices (DAOs)	Summation of machines used for rice production in rice-producing areas.
C1: Market share of local rice	87%	2022	90%	Primary Data	• Retail shops selling both imported and locally produced rice.	Summation of rice procured and sold by retail shops.
C2: Qty of high-yielding seeds	37.4MT	2019	50MT	Secondary Data	• Seed Services Unit of DARS	Added-up quantities of various high-yielding varieties and obtained a sum.
E1 : Farmers' accessibility to Financial services	• 6.5% of the rice farmers had access to finances for rice production.	2022	20%	Primary Data	• Rice farmers	Simple analysis to get a percentage.
E2: Farmers' accessibility to technical services	36% of the rice farmers had access to pieces of training in all key areas.	2022	50%	Primary Data	• Rice farmers	Simple analysis to get a percentage.
Prevailing Prices for Rice	• The average price of Locally produced rice: MwK1813.00 [1](US$1.78) per Kg	2022	Av. price of Locally produced rice: MwK2,060 (US$2.00) per Kg.	Primary Data	• Retail shops	Simple analysis to generate the Mean Price.
	Average price of imported rice: MwK2943 (US$2.86) per Kg	2022	Av. price of imported rice: MwK3000 (US$2.91) per Kg	Primary Data	• Retail shops	Simple analysis to generate the Mean Price.

PRODUCTION, PRODUCTIVITY, AND SELF RELIANCE

Rice production, Productivity, and Area Harvested with Rice:

Results of the study showed that all elements of production including area harvested with rice, rice productivity (yield) as well as production, steadily increased over the years. The study found that three-quarters of the quantity of rice produced in Malawi is produced under rain-fed conditions, this includes upland rice. A quarter of rice produced in Malawi is cultivated under irrigated conditions. On productivity, rice produced under irrigated conditions has a higher yield performance. Its productivity (yield) is generally three times more than rice produced under rain-fed conditions. This report suggests that production and productivity need to be strengthened among rice farmers by promoting the use of quality seeds, good agricultural practices such as the System of Rice Intensification (SRI), integrated pest and disease management (IPDM), and many

[1] Exchange Rate of US$1 = MwK1030

more. The Research Team and the National Rice Development Task Force suggested a need to place a strategic approach to either increase productivity under rain-fed production (since rice yields under rainfed conditions are low) or expand the area for rice under irrigation.

Self-Sufficiency:

The baseline study established that Malawi is self-sufficient in terms of rice as a food commodity. It has a self-sufficiency rate of 98%. Showing that Malawi, as a country does not depend on rice produced in other countries to feed its people. This does not mean that there is no rice demand gap.

RESILIENCE

Resilient Production Systems (Irrigated rice production):

The study also found that only 36% of the area that can be potentially irrigated for rice production is currently under use to produce irrigated rice. A lot more has to be done to fully utilize the remaining uncultivated 64% of the land. In addition, more initiatives need to be put in place to reclaim more land that can be potentially used for irrigation.

Availability of Resilient and High Yielding Seeds:

The study revealed that there are 19 released rice varieties for cultivation in Malawi. These varieties were approved for use in Malawi by the Agricultural Technology Clearing Committee. A total of 17, out of the 19 varieties, are resilient and relatively high-yielding varieties. The study also found that yield levels under farmer management were three times lower than the potential yields of the released varieties. These low yields are attributed to the use of poor-quality seeds, pest infestation, disease infection, negligence, climate change, and poor husbandry practices among others. More efforts need to be imparted to enhance rice productivity among Malawian rice farmers. There is a need to support Malawian rice farmers to move toward achieving the potential yield levels of the rice varieties which they grow. There is also a need to foster a positive attitude toward the farmers so that they can adopt the culture of using quality, fresh, and certified pure seeds of the available resilient and high-yielding varieties.

Malawian rice farmers rely on locally bred and multiplied seeds for their cultivation. The seeds are either certified or not. It is known that most of them recycle their seed. On the importation, of seeds, there was no information on the quantity of certified seeds imported for use in Malawi. only small quantities of seeds were imported for research purposes. Owing that the study has established that Malawian farmers use locally bred and multiplied seeds, it is important to strengthen the local rice seed system. This can help to increase access to quality seeds among Malawian farmers.

INDUSTRIALISATION

Modernisation of Processing:

The study found that the Medium and Large Mills process up to 2.5% of functional rice mills in the selected rice-growing areas. Equally, there is one Medium to Large scale in every 39 functional mills in serious rice-producing areas. As such, more need to be done to upgrade the rice processing sector. There is a need to capture the operational capacity of an industrial rice mill. For example, Mtalimanja rice Mill, in Nkhotakota was operating at 30% of its capacity. To improve its capacity, there is a need to thoroughly understand factors affecting or limiting the achievement of the full milling potential. If the limitations are well understood. Future initiatives as well as the National Rice Development Strategy should aim at minimizing them to achieve an increased potential.

The mechanization of Production Systems:

The study found that there are very few machines that are sparsely hired for the cultivation of rice. The total number of tractors used by rice farmers in all the rice-growing areas was only 22. For rice farmers, tractors were usually hired for land preparation. It was also unveiled that the farmers were also using Cono Weeders which were only 41 in total across all rice growing areas. A total of 49 power tillers were being used. The study found that there are no combined harvesters in Malawi for rice farming. Appropriate mechanization is another suggested dimension to be

followed to improve mechanization for rice farmers. Most Malawian farmers are small-scale rice farmers. They are only allocated 0.1 ha in the scheme for their annual rice production. Well-sized small walking tractors, power tillers, cono-weeders, and other smaller mechanized equipment can be for their rice production.

COMPETITIVENESS

Market Penetration:

The Malawian rice Market is dominated by Malawian rice varieties. The sampled retail shops were procuring a proportion of 87% of locally produced rice in their shops. It was also found that the market was dominated by two non-resilient and relatively low-yielding varieties which are Kilombero and Faya. The two varieties were perceived by the Malawian society as flag carriers for their country. Kilemboro was on display in most shops.

EMPOWERMENT

Access to Finances:

A proportion of 6.5% of the farmers was able to access financial services from financial institutions. This access was on an individual basis, as they confirmed that the finances were meant for rice production. From a group perspective, the study found that a proportion of 11.1% of the groups (WUAs) was financially supported by partner institutions. In most circumstances, the cash did not go directly into their pockets. The partners directly paid for either goods or services utilized by the groups. More financial service platforms need to be established to support rice production and strengthen the rice value chain.

Access to Extension:

The study found that all farmers received some form of training. Further analysis, showed that only 36% of the rice farmers had received pieces of training in all key areas associated with rice farming. Rice farmers need to be tailored toward receiving pieces of training on good agricultural practices that cut across all elements associated with pre-production, during-production, and post-production.

Future Data Collection Processes for NRDS Monitoring

The general recommendation is that the NRDS Task Force, The Focal Person together with the JICA team should make arrangements with specific institutions that document data required for monitoring the NRDS. The needed data should have frameworks that will appropriately capture the needed data and information. Currently, the Ministry of Agriculture (MoA) is developing an Agricultural Information System (AIS). There is a need to liaise with the developers of the AIS to structure it in a way that it can easily capture data for monitoring the progress of the 12 CARD M&E indicators as well as the 36 NRDS parameters.

Outline of the Report

This report contains the background framework of the study, objectives, methodology, findings, conclusions, and recommendations. It also contains issues on research ethics, compliance with social, research criteria, confidentiality, data ownership as well as mechanisms for control of data quality. Section 1.0 to 2.0 of this report contains the introductory part and the methodology respectively. Section 3.0 contain the findings; it also serves as the manual for future data collection. It discusses the findings and also provides the data procedure that was followed to come up with data for a particular indicator or parameter. Section 3.0 is in two segments: (3.1) contains the 12 CARD M&E indicators and (3.2) Contains the 36 NRDS parameters. In the end, section 4.0 contains conclusions and recommendations while 5.0 contains appreciation for the client. Below is a brief discussion of the study findings.

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ACRONYMS AND ABBREVIATIONS

AATF	African Agricultural Technology Foundation
AfDB	African Development Bank
AfricaRice	AfricaRice is a CGIAR Research Center for Rice in Africa
AEDO	Agricultural Extension Development Officer
AEDC	Agricultural Extension Development Coordinator
ATCC	Agricultural Technology Clearing Committee
AUDA-NEPAD	African Union Development Agency NEPAD
AGRA	Alliance for a Green Revolution in Africa
APES	Agricultural Production Estimates Survey
CARD	Coalition for African Rice Development
COMESA	Common Market for Eastern and Southern Africa
DCD	Department of Crops Development
DAO	District Agriculture Offices
EAC	East African Community
ECCAS	Economic Community of Central African States
ECOWAS	Economic Community of West African States
FAO	Foood and Agricultulture Organisation
FARA	Forum for Agricultural Research in Africa
FGD	Focus Group Discussion
IFAD	International Fund for Agricultural Development
GM8	8th General Meeting
GI	Group Interviews
Ha	Hectare/s
IPDM	Integrated Pest and Disease Management
IRRI	International Rice Research Institute
IsDB	Islamic Development Bank
JICA	Japan International Cooperation Agency
JIRCAS	Japan International Research Center for Agricultural Sciences
KII	Key Informant Interviews
MoA	Ministry of Agriculture
M&E	Monitoring and Evaluation
MT	Metric Ton
NEPAD	New Partnership for Africa's Development
NGOs	Non Governmental organization
NRDS	National Rice Development Strategy
NRDS FP	National Rice Development Strategy Focal Person
NRDS TF	National Rice Development Strategy Task Force
M&E	Monitoring and Evaluation
PVA	Participatorly Variety Assessments
Qty	Quantity
SADC	Southern African Development Community
SMS	Subject Matter Specialists
SRI	Sustainable Rice Intensification
SS	Self Sufficiency
SSA	Sub-Saharan African
TICAD IV	Fourth Tokyo International Conference on African Development
WUA	Water Users Association
WB	World Bank
WFP	World Food Programme
RICE	Resilience, Industrialization, Competitiveness, and Empowerment Approach

1.0 INTRODUCTION

This report provides findings from a baseline study that was conducted for the monitoring, formulation, and implementation of the National Rice Development Strategy (NRDS) in Malawi. The study captured data and information associated with rice production, productivity, Resilience, Industrialization, Competitiveness, Empowerment, and Marketing. The study was in line with the standard Monitoring and Evaluation stipulated by the Coalition for African Rice Development (CARD). These indicators are essential input for development and a datum for the development of the National Rice Development Strategy and for monitoring its progress.

1.1 Background

1.1.1 Coalition for African Rice Development

Coalition for African Rice Development (CARD) is a consultative group of bilateral and multilateral donors and African/international institutions, namely COMESA, EAC, ECCAS, ECOWAS, SADC, AfricaRice, AATF, AfDB, AUDA-NEPAD, AGRA, FAO, FARA, IFAD, IRRI, IsDB, JICA, JIRCAS, WB, and WFP, supporting the development of rice sector in 32 Sub-Saharan African (SSA) countries[2]. CARD was launched by the Alliance for Green Revolution in Africa (AGRA), the New Partnership for Africa's Development (NEPAD, current AUDA-NEPAD), and the Japan International Cooperation Agency (JICA) at the Fourth Tokyo International Conference on African Development (TICAD IV) in May 2008. The CARD initiative aimed at doubling the rice production in SSA in ten years from 14 million Metric Tons in 2008 to 28 million Metric Tons in 2018, thereby closing the demand-supply gap and contributing to food security as well as poverty reduction in the continent. To achieve this goal, the CARD Initiative tried to promote increased dialogue among partners interested in promoting rice sector development in SSA leading to improved interventions, both in quantity (resources allocated) and quality (more and better coordination). While the initiative achieved its goal of doubling rice production by 2018, the demand-supply gap remained significant, due to the continuous increase in demand for rice. Therefore, the CARD entered its second phase in 2019, with a new target of further doubling rice production to 56 million Metric Tons by 2030.

One of the main activities of CARD at the country level is the provision of assistance in formulating and implementing the National Rice Development Strategy (NRDS). Currently, CARD

[2] During the first phase (2008-2018), CARD had 23 member countries: Benin, Burkina Faso, Cameroon, Central African Republic, Côte d'Ivoire, Democratic Republic of the Congo, Ethiopia, The Gambia, Ghana, Guinea, Kenya, Liberia, Madagascar, Mali, Mozambique, Nigeria, Rwanda, Senegal, Sierra Leone, Tanzania, Togo, Uganda, and Zambia. For the second phase (2019-2030), nine countries joined the initiative: Angola, Burundi, Chad, Congo Republic, Gabon, Guinea-Bissau, Malawi, Niger, and Sudan.

is supporting its original member countries to revise their NRDS and the new member countries to formulate their NRDS. NRDS charts out the pathways for developing the rice sector in the respective country, based on their strengths and needs.

On the other hand, CARD has recently developed an M&E framework, applying the "RICE Approach" (Resilience, Industrialization, Competitiveness, and Empowerment), a new strategic approach that CARD adopted for the second phase. The M&E framework involves four overall indicators, namely:

i. *Production Quantity*
ii. *Area Harvested*
iii. *Yield, and*
iv. *Self-Sufficiency Rate*

as well as two indicators for each of R, I, C, and E (2 x 4 = 8) totaling 12 indicators. CARD's M&E framework involving this common set of indicators had been approved by its stakeholders in the 8th General Meeting (GM8) in October 2021.

CARD member countries are requested to adopt these 12 common indicators in their own NRDS M&E framework, so that CARD can monitor and compare the progress of NRDS implementation in its member countries, using the same scale of measures. Apart from the 12 common indicators, additional information about retail prices for representative rice brands/varieties for both domestic and imported rice should be collected, if not included in the country's NRDS M&E indicators.

1.1.2 The National Rice Development Strategy for Malawi

In Malawi, rice is one of the prioritized value chains under its National Agriculture Investment Plan (NAIP) and is considered a value chain with good commercialization and export potential. The Government of Malawi through the Ministry of Agriculture implemented the first NRDS (2014 - 2018) and the implementation status was not favorable. As a result, some components identified in the strategy were left unattended, during the first phase of CARD. After entering the second phase, Malawi also opted for the revision of the strategy paper to boost its implementation. However, baselines for setting developmental targets for the rice value chain under NRDS-II are lacking at present. In this context, a task force responsible for formulating NRDS-II identified a set of parameters necessary for the revision process.

At the hand of Malawi's NRDS Taskforce (TF)[3], there are the following two sets of indicators whose baseline figures should be collected for:

i. *Malawi's NRDS-II formulation; and*
ii. *CARD's NRDS M&E exercise.*

Concerning the highlighted background, the Ministry of Agriculture (MoA), the CARD Secretariat, and JICA Malawi engaged Creativity Entrepreneurs (CE) to conduct the baseline study. This was conducted under the guidance of the CARD secretariat and the National Rice Development Task Force (NRDS TF) led by the NRDS Focal Point person (FP), who is an overseer of the rice promotion in the MoA.

1.2 Objective of this Study and Expected Outputs

1.2.1 Objective of the Study

The primary purpose of this study was to collect necessary data for setting baselines for NRDS-II formulation and NRDS-II M&E exercise in Malawi. Another task expected in the study is to specify appropriate data collection methods for the 12 M&E indicators and to summarize them into a manual for the subsequent years' M&E exercises by the NRDS TF.

The consultant was expected to generate data for the "For CARD 12 indicators" as well as a step-by-step data collection manual which will specify data sources and associated contacts as reflected in Table 6. The Research Team also collected other indicators identified by the Ministry for the formulation of NRDS 2 including retail prices for both imported and locally produced rice as reflected in the Research Design Table (See Table 6). The results were also packaged in this report as a guiding manual indicating data sources, contact persons, and the suitable time of the year for accessing the data. The report also illustrates the means for calculating the collected data to synthesize figures necessary for each indicator. This report also provides a framework that will serve as a manual for the NRDS TF, to collect data annually from next year up to the year 2030.

1.5 Procedure followed when Conducting the Baseline Study

CARD Monitoring and Evaluation Framework adopts the RICE. The findings from this baseline are a great input to the development and periodic data provision to the National Rice Development Strategy (NRDS). The results presented in this report were achieved through the following two stages:

[3] NRDS Taskforce (TF) is a group established in each CARD member country, in charge of formulation of the strategy, and subsequent implementation and M&E of the same.

Stage 1: Responded to Parameters Contained in the Research Design Matrix – Appendix 6

1. The Research Team reviewed some documents that were provided by the CARD secretariat, JICA, and the NRDS TF as well as the NRDS focal person. These included NRDS-I, Data items, clarification Memo on CARD M&E indicators as well as the definition of CARD M&E indicators.
2. The NRDS TF provided definitions and details for the 12 CARD M&E indicators and the 36 NRDS parameters.
3. Identified data sources and associated data collection methods. Thereafter, agreed with the NRDS-TF on the way forward. On the other hand, secondary data was requested from different information sources including the National Statistics Office (NSO), and relevant Ministry Departments among others. Supplementary primary data and information were collected on a few indicators with no reliable secondary data source, especially for data required for M&E 12 indicators and retail prices.
4. Appropriate data sources and collection methods were carefully selected with the consideration that monitoring and evaluation data will be collected annually way up to 2030 by the NRDS TF.
5. An Inception Report was prepared and approved which described how the whole assignment will be conducted.
6. Data and other necessary information were collected through phone calls, e-mails, face-to-face interviews, and other appropriate methods from the various sources which were identified in consultation with the NRDS TF and NRDS Focal Person.
7. The collected data and information were analyzed and consolidated under the headings of the 12 CARD M&E indicators.
8. Thereafter, the findings from the baseline study were presented to the NRDS FP and NRDS TF members through a meeting held at the Ministry of Agriculture headquarters. The highlighted participants guided the finalization of the report.
9. Th baseline report contains results on all collected data, and information as well as computed baseline figures for each indicator.

Stage 2: After working on the 12 M&E indicators and indicator 13 on retail price

10. A manual was generated containing details of the methodology of the data collection for every indicator with considerations that the NRDS TF is the one to use for data collection until 2030.
11. Prepared a Final Report that includes the manual, in addition to the contents of the Progress Report.

12. The Final Results from the baseline study were shared with the NRDS FP, and NRDS TF members, a meeting and obtaining feedback. and the CARD secretariat.
13. The comments were incorporated and the final report was submitted to the JICA Malawi office.

1.6 Rice production in Malawi

In Malawi rice is grown traditionally along the shores of Lake Malawi, around the Lake chirwa plains, the shire Highlands, and the Lower Shire Valley. It is also grown in low-lying locally known as '*dambos*'[4] in many parts of the country, for example, Chitipa, Mzimba, Mchinji, and Machinga. A small hectarage is in the upland Dambos which becomes too wet for upland crops during the rainy season. National wide rice is grown in three ecosystems which include: irrigated ecosystem(15%), rain-fed lowland ecosystem (84%), and rain-fed upland ecosystem(1-2%). The total rice production area which was estimated to be 52,500 Ha in 2007 has now gone up to 70,000 Ha. This has been a result of increasing awareness of the importance of rice as a food security crop as well as a cash crop in the country. However, high-yielding varieties, with average yields of up to 6 tons Ha^{-1} are utilized in the irrigation schemes and can be grown twice a year. Varieties grown in rain-fed ecosystems are mostly local varieties with an average yield of 1.2 tons Ha^{-1}. Production areas vary with altitudes ranging from 50 to 1,500 meters above sea level. In these ecological areas, annual temperatures range from 19-30 °C and rainfall is commonly in the range of 600-2,400 mm. Although rice does well in heavy clay soils it can be grown on a variety of soil types with pH 5.5-6.5. Total production is over 145,446 metric tonnes (mt), but the national mean grain yield is 1.97 t/ha. (FAOSTAT, 2020). Furthermore, production systems for rice are classified according to varieties, landforms, water supply, crop establishment, and climate.

1.6.1 Importance of rice in Malawi

Rice (*Oryza Sativa*) is the second most important cereal crop, after maize, in Malawi. (W.A. Kanyika, 2012). It is an important food and cash crop for smallholder farmers. It is also a source of forex for the country. Rice straws, bran, and husk can be used as animal feed or used in animal feed formulation. Furthermore, it is a source of income for those who are hired to carry out field activities. Rice straws are now also being used for compost manure-making to enrich soil fertility (Davis et al., 2012).

[4] A dambo is a class of complex shallow wetlands in central, southern and eastern Africa, they retain wet lines of drainage through the dry season. They are inundated (waterlogged) in the wet season. They have open water surface such as streams and small ponds at their lowest point, generally near the centre.

Some challenges such as climatic, socio-economic, field, and post-harvest management issues are being faced in rice production. Among such challenges weed infestation, inappropriate fertilizer or soil fertility management, poor seed quality, pests and diseases, drought, water management, and other unfavorable crop husbandry practices are more prominent. These factors affect the national average yield hence a lot of improvements need to take place. Of course, marketing challenges are not left out of the value chain whereby the market always experiences price fluctuations due to poor milling facilities, grading issues, and consumer preferences.

Despite several challenges which hinder production and productivity as well as the market of rice in Malawi, there is a potential for expansion due and intervention due to the following opportunities:

- *there are more than 200,000 Ha of land that can be used for growing rice*
- *the demand for rice is increasing both domestically and regionally. There is a shift, where rice is no longer a luxury food but it is becoming a staple. This has also resulted in a change of attitude among Malawians to move from just preferring the aroma and started considering increased productivity in terms of higher yields.*
- *rice adaptability to both rain-fed lowland and irrigated lowland agro-ecologies*
- *diversification of both food and crops has led to increased consumption and production of rice*
- *A lot of organizations have a vested interest in the value chain of rice*
- *political will and government initiatives to enhance rice production and also the formation of the National Rice Production Strategy (Nao, 2014).*

Therefore rice is the second most important staple food in Malawi second to Maize. The demand for it outweighs the production as well as the supply chain. This calls for a National Rice Development strategy which has called for this baseline study. Table 1 contains the trajectory of rice production in Malawi for the past two decades. Statistics (Table 1) show that rice production in Malawi has constantly increased over the the years in the last two decades. The potential yield of many rice varieties including local cultivars is more than 3 Tons/ha but the national statistics in Table 1 show failure in reaching the potential yields. This shows that there is more that needs to be done to increase rice production as well as productivity. This is why this study was conducted to understand the dynamics of rice production. Consequently, the findings will help in including key development areas in the National Rice Development Strategy to improve the rice value chain.

Table 1: *Rice Production and Productivity in Malawi during the past Decade*

Year (Paddy Rice)	Area (ha)	Yield (Ton/ha)	Production (Tons)		Year (Paddy Rice)	Area (ha)	Yield (Ton/ha)	Production (Tons)
2020	72,763	1,999	145,446		2010	59,098	1,863	110,106
2019	70,573	1,881	132,728		2009	63,967	2,126	135,988
2018	63,971	1,756	112,313		2008	63,124	1,820	114,885
2017	64,881	1,866	121,079		2007	58,091	1,948	113,166
2016	53,676	1,560	83,757		2006	52,031	1,758	91,450
2015	65,761	1,695	111,437		2005	48,993	842	41,270
2014	67,400	1,959	132,002		2004	42,568	1,168	49,722
2013	65,275	1,917	125,156		2003	54,393	1,621	88,184
2012	60,132	1,845	110,964		2002	56,029	1,643	92,021
2011	61,559	1,913	117,733		2001	50,146	1,858	93,150
					2000	43,523	1,645	71,601

FAOSTAT (2022)

2.0 STUDY APPROACH AND METHODOLOGY

2.1 The study design

Following the understanding of the Terms of Reference, the study mainly focused on quantitative data with pre-defined primary and secondary study outcomes. It was clear that every indicator demanded a specific form of data while some indicators were generated by synthesizing the collected data. Owing to this, the study is tailored to the 12 CARD M&E monitoring indicators (Appendix 6) as well as the 36 parameters for developing the National Rice Development Strategy.

2.2 The Study Approach and Data Collection Methods

To execute tasks contained in the scope of work, mixed methods were used to collect data for the Baseline study. These were literature/document review, access to secondary data, individual interviews, and a mini market survey. The data collection process was guided directly by the needs of the indicators as well as pre-developed tools. Data sets and information were requested from various offices through phone calls, face-to-face conversations, e-mails as well as messages sent through WhatsApp or Telegram. In summary, the following are the data collection approaches that were used:

- *Desk-review of Relevant Documents (Document Review)*
- *Face-to-face conversation with relevant officials.*
- *Phone Calls*
- *E-Mails*
- *Simple Market Survey*
- *Simple Farmers Survey*

i. Desk-review of Relevant Documents (Document Review)

The review of the literature helped to effectively address the specific task of the baseline study. A review of key literature and documents was carried out to understand the rice value chain. The documents that were reviewed are outlined in Table 3.

Table 2: *Some Documents to be Reviewed*

• The National Rice Development Strategy (2014-2018). • National Agriculture Estimates • FAO/USDA/UN-Trade Statistics • Catalog of released technologies • Grey literature on rice production in Malawi • Reports from Extension Planning Areas-agriculture estimates and field reports • Country Reports of Rice production • Malawi Vision 2063 (2020) • Sustainable Development Goals • Guide to Agricultural Production	• National Agriculture Policy (2011) • National Agriculture Extension Policy (2000) • District Agricultural Extension Services System (2009) • National Agriculture Investment Plan (NAIP) • Strategy for Agricultural Extension and Advisory Services (2020) • Agriculture Sector Wide Approach (ASWAp I and II) • Malawi Growth Development Strategies (MGDS) II and III

Source: NRDS Baseline Study (2022)

ii. Collection of Secondary Data

Secondary data collection was the main data collection method. Relevant institutions as well as offices were approached and requested to provide specific data that was used for synthesizing information for specific indicators. These institutions included the Agro-Economic Survey, The Department of Agricultural Research Services (DARS), The Department of Agricultural Extension Services (DAES), the Department of Crop Development (DCD), Lifuwu Research Station, Water Users Associations, the National Statistics Office (NSO), Malawi Revenue Authority (MRA), Ministry of Trade and Industry among others. These institutions provided specific data items that helped to compute data items to respond to specific indicators.

iii. Office Visits and Face-to-Face Interviews

As indicated earlier, the study demanded the provision of specific data that was being kept in various forms in different offices. Face-to-face discussions were key in explaining the details of the data and information being demanded by the baseline study. After face-to-face meetings, follow-ups were made by phone calls as well as e-mails until the data was sent.

iv. A Simple Market Survey

Approached shops (See Table 34) that were selling considerable quantities of locally produced paddy rice as well as imported brands as guided by parameters and indicators associated with price, market penetration, and the market share of local rice. Individuals handling the stocking and selling of rice were targeted. Thereafter, quantities procured for local and imported types were captured. Prices of different brands and categories were also captured. Additionally, information and contacts on rice packages were captured. The contacts were summarised and every packaging and milling company was contacted to find out if they mill on their own or if they buy already milled quantities. When millers were identified, they were contacted to find

out their mill capacities as well as their capacity share. For example, Mtalimanja mill expressed that they were milling at 30% of their capacity. A simple checklist questionnaire was used to capture data and information.

v. *A Simple Farmer Survey*

Randomly selected farmers were selected (See Table 3) to determine the following indicators associated with smallholder farmer empowerment:

- farmers' access to financial services. (% of farmers accessing finance).
- farmers' accessibility to technical training or services. (% accessing extension Services).

Table 3: Sampling for the Simple Farmer Survey

District	Scheme	WUA Registration	Male	Female	All	Sampled
Karonga	Hara	Registered in 2001	541	90	631	9
Dedza	Bwanje	Not Registered	983	1084	2067	25
Salima	Lifuwu	Registered	76	79	155	7
Zomba	Likangala	Registered in 2009	1000	684	1684	21
		TOTAL	**2600**	**1937**	**4537**	**62**
		%	**57.3**	**42.7**	**100**	

Source: NRDS Baseline Study (2022)

2.3 Design of Tools for the Baseline Study

The Research Team designed some tools in consultation with JICA and the NRDS Team. The tools that were used were matched with subjects that were contacted. For example, **checklist questionnaires** guided data collection from different stakeholders along the rice value chain. This included discussions with national-level stakeholders (policy level) and the facilitation of Focus Group Discussions (FGD) to ensure that information is gathered on all the relevant issues along the rice value chain. Some checklists were developed tailored to respond to specific indicators in line with the RICE approach.

2.4 Study Sites

The study has purposively selected major rice-producing districts (where rice schemes are also located) to capture elements on levels of production, industrialization, production technologies, cultivars, and local processing among others. Additionally, some data and information on rice marketing, price, and competitiveness were captured from three main cities of Malawi which are ***Mzuzu, Lilongwe,*** *and* ***Blantyre.*** The main shops that were targeted include Sana, Chipiku, Shoprite, Savers' Choice, and other chain Stores that were selling locally produced and imported rice.

The study purposively selected major rice-producing districts including ***Karonga, Salima, Dedza, and Zomba*** *after consultations with the NRDS FP who expressed that there were low socio-economic variations across rice-growing districts*. The distribution of the areas of focus was according to the political administrations (southern, central, and northern regions) of Malawi. The sampled districts are among the major rice-producing districts of Malawi with their associated major rice schemes. Details of the sampled elements are contained in Table 4.

Table 4: *Sampling and Sample Distribution*

	Selected Major Rice producing districts.	**Selected Rice Scheme**	**Main Cities/ National Offices**	**Major Rice Processing Mills.**
Northern Region	1.Karonga	Hara Scheme	Mzuzu	Standard Mills Standard Mills
Central Region	2.Salima	Lifuwu	Lilongwe	Lifuwu Cooperative Commercial Mill
	3.Dedza	Bwanje		Mtalimanja Holdings Commercial Mill
Southern Region	4.Zomba	Likangala	Blantyre	Standard Mills ADMARC Commercial Rice Mill
Total	*7* Districts	*7* Rice Schemes	3 Cities	All dominant mills in each district

Standard Mills: *Provide simple basic milling processes*
Commercial Mills: *Provide several processing levels including (1) destoning, removal of chuff, polishing, and grading*

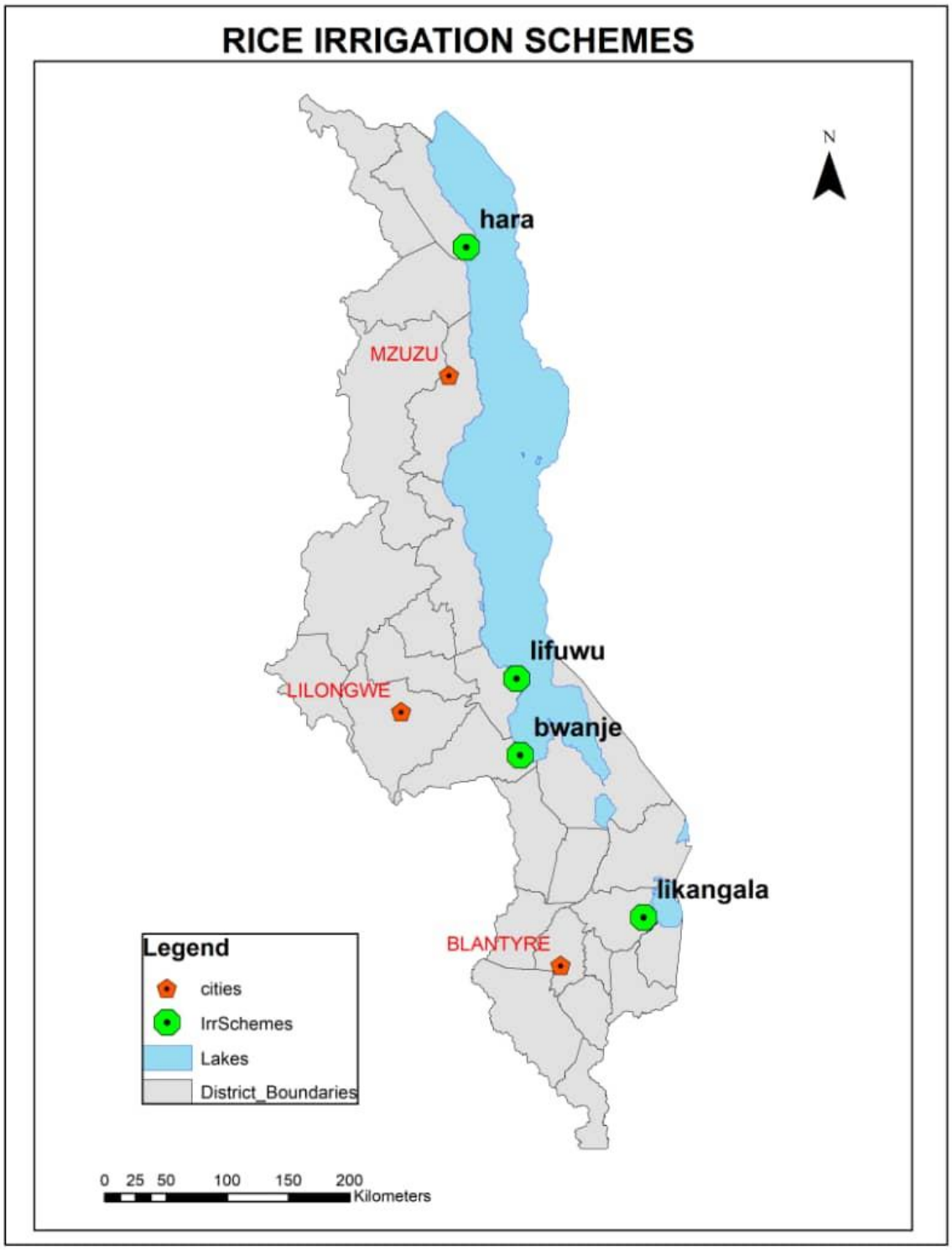

Figure 1: *Map of Malawi showing the selected irrigation schemes and cities.*

2.5 Data Processing, Analysis, and Report Writing

Being a kind of its own, the analysis of the data was tailored toward the nature of a particular indicator or parameter. There were cases where the data had to be analyzed using formulas that were provided by the frameworks containing indicators and parameters. On the other

hand, simple analyses were conducted in MS Excel. In a few circumstances, especially where a simple farmer survey was concerned, the data was entered in MS Excel. Then exported to SPSS for simple descriptive analysis.

2.6 The Research Design Matrix

The Research Design Matrix (See Appendix 6)contains all details associated with the Baseline study. It highlights the themes and indicators being focused on by the study. It also provides details of the type and sources of the data.

2.7 Confidentiality and Data Ownership

The research team made sure that the assignment followed the guidelines on the confidentiality of data and respondents as stipulated in the contract by JICA. The team also understood that the data and all related materials from the survey are not supposed to be disclosed to third parties.

2.8 Data Quality Control Mechanisms

Quality control for the data collected and captured was maintained by:

- Prolonged engagement of the client, NRDS task force, and NRDS task team. The research team kept consulting the client, JICA, at all stages of the baseline study to gather feedback and input that was continuously used to perfect the study.
- Triangulation of information collected from various sources used different data collection methods that enhanced the credibility of the study.

2.9 Organisation of the Study

Owing to the specialized nature of the baseline. The study commenced with the collection and analysis of secondary data. This made it possible to respond to specific indicators. The expectation was to complete the collection of secondary data and then moved to the collection of primary data. Halfway through the journey, it was observed that some primary data collection was conducted to fulfill the data needs of some indicators, as well as access to specialized information. It was also observed that some indicators/parameters such as empowerment demanded the collection of primary data. There was still a need to concurrently collect primary and secondary data to successfully respond to the study's needs.

3.0 STUDY FINDINGS

This section contains the findings, a discussion of the findings, and details on how the data was collected. It also provides the "data procedure" which is a framework to be followed in collecting and analyzing data for annual monitoring of progress for the indicators. On the other hand, the "data procedure" serves as the manual that will guide future data collection. Guided by the ToRs, the study findings are contained in the following two sub-sections, 3.1 and 3.2:

i. CARD's NRDS M&E INDICATORS

This covers the 12 CARD's M&E indicators (See Table 5) aligned to the RICE approach as explained at the onset of section 3.1 below.

ii. Malawi's NRDS-II formulation (3.2)

This subsection responds to the demands of the National Rice Development Strategy. It gives details on how the 36 NRDS parameters were handled. As indicated earlier, the arrangement of the section is in line with the ToRs for this assignment. The report organization also makes it easy for a reader to easily access a section of interest. One can easily narrow down to the 12 CARD M&E indicators section or can choose to directly read "the 36 NRDS parameters for Malawi" in section 3.2.

3.1 The M&E CARD TWELVE INDICATORS

Section 3.1 of the progress report gives details of the 12 CARD M&E indicators that have been outlined in Table 5. The findings and work processed are guided by the CARD Monitoring and Evaluation Framework that adopts the RICE approach. This builds on Resilience, Industrialization, Competitiveness, and Empowerment. Consequently, this renders sustainability to the impacts of NRDS implementation, while carrying out necessary interventions and various activities along the rice value chain. To appropriately respond to the needs of CARD's M & E indicators the study approach was aligned to the 12 indicators as reflected in Table 5.

Table 5: *Indicators of Focus on the Baseline Study*

Category	Sub-category	Code	Indicator	Definition
Overall	Production	O1	Quantity of paddy produced (MT)	Sum of paddy produced in a given year in different ecologies
	Area	O2	Total area harvested (ha)	Summation of the rice-harvested area from all rice-growing ecologies
	Productivity	O3	Yield per unit area (t/ha)	The average quantity of paddy grains harvested per hectare of land
	Self-sufficiency	O4	Self-sufficiency (%)	The coverage rate of rice needed by local production
Resilience	Resilient production system – Irrigation	R1	The area under irrigation (ha)	The area under rice cultivation with supplementary irrigation could mitigate the negative impacts of weather fluctuations on rice production
	Availability of resilient variety	R2	Quantity of resilient variety seeds (ton)	Quantity of seeds of locally preferred varieties with resilient characteristics locally produced and/or imported annually
Industrialization	Modernization of processing	I1	Level of industrial milling capacity (%)	The ratio of installed capacity of medium and large mills among all functional mills
	Modernization of production	I2	Level of mechanization in production (unit)	Number of machines available for plowing and harvesting (in rice-producing areas)
Competitiveness	Market penetration	C1	Share of local rice in the market (%)	Share of locally produced rice in the total quantity of rice procured by major retail stores for a year
	Availability of some high-yielding variety	C2	Quantity of high-yielding variety seeds (ton)	Quantity of seeds of locally preferred varieties with high-yielding attributes locally produced and/or imported annually
Empowerment	Access to finance	E1	Smallholder farmers' access to financial services (%)	Percentage of smallholders in pre-selected farmers' groups/associations accessing necessary financial services (in rice-producing areas)
	Access to extension	E2	Smallholder farmers' accessibility to technical training and services (%)	Percentage of smallholders in pre-selected farmers' groups/associations regularly accessing necessary technical training and services (in rice-producing areas)

Source: NRDS Baseline Study (2022)

Details of the findings associated with the CARD M&E indicators are discussed in the following section:

3.1.1 Quantity of Paddy Rice Production

The first indicator of the CARD M&E framework captured the whole quantity of paddy rice produced in the 2018-19 farming season. Following CARD's requirements, the data on the quantity of rice produced, the area harvested with paddy rice, and the yield performance of paddy rice are expected to be disaggregated by the agro-ecologies of Malawi. Consequently, the results were disaggregated into the eight Agricultural Development Divisions (ADDS) of Malawi. The quantity of paddy rice produced was extracted from a data set provided by the

Agricultural Production and Estimates Survey (APES) program. The following data procedure was used to establish the quantity of paddy rice produced in 2018-19.

DATA PROCEDURE:

i. *The data was accessed from Agro-Economics Survey Offices which is located in Area 4, Lilongwe. The contact person was the incumbent "Agricultural Statistician" who provided data sets and presentations for Crop production data for Malawi for the 2018=19 farming season. He further advised that, if the team wishes to access additional data and information, they should contact the "Senior Agricultural Statistician" who is housed at Capital Hill.*

ii. *The accessed data has been presented in this report, raw as it was accessed.*

iii. *The data responded to the following indicators: 3.1.1- Quantity of Paddy Rice Produced (O1) and 3.1.2- Total Area Harvested (O2). Guidance on using ADDs as the key development ecologies for the the two indicators was provided by the NRDS Focal Person.*

O1 – Quantity of Paddy Rice Produced (MT).

Definition	**Data required**	**Potential Data source**	**Freq.**	**Target**	**Note**
Sum of paddy produced in a given year in different ecologies	-Volume of paddy production in each ecology	Agro-Economics Survey	Annually	Set by NRDS	Production data for each ecology should be collected and added up to reach the national figure.

As reflected in the above parameter the sum of paddy produced in the 2018-2019 farming year has been provided in Table 6 below. This reflects a sum of production levels across different ecologies.

Table 6: Quantity of Rice produced across different Ecologies (ADDs) of Malawi

		Quantity of Paddy rice produced in the 2018-19 farming season		
#	**ECOLOGY**	**RICE (Rain fed)**	**Rice (Irrigated)**	**RICE (Rainfed & Irrigated)**
	Agriculture Development Division **(ADD)**	**PROD (MT)**	**PROD (MT)**	**PROD (MT)**
1	KARONGA	31916	6873	38789
2	MZUZU	5066	1689	6755
3	KASUNGU	1088	0	1088
4	SALIMA	15156	1185	16341
5	LILONGWE	2341	3588	5929
6	MACHINGA	15341	287	15628
7	BLANTYRE	16386	0	16386
8	SHIRE VALLEY	9597	1800	11397
	Total Rice Production Across Ecologies	96891	15422	112313
	Proportions	*86.3%*	*13.7%*	*100%*

Source: Agricultural Production Estimates Survey (2022)

Results in Table 6 above also shows the quantity of rice production across different ecologies in Malawi. It also shows that the total quantity of rice produced in Malawi in the 2018-19 farming season was 112,313MT. The NRDS task team confirmed that considerable quantities of rice produced during rainfed (96891MT) were more than the quantity produced through irrigated farming (96891MT).

Summary: Quantity of Rice produced across different Ecologies (ADDs) of Malawi (O1)

Baseline Figure	Baseline Year	Data Source/s	Method to get BF	Replicability by NRDS
112,313MT	2019	• Agro-Economics Survey Offices • Department of Crop Development (DCD).	Production data for each ecology should be collected and added up to reach the national figure.	The process is repeatable. The data used will be accessible to the NRDS task team members.
Recommendation on data collection for O1, O2, and O3: Data for these three indicators will come from the Agricultural Estimates Survey (APES). This is an extensive and robust national activity for collecting data on many agricultural parameters and it is held annually in Malawi. These two offices: Agro-Economic Surveys (AES) and the Department of Crop Development (DCD). are the key implementers of the APES among many. The two offices work together in conducting the APES every year. Both Offices are also the custodians of the data that comes out from APES. The NRDS focal person is one of the overseers of this exercise, meaning that APES data is at the fingertips of the NRDS TF. Consequently, the NRDS TF will easily access APES data and use it for generating the NRDS indicators up to 2030 and beyond.				

3.1.2 Total Area Harvested with Paddy Rice

Data presented for the Total area harvested with paddy rice was from the dataset used to respond to indicator 3.1.1. The data was accessed from the Agro-Economics Surveys and it was presented raw. There was no further computation.

O2 -Total area harvested (ha)

Definition	Data required	Data source	Freq.	Target	Note
Summation of the rice-harvested area from all rice-growing ecologies	-Area of paddy harvested (field) in each ecology	Agro-Economics Survey	Annually	Set by NRDS	The area for each ecology should be collected and added up to reach the national figure.

Table 7: Area Harvested with Rice across different ecologies of Malawi in Ha

		Area Harvested with Rice across different ecologies in the 2018-19 farming Season		
#	**ECOLOGY**	**RICE (Rain fed)**	**Rice (Irrigated)**	**RICE (Rainfed & Irrigated)**
	Agriculture Development Division **(ADD)**	**Area (Ha)**	**Area (Ha)**	**Area (Ha)**
1	KARONGA	12152	1488	13640
2	MZUZU	2955	645	3600
3	KASUNGU	950	0	950
4	SALIMA	8426	386	8812
5	LILONGWE	2628	935	3563
6	MACHINGA	15976	163	16139
7	BLANTYRE	11150	0	11150
8	SHIRE VALLEY	5428	689	6117
	NATIONAL TOTAL	59665	4306	63971
	Proportions	*93.3%*	*6.7%*	*100%*

Source: Agricultural Production Estimates Survey (2022)

Just as highlighted in quantity harvested, most rice (93.3%, see Table 7) was harvested from the area under rain-fed farming of 59,665 Ha. On the other hand, a small quantity (6.7%, again, see Table 7) was harvested from an irrigated area of 4306 Ha. As reflected in Table 6, this means 86.3% of the area harvested with paddy rice was under rain-fed production whilst 13.7% of the area harvested with rice was under irrigated farming.

Baseline Figure	Baseline Year	Data Source/s	Method to get BF	Replicability by NRDS
63,971Ha	2019	• Agro-Economics Survey Offices • DCD	Production data for each ecology should be collected and added up to reach the national figure.	The process is repeatable. The data used will be accessible to the NRDS task team members.
Recommendation on data collection for O1, O2, and O3: Data for these three indicators will come from the Agricultural Estimates Survey (APES). This is an extensive and robust national activity for collecting data on many agricultural parameters and it is held annually in Malawi. These two offices: Agro-Economic Surveys (AES) and the Department of Crop Development (DCD). are the key implementers of the APES among many. The two offices work together in conducting the APES every year. Both Offices are also the custodians of the data that comes out from APES. The NRDS focal person is one of the overseers of this exercise, meaning that APES data is at the fingertips of the NRDS TF. Consequently, the NRDS TF will easily access APES data and use it for generating the NRDS indicators up to 2030 and beyond.				

3.1.3 Productivity (Yield)

O3 - Yield per unit area (MT/Ha)

Productivity was simply calculated by dividing the Volume of Paddy Rice (O1) by the Total Harvested Area (O2).

Definition	Data required	Data source	Freq.	Target	Note
The average quantity of paddy grains harvested per hectare of land	(Obtained by dividing the quantity of paddy produced (O1) by the area harvested (O2))	Agro-Economics Survey	Annually	Set by NRDS	Calculated using O1 and O2 above.

Results in Table 8 demonstrates that productivity in Rainfed production is lower than productivity under irrigated production due to: farmers not applying fertilizers, high weed infestation, recycling of seed, broadcasting of seeds without following SRI, difficulties to control inflow and outflows of water in paddies, higher disease infection among other factors. All these are minimal in irrigated fields.

The National Task Force suggested that there is a need to place a strategic approach to either increase rain-fed production or increase area under production under irrigation. It was also alluded by the task force that caution should be made concerning climate change as many water sources for irrigation are drying out. On the other hand, Malawi lacks upstream water harvesting technologies such as dams (ponds) that can recharge the water table. Equally, National political campaigns of drilling boreholes on every mile are extractive, they do not come with any water harvesting techniques package to recharge the water extracted by the boreholes.

Table 8: Productivity of Paddy Rice among Farmers *2018-19 Farming Season.

#	ECOLOGY	RICE (Rain fed)			Rice (Irrigated)			RICE (Rainfed & Irrigated)		
	ADD	PRODN. (MT)	AREA (Ha)	YIELD (MT/Ha)	PRODN. (MT)	AREA (Ha)	YIELD (MT/Ha)	PRODN. (MT)	AREA (Ha)	YIELD (MT/Ha)
1	KARONGA	31916	12152	2.626	6873	1488	4.619	38789	13640	2.844
2	MZUZU	5066	2955	1.714	1689	645	2.619	6755	3600	1.876
3	KASUNGU	1088	950	1.145	0	0	0.000	1088	950	1.145
4	SALIMA	15156	8426	1.799	1185	386	3.070	16341	8812	1.854
5	LILONGWE	2341	2628	0.891	3588	935	3.837	5929	3563	1.664
6	MACHINGA	15341	15976	0.960	287	163	1.761	15628	16139	0.968
7	BLANTYRE	16386	11150	1.470	0	0	0.000	16386	11150	1.470
8	SHIRE VALLEY	9597	5428	1.768	1800	689	2.612	11397	6117	1.863
	Productivity	96891	59665	**1.624**	15422	4306	3.582	112313	63971	1.756

Source: NRDS Baseline Study (2022)

Results in Table 8 show that productivity (yield performance) in rainfed paddies was 1.624 MT/Ha. On the other hand, the productivity in Irrigated Paddies was 3.582 MT/Ha. The overall productivity level was 1.756MT/Ha as shown in Table 8 below.

Baseline Figure	Baseline Year	Data Source/s	Method to get BF	Replicability by NRDS
1.756MT/Ha	2019	• Agro-Economics Survey Offices • DCD	The average National yield level was calculated by dividing the National total quantity of rice harvested (MT) by the National Total area (Ha) harvested with paddy.	Repeatable. The data is accessible by NRDS task team members.

Recommendation on data collection for O1, O2, and O3: Data for these three indicators will come from the Agricultural Estimates Survey (APES). This is an extensive and robust national activity for collecting data on many agricultural parameters and it is held annually in Malawi. These two offices: Agro-Economic Surveys (AES) and the Department of Crop Development (DCD). are the key implementers of the APES among many. The two offices work together in conducting the APES every year. Both Offices are also the custodians of the data that comes out from APES. The NRDS focal person is one of the overseers of this exercise, meaning that APES data is at the fingertips of the NRDS TF. Consequently, the NRDS TF will easily access APES data and use it for generating the NRDS indicators up to 2030 and beyond.

3.1.4 Self-Sufficiency (SS)

O4 - Self-sufficiency (%)

Self-Sufficiency is needing no outside help in satisfying one's basic needs, especially concerning the production of food. Guided by the ToRs, FAO Calculated the SS using the following formula: **Qty produced / (Qty produced + Qty imported - Qty exported).** Malawi is demonstrating a peculiar situation of SS which shows that it is Self-Sufficient owing to the local demand. Malawians prefer varieties that are highly scented, have medium-length grains, and separate well when cooked. Owing to this, they highly consume grains from their cultivars. The widely consume variety is Kilombero followed by Faya. The study team observed that even though there can be a gap between the demand and supply, In Malawi, imports do not translate into demand. Imported rice is food for foreigners, not Malawians. Malawians eat what they grow and they grow what they prefer. Unfortunately, what they grow does not meet Malawi's demand and the alternative supply flow is not importation but producing more.

The SS statistic cannot take into account the Malawian demand. The Study team feels that if the Demand, Supply, and per Capita consumption were built in the FAO formula, the Self-Sufficiency statistic can be more representative. Owing that Malawi does not export a lot of Paddy rice, the Self-Sufficient statistic was close to 100% (See Table 9).

Definition	**Data required**	**Data source**	**Freq.**	**Note**
The coverage rate of rice needed by local production	-Volume of **milled rice produced,** imported, and exported	Statistics bureaus, Customs	Annually	Calculated using the following formula (definition by FAO): **Qty produced / (Qty produced + Qty imported - Qty exported)**

DATA PROCEDURE FOR COMPUTING SS

- The "Quantity Harvested" in 2019 was subjected to a 60% milling rate to derive its milled equivalent.
- Data on the annual Import and Export for Malawi on Milled rice for the year 2019 was accessed from the Ministry of Trade and Industry through the NRDS focal person (Mr. Kausi).

Table 9: *Quantity of Imported and Exported Milled Rice*

Import and Export of Milled Rice Versus Production for 2019				**Source of Data**
Total Production (MT)	T	112,313	Collected on Page 2 of Report #2	Agro-Economic Surveys
Quantity Imported (MT)	Imp	1,877	From the import and Exports Table below	Ministry of Trade & Industry
Quantity Exported (MT)	Exp	2	From Import and Export Table below	Ministry of Trade & Industry

Table 10: *Computation of Self-Sufficiency*

Quantity	**2019**	**CALCULATION OF SELF SUFFICIENCY**
Milled Rice (MT)	79,637	Self-sufficiency (%) = Qty produced / (Qty produced + Qty imported - Qty exported)
Imported (MT)	1877	= 79,637/ (79,637+1877 – 2)
Exported (MT)	2	= 79,637/81,512
		= 0.98

Source: Synthesis from the NRDS Baseline Study (2022)

The computation of SS shows that Malawi is 98% self-sufficient in terms of rice. This means that Malawians consume the rice they produce, and their country does not depend on importing rice from other countries.

Summary for Self-Sufficiency

Baseline Figure	Baseline Year	Data Source/s	Method to get the Baseline Figure	Replicability by NRDS
0.98 (98%)	2019	• The quantity of milled rice was deduced from the quantity of rice produced which was extracted from APES • Imports and Exports of milled rice were accessed Data from the Ministry of Trade and Industry • .No objection documents on the quantity of milled rice exported and imported in Malawi archived at DCD.	Calculated using the following formula: Self-sufficiency (%) = Qty produced / (Qty produced + Qty imported - Qty exported)	Repeatable. The data is accessible by NRDS task team members and the computation is not complex.
• **Recommendation for Self-Sufficiency:** Data on the quantity of milled rice will be easy to compute from the total quantity of harvested rice. On the other hand, the quantity of imported and exported rice should be accessed from the Data from the Ministry of Trade and Industry. A request to access the data should be sent by the NRDS focal person. . The data should be triangulated with quantities appearing on no-objection documents archived by the DCD.				

3.1.5 Resilient Production System – Rice Under Irrigation

The area under irrigation was also extracted from 2019 APES data which was accessed from the Agro-Economic survey as indicated in the earlier indicators on Area, Productivity, and Yield. This indicator should just be copied from the APES data set as raw as it is presented without alterations and calculations.

R1 - Area under irrigation (ha)

Definition	Data required	Data source	Freq.	Note	Definition
The area under rice cultivation with supplementary irrigation could mitigate the negative impacts of weather fluctuations on rice production	Data from Indicator O2	APES data from the Agro-Economic Survey's Office.	Annually	Set by NRDS	Data from an inventory by Extension services (the same as the data for Indicator Overall 2)

DATA PROCEDURE FOR GENERATING AREA UNDER IRRIGATION

i. *Contacted the Department of Irrigation (Talked to the Senior Irrigation Office)*
ii. *Data for functional schemes was provided through an e-mail*
iii. *Consulted the NRDS TF on functional and non-functional schemes*
iv. *NRDS members removed non-function schemes*
v. *Summed up land for all functional schemes in-use and not in-use.*
vi. *Thereafter, calculate the percentage of land being used under supplementary irrigation.*

Data from Indicator O2 shows that the area harvested with rice was 4306 Ha at the end of the 2018-19 farming season. Table 11 below shows the potential versus actual utilization of irrigatable areas for all crops and specifically rice.

Table 11: *potential versus actual utilization of irrigatable area for all crops and rice*

National (2018-19)	Potential Land for Irrigation (Ha)	Land Size Being Used for Irrigation (Ha)	The proportion of available being used (%)
For all crops	408,000	140,000	34.3
Specific to rice	11,792	4306	36.5

Source: NRDS Baseline Study (2022)

The study shows that only 36% of the area that can be used for irrigation is being used for the production of irrigated rice.

Summary for Area under irrigation (ha) - R1

Baseline Figure	Baseline Year	Data Source/s	Method to get the Baseline Figure	Replicability by NRDS
4306 Ha	2019	• APES Data files accessed from Agro-Economic Surveys and DCD.	• Extracted figures direct from Round 3 Main APES data file.	Repeatable. APES data is accessible by the NRDS task team members and the extraction is just copying and pasting the figures.
Recommendation on the summary for the area under irrigation: The baseline figure should be extracted from APES data files accessed from Agro-Economic Surveys or the DCD. In this case, DCD is an alternative source of the data. Most times the AES keeps data for recent years while DCD archive data for all years including old data. The APES data collection framework is structured to capture areas covered by irrigated rice.				

3.1.6 Resilience: Availability of Resilient Variety Seeds

R2 - Quantity of resilient variety seeds (MT).

R2 - Quantity Seeds for Locally Preferred and Resilient Varieties (MT).

Definition	Data required	Data source	Freq.	Note	Definition
Quantity of seeds of locally preferred varieties with resilient characteristics locally produced and/or imported annually	-Volume of seeds produced locally by a variety -Volume of seeds imported by a variety -List of rice varieties (to know which variety is considered to be resilient)	Seed certification unit/ Crop protection dept.	Annual	Set by NRDS/RRDS (need to segregate total required quantity to each characteristic) or NRDS TF	This is a sum of the volume of locally produced seeds and imported seeds, identified by NRDS TF as resilient varieties. The seed production data should be available from the seed certification unit yearly, while the import figures can be accessed either from the crop protection department or the revenue authority.

DATA PROCEDURE

Data on available resilient Seeds was accessed by contacting the Seed Services Unit (SSU) at Chitedze Research.

i. *A request was sent to the Seed Quality Manager who tasked Seed Inspection Specialists to compile the Data.*
ii. *Some data was in form of soft copies and other data was accessed as hard copies. The hard copies were accessed as photocopies and entered on an MS Excel Sheet.*
iii. *The data was reorganized into Tables responsive to this study.*

Table 12: Certified Rice Seed Produced in the 2018-19 Crop Production Season

	Name of Variety	Characteristics (tick where appropriate)	
		Resilient	Quantity (MT)
1	Faya (Non-Resilient)		71.3
2	Kilombero (Non-Resilient)		105.5
		TOTAL	**176.8**
Quantity of Resilient			
3	*Nunkile (Pussa 33)*	✓	30.4
4	*Wambone*	✓	3.5
5	Lifuwu	✓	3.5
		TOTAL	**37.4**
Total Quantity of High-Yielding Certified Rice Seed Produced in the 2018-19 farming season			

Source: NRDS Baseline Study (2022)

There are 19 released rice varieties for cultivation in Malawi (See Appendix 1). These varieties were released from 1973 to date. Amongst the 19, seventeen are resilient and only 2 are non-resilient. Data from the National Seed Services Unit showed that in 2018-19, farmers only concentrated on multiplying non-resilient varieties that sell highly in Malawian shops. A quantity of 105.5 MT of Kilombero-certified seed was produced and a total of 71.3 MT of Faya were also produced. On the other hand, for the resilient varieties, a total of 37.4MT of Nunkile, Pussa, Wambone, and Lifuwu were produced (See Table 12). This shows that seed production was

responsive to the market not resilience per se. On the other hand, none of these varieties or any other varieties were documented to be imported for general cultivation. Only small quantities of less than 0.25MT were imported purely for research under the Department of Agricultural Research Services.

Summary for Quantity of High-Yielding Certified Rice Seed Produced in the 2018-19 farming season

Baseline Figure	Baseline Year	Data Source/s	Method to get the Baseline Figure	Replicability by NRDS
37.4 MT	2019	Seed Services Unit of DARS, MoA.	Summation of quantities of seeds produced for each resilient variety.	Repeatable. The data is accessible by NRDS task team members and the computation is simple.
Recommendation on the quantity of high-yielding varieties: For the quantity of high-yielding certified rice seed, the data should only be collected from the Seed Services Unit, which is at Chitedze Agricultural Research Station, a section in the Department of Agricultural Research Services which is under the Ministry of Agriculture. There is a possibility that some data files will be in hard copies. The Seed Officers issuing out the data should be encouraged to enter the data into their electronic platform and provide a complete data set.				

3.1.7 Industrialization: Modernization of Processing

For this indicator, data was collected using the following procedure:

DATA PROCEDURE

i. *By observing rice brands stocked in shops, contacts of millers, and further processers were collected from rice packages on shelves. Followups were made through phone calls to inquire and trace where the Milling is done.*
ii. *Also, inquiries were made to Subject Matter Specialists (SMSs) working in the 28 districts of Malawi. Contact lists for SMSs were obtained from the Department of Crops Development (DCD), DAES, DoI, and the Department of Land Resource and Conservation. The SMSs were contacted who further provided contacts and details of specific frontline officers responsible for providing the data. These were contacted and details of Mills, tractors, Tillers, and Cono Weeders among others*
iii. *A simple checklist for capturing the data on Machines was used.*
iv. *The captured data was based on functional mills in selected rice-producing areas.*
v. *The data was compiled and analyzed as shown in the results Table.*

I1-Level of industrial milling capacity (%)

Definition	Data required	Data source	Freq.	Note	Definition
The ratio of installed capacity of medium and large mills among all functional mills	-List of rice mills in the country (or rice-producing areas) with the installed capacity of each mill and information about occupancy rate during the harvest period.	Min. of Commerce Millers' association	Annual	Set at the timing of the baseline survey	This is the percentage of medium and large-scale mills among all functional mills in their capacity.

Table 13: Mills Sizes and the Mill Ratio of Large & Medium Mills

	Small (<2 t/hr)			Medium (2-5 t/hr)				Large (>5 t/hr)			
District	**#**	**MT/ Day**	**MT/ Hr**		**#**	**MT/ Day**	**MT/ Hr**	**Name**	**#**	**MT/ Day**	**MT/ Hr**
Nkhotakota (KK)	62	248	31					Ntalimanja (KK)	1	200	25
								Bua (KK)	1	100	13
Karonga	168	672	84	Karonga (Kapolo)	1	40	5				
			0	Karonga (Hara)	1	40	5				
Salima	21	84	10.5	Salima (Lifuwu)	1	30	4				
Lilongwe	14	56	7	NASFAM (Lilongwe)	1	25	3				
Machinga (Liwonde)	11	44	5.5					ADMARC (Liwonde)	1	300	38
Total	**276**		**107**		**4**		**17**		**3**		**75**
Grand Total (Numbers)	**283**										
Grand Total (Capacity MT/Hr)	**199**				**92**						
RATIOS											
Large & Medium mills: All mills					**S+M**	All					
Number Ratio	**1:40**			**Total**	**7**	**283**					
Capacity Ratio	**1:2 =50%**			**Capacity**	**92**	**199**					

Assuming the small mills process 3 to 4 MT per 8-hour day

Subject to further reviews

Source: NRDS Baseline Study (2022)

The results of the study (Table 13) show that Medium and Large Mills only take up 3% of the functional rice mills in the selected rice-growing areas. Equally, there is one Medium to Large scale in every 40 functional mills in the rice-producing areas. It was observed that the captured large mills were operating at less than 30% of their designed capacity. This was due to the availability of enough rice as well as a shortfall of milling expertise. On the other hand, the capacity ratio was 1:2 calculated based on their installed capacity as shown in Table 14.

Summary for Capacity Ratio

Baseline Figure	Baseline Year	Data Source/s	Method to get the Baseline Figure	Replicability by NRDS
Capacity Ratio of 1:2 =(0.5) =50%	2022	• Department of Crops Development. • District Agricultural Offices (DAO) • Mill owners	Calculations are reflected in Table 14.	Repeatable since the data is accessible by the NRDS task team.
Recommendation on Capacity Ration: Data on potential milling capacity for Medium and Large mills should be collected from the DCD. There is a responsible officer handling information on these. On the other hand, installed milling capacity for small mills should be collected from the Crops Officer whose office is at the DAO.				

3.1.8 Industrialization: Level of Production

Mechanization In Production (Unit)

Definition	Data required	Data source	Freq.	Note	Definition
Number of machines available for rice production in Malawi (plowing, weeding, harvesting among others (in rice-producing areas)	-Number of tractors and harvesters in rice-producing areas	Extension services (Rice production areas)	Annually	Set by Mechanisation Strategy or NRDS TF	Data should be collected only from rice-producing areas. By doing so, we can more accurately count tractors meant for rice.

Data for machines used for cultivating rice in the rice growing areas were collected following the procedure:

i. *Accessed a list and contacts of Subject Matter Specialists (SMS) for Crops and Irrigation from their relevant Departments.*
ii. *The SMSs were contacted asking about the availability of machines used for rice production. They were also questioned if there were service providers who hire out such services.*
iii. *They were requested to recall the details and situation for the past 4 years,*
iv. *A summary of the findings were tabulated in Table 15 below.*

Table 14: Machines Used for Rice Production in Malawi

Type of Machine	2018	2019	2020	2021	2022
Tractors	24	28	22	25	22
Cono Weeders	52	63	57	46	41
Power Tillers	44	52	50	48	49
Combine Harvesters	0	0	0	0	0

Source: NRDS Baseline Study (2022)

As reflected in Table 14, the total number of tractors used by rice farmers in all the rice-growing areas across Malawi was 22 as reflected in the Table above. Rice farmers in various rice-growing areas of Malawi were also using Cono Weeders (41), and Power Tillers (49). The study found that no farmer or farm was using Combined Harvesters.

Observations from the research team and the NRDS task team were that the concern was twofold. First, the distance from the hiring points was a challenge. Hiring out tractors in Malawi are usually housed at Agricultural Offices including ADDs, District Agricultural Offices (DAO), or RDPs. Secondly, the appropriateness of the use of tractors on their fragmented pieces of land. Additionally, farmers' perception of the use of tractors being expensive. More specialized studies on mechanization and the use of appropriate implements among rice farmers need to be done.

Summary Mechanization ratio (I2)

Baseline Figure	Baseline Year	Data Source/s	Method to get the Baseline Figure	Replicability by NRDS
Tractors-28: Cono Weeders-63: Power Tillers-52: Combine Harvesters-0	2019	• Department of Crops Development. • District Agriculture Offices (DAOs)	Summation of all tractors used for rice production in rice-producing areas.	Repeatable since the data and information is accessible by the NRDS task team.
Recommendation for Mechanisation Ratio: This baseline figure should be collected by contacting Crops Officers (CO) or Irrigation Officers (IO) in all districts. The updated list of Crops Officers should be accessed from DCD and for Irrigation Officers, it should be accessed from the Department of Irrigation. Thereafter they should be contacted through phone calls, e-mails, WhatsApp, or any other communication platform. They should be asked about available machines being used by rice farmers for cultivation in their rice fields. They should also be asked about the availability of service providers who hire machinery for rice production.				

3.1.9 Competitiveness: Market Penetration

C1 - Share of local rice in the market (%)

Definition	Data required	Data source	Freq.	Note	Definition
Share of locally produced rice in the total quantity of rice procured by major retail stores for a year	-Volume of local rice (a) procured and (b) sold -Volume of imported rice (a) procured and (b) sold	Simple market survey (several major retail stores)	Annually	Set at the timing of the baseline survey	This is the share of local rice among the entire volume of rice procured for a year by a few major retail stores pre-selected by NRDS TF.

Source: NRDS Baseline Study (2022)

Their share of local rice of rice on the market was generated using the following procedure:

DATA PROCEDURE (Simple Market Survey)

i. *Visited several major retail stores selling both local produce and imported rice.*
ii. *Used the following checklist questionnaire (See Appendix 8) to capture the required information:*
iii. The data was simply organized in MS Excel as shown in Table 15.
iv. The quantity of rice procured and sold (Imported Vs. Locally produced) by the Retail Shop was summed.
v. The percentage of Local rice procured and Sold (Imported Vs. Locally produced) was then computed by the following formula:

%age of Local rice Procured = TOTAL of Locally Produced Rice /TOTAL **Qty of Rice Procured (Kg) * 100**
%age of Local rice sold = TOTAL of Locally Produced Rice sold /TOTAL **Qty of Rice Procured (Kg) * 100**

Table 15: Quantity of Rice Procured and Sold in Major Retail Shops

	Name of Retail store	City/town	Rice procured in the last 12 Months (Kg).				Qty of Rice Procured (Kg)	Qty of Rice Sold (Kg)	%age of Local rice Procured	%age of Local rice sold
			Imported		Locally produced					
	SHOP	DISTRICT	Procured	Sold	Procured	Sold				
1	Savers Choice	Blantyre	5000	4280	40000	36120	45000	40400	88.9	89.4
2	Sana	Chain Store	21600	17384	106800	103400	128400	120784	83.2	85.6
3	Chipiku	Chain Store	8550	6683	48200	38450	56750	45133	84.9	85.2
4	City Mall	Lilongwe	10500	9540	160000	152160	170500	161700	93.8	94.1
5	Shoprite	Lilongwe	15000	13987	50000	44756	65000	58743	76.9	76.2
6	Luck One	Lilongwe	1000	680	10500	8860	11500	9540	91.3	92.9
7	Santa Plaza	Lilongwe	1500	1480	21000	18343	22500	19823	93.3	92.5
		TOTAL	**63150**	**54034**	**436500**	**402089**	**499650**	**456123**	**87.4**	**88.2**

C1- the Share of locally cultivated rice in the market is 87% for the rice procured in the shops and 88% for the rice sold by the shops as shown in the above Table. During data collection, it was observed that there were only two locally produced varieties stacked on the shelves. These were Kilombero and Faya. Kilemboro was widely sold and found almost in all shops. The NRDS task team members indicated that many packaging companies owning particular brands were selling other varieties such as Wambone on their brands in the name of Kirembero, One of the Task Team members indicated that they had once penalized one company for faking one variety for the other. This shows that the other varieties are equally good to be sold. Unfortunately, Malawians are obsessed with Faya and Kilombero. There is a need to strategically promote other varieties that are equally great in addition to Faya and Kilembero. The Task Team also emphasized that proper pricing can help the other rice varieties to penetrate the market that is heavily dominated by Kilombero and Faya.

Summary of share of locally cultivated rice in the market

Baseline Figure	Baseline Year	Data Source/s	Method to get the Baseline Figure	Replicability by NRDS and Recommendation for Data Collection
87%	2022	• Retail shops selling both imported and locally produced rice.	Summation of rice procured and sold by retail shops.	Phone calls of staff handling the rice sections in the retail shops are contained in Appendix 5 for easy follow-up by the NRDS task team.

3.1.10 Competitiveness: Availability of High-Yielding Variety

C2-Quantity of high-yielding variety seeds (ton)

Definition	Data required	Data source	Freq.	Note	Definition
Quantity of seeds of locally preferred varieties with high-yielding attributes locally produced and/or imported annually	-Volume of seeds produced locally, by a variety -Volume of seeds imported, by a variety -List of rice varieties (to know which variety is considered to be high yielding)	Seed certification unit/ Crop protection dept.	Annually	Set by NRDS/RRDS (need to segregate total required quantity to each characteristic) or NRDS TF	This is a sum of the volume of locally produced seeds and imported seeds, identified by NRDS TF as preferred high-yielding varieties. The seed production data should be available from the seed certification unit yearly, while the import figures can be accessed from the crop protection department and the revenue authority.

DATA PROCEDURE

i. *Data on the number of certified seed varieties with their yield potentials were accessed from the Seed Serviced Unit at Chitedze.*
ii. *The requested data was for the requested period (from 2007 to 2022 as it was in our case.*
iii. *Data on Yield Level was accessed from Appendix 1, which is a- list of details of all available rice varieties released for cultivation in Malawi.*
iv. *Newly released varieties beyond 2022 should be added to the list by accessing a Catalogue of Released Technologies from the Technology Transfer Unit of DARS, MoA.*
v. *The data from the SSU was Organised in a Table. The data was not subjected to any computation.*

Table 16: Certified Rice Seed Varieties with their Yield Levels (2018-19 Season)

	Name of Variety	**Characteristics (tick where appropriate)**	
		Resilient	**Quantity (MT)**
1	Faya (Non-Resilient)		71.3
2	Kilombero (Non-Resilient)		105.5
		TOTAL	**176.8**
Quantity of Resilient			
3	*Nunkile (Pussa 33)*	✓	30.4
4	*Wambone*	✓	3.5
5	Lifuwu	✓	3.5
		TOTAL	**37.4**
Total Quantity of High-Yielding Certified Rice Seed Produced in the 2018-19 farming season			

Source: NRDS Baseline Study (2022)

HIGH YIELDING VARIETIES

The study also summarised a list of available high-yielding varieties as follows:

DATA PROCEDURE

i. *A list of all rice varieties released for cultivation in Malawi was drawn from Appendix 1.*
ii. *Inquired from rice breeders and defined a cutting point of high yielding vs. Low yielding which was established as 4.0MT/Ha. All varieties with a potential yield above 4.0MT/Ha are considered high-yielders.*
iii. *Low-yielding varieties were highlighted in Red in Table 18.*

Table 17: List of Varieties Released for Cultivation in Malawi and their attributes

Name of Rice Variety	Release Year	Potential Yield (MT/Ha)	DTM (Days)	Name of Rice Variety	Release Year	Potential Yield (MT/Ha)	DTM (Days)
1) Faya 14-M-69	1973	3.5	150-155	11) NERICA 3	2011	4.5	95
2) Blue Bonnet	1960	4.0	125-155	12) NERICA 4	2011	5.0	95
3) Senga	1987	5.5	116	13) Mpatsa	2014	5.8	100
4) Change	1987	5.0	119-145	14) Kayanjamalo	2014	6.5	110
5) Vyawo	2000	5.5	150	15) Katete	2014	6.4	94
6) Mtupatupa	2000	6.3	130-155	16) Mpheta	2017	7.0	110
7) Nunkile (Pussa 33)	2000	6.0	112	17) Nanzolo	2017	7.0	85
8) Lifuwu	2003	5.0	90-120	18) Makafaci	2020	7.0	84-90
9) Wambone	2003	5.7	120	19) Wachangu	2020	8.0	85-90
10) Kameme	2003	3.7	90-120				

Source: NRDS Baseline Study (2022)

An analysis of all varieties released for cultivation in Malawi by the Agricultural Technology Clearing Committee (ATCC) shows that most of the released varieties (17 out of 19) are relatively high yielding than Landraces. On the other hand, to see the yield levels on the farmers' side, data on yield for varieties grown by the farmers accessed from APES data sets was observed to be three times lower on average. The use of poor-quality seeds and poor husbandry practices are among the the causes of low productivity in rice. The data was for two farming seasons (2020-21 and 2021-22). Thereafter, the mean yield performance for each variety was calculated, for the two years. Then, the mean yield levels were ranked, one being the highest yielder (Mtupatupa) and 9 being the least yielder (Landraces) as shown in Table 18. The Table contains varieties that have been scientifically approved by the Government for cultivation in Malawi. It is a menu of rice varieties from research that is subject to farmer selection. On the other hand, Table 19 contains the actual varieties which have been adopted by farmers. These varieties have been ranked according to their yield performance.

Table 18: List of Varieties Cultivated by Farmers across the Country

Rice Variety	Trait	Potential Yield (MT/Ha)	Scent	2021			2022			Mean	Rank
				Area (ha)	Production (MT)	Yield (Kg/ha)	Area (ha)	Productn (MT)	Yield (Kg/ha)		
Landraces	R	4.5	HS	34392	48026	1,396	34981	52886	1,512	1,454	9
Faya	M	4.5	HS	8323	16844	2,024	9159	20529	2,241	2,133	7
Nunkile (Pussa)	RH	6.5	MS	4486	12951	2,887	3831	11473	2,995	2,941	2
Mtupatupa	RH	6.5	MS	8669	22890	3,721	4803	12914	3,829	3,775	1
SENGA	RH	4.5	MS	164	330	2,012	201	438	2,179	2,096	8
Wambone	H	5.0	MS	1112	2280	2,05	1220	2742	2,248	2,149	5
Kilombero	M	4.5	HS	19360	45596	2,355	20759	52763	2,542	2,448	3
Nerica	RH	5.5	MS	400	937	2,343	833	1688	2,026	2,184	4
Av. Across Varieties				**73696**	**142591**	**1,935**	**75787**	**155433**	**2,051**	1,993	

Trait: RH=Resilient and High Yielding, R=Resilient, M=Medium Resilience, H=High Yielding
Scent: HS=Highly Scented, MS=Medium Scented

Summary on quantity or certified high-yielding rice seed Varieties

Baseline Figure	Baseline Year	Data Source/s	Method to get the Baseline Figure	Replicability by NRD S
37.4MT	2019	Seed Services Unit of DARS	• Calculations are reflected in Table 16. Comprise a summation of quantities of seeds produced for each resilient variety.	Repeatable since the data is accessible by the NRDS task team.
Recommendation on the quantity of high-yielding varieties: For the quantity of high-yielding certified rice seed, the data should only be collected from the Seed Services Unit, which is at Chitedze Agricultural Research Station, a section in the Department of Agricultural Research Services which is under the Ministry of Agriculture. There is a possibility that some data files will be in hard copies. The Seed Officers issuing out the data should be encouraged to enter the data into their electronic platform and provide a complete data set.				

3.1.11 Empowerment: Access to Finance

Farmer empowerment looked at two elements which included

E1 - Smallholder farmers' access to financial services (%)

Definition	Data required	Data source	Freq.	Note	Definition
Percentage of smallholders in pre-selected farmers' groups/associations accessing necessary financial services (in rice-producing areas)	-Number of member farmers in a few pre-selected farmers' groups/associations receiving financial services from financial institutions (in rice-producing areas)	Public Extension and Research Service providers working directly with the farmers in the selected rice-producing areas.	Annually	Set at the timing of the baseline survey	Data should be collected only from rice-producing areas. By doing so, we can more accurately capture the financial services provided for rice farmers. Financial services considered under these indicators should be identified by NRDS TF.

Source: NRDS Baseline Study (2022)

As specified in the ToRs, the Number of member farmers in a few pre-selected farmers' groups receiving financial services from financial institutions (E1) and the number of member farmers in a few pre-selected farmer groups accessing identified necessary technical training and services in rice-producing areas was generated through the following procedure:

DATA PROCEDURE

i. *A dataset containing details on membership of associations and phone contacts was requested and accessed from the DoI.*
ii. *Schemes to be focused on for the study were selected with the guidance of the NRDS focal person.*
iii. *The selected groups were* Water Users' Association (WUAs).
iv. *Membership of the pre-selected WUAs was isolated and summarised as shown in the snipped Table below:*
v. *A list of rice farmers from each association was requested.*
vi. *A few farmers were randomly selected proportionate to group size.*
vii. *The sampled rice farmers were asked if they accessed (i) finance and (ii) pieces of training using a simple structured questionnaire (See Appendix 8).*

viii. The collected data were entered in Excel, then exported to SPSS where results in Table 20 and Table 21 were generated. Since sampling was done, the results were inferred from the general farmer population where the sample was drawn.

Table 19: Proportion of Farmers Accessed Finances for rice Farming from Financial Institutions

If you accessed finances for rice farming from Financial Institutions in the last 2 Years)	**Freq.**	**Percent (%)**
No	58	93.5
Yes	4	6.5
Total	**62**	**100,0**

Source: NRDS Baseline Study (2022)

Results of the baseline study (See Table 19) found that only 6.5% of the farmers were able to access finances on their own for rice farming. Fortunately, during the baseline study, it was observed that banks were loitering around the rice scheme to register farmers to access loans. The most dominant bank was First Capital Bank although there was no loan yet disbursed.

Summary on Empowerment: Smallholder farmers' access to financial services (%) (E1)

Baseline Figure	Baseline Year	Data Source/s	Method to get the Baseline Figure	Replicability by NRDS
6.5% of the rice farmers accessed finances for rice production.	2022	• Rice farmers	Simple analysis to get a percentage.	The NRDS task team will liaise with Extension Staff working in the rice growing areas to randomly identify farmers to be interviewed.

3.1.12 Empowerment: Access to Extension

E2 - Smallholder farmers' accessibility to technical training and services (%).

Definition	**Data required**	**Data source**	**Freq.**	**Note**	**Definition**
Percentage of smallholders in pre-selected farmers' groups/associations regularly accessing necessary technical training and services (in rice-producing areas)	-Number of member farmers in a few pre-selected farmer groups/associations accessing identified necessary technical training and services (in rice-producing areas) -List of necessary technical and/or extension services identified by NRDS TF as good indicators	Extension services (Rice production areas)	Annually	Set at the timing of the baseline survey	First, NRST TF defines technical training and services necessary for rice farmers, against which the percentage of farmers accessing them is calculated. This is also collected only from rice-producing areas, more specifically from certain farmers' associations or groups for easier data collection. The denominator is the total number of member farmers belonging to the pre-selected associations/groups.

Source: NRDS Baseline Study (2022)

On empowerment, the selected rice farmers were asked if they have received any training in rice farming in the past 3 years. Scheme farmers are organized in well-structured groups and they receive training from public frontline extension agents and change agents from other institutions including NGOs and Commercial entities. Consequently, the results were showing that all the farmers (100%) had ever received some training. The results were reported to members of the task team they advised to split "training" into the following four elements: (1) production

planning, (2) field practices, (3) post-harvest management (storage, processing, packaging), and (4) Marketing. They further advised that farmers who have been trained in all four elements should be the ones considered to be "trained farmers". Thereafter, results in Table 20 were generated, equally presented in Figure 2.

Table 20: Distribution of Training Sessions among the Sampled Rice Farmers

Level of Training	Freq.	Percentage (%)
Received on One Area	6	9.7
Received in Two Areas	15	24.2
Received in Three Areas	19	30.6
Received Across Board Training	22	35.5
Total	62	100.0

Source: NRDS Baseline Study (2022)

About 36% of the rice farmers had received board training on the following four elements:

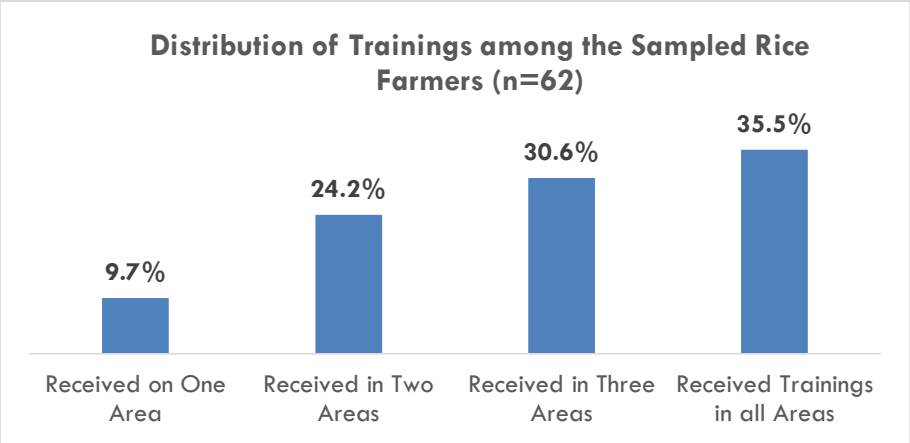

Figure 2: *Table: Distribution of Training Sessions among the Sampled Rice Farmers*

Summary on Smallholder farmers' accessibility to technical training and services (%) (E2)

Baseline Figure	Baseline Year	Data Source/s	Method to get the Baseline Figure	Replicability by NRDS
36%	2022	• Rice farmers	Simple analysis to get a percentage.	The NRDS task team will liaise with Extension Staff working in the rice growing areas to randomly identify farmers to be interviewed.

Conclusion

In summary, the following framework summarises the conclusion of the 12 indicators:

Indicator Code (Title)	Baseline Figure	Baseline Year	Type of Data	Data Source/s	Method to get BF
O1: Production	112,313MT	2019	Secondary Data (APES)	• Agro-Economics Survey Offices • Department of Crops Development (DCD)	Production data for each ecology should be collected and added up to reach the national figure.
O2: Area Harvested	63,971Ha	2019		• Agro-Economics Survey Offices • DCD	Production data for each ecology should be collected and added up to reach the national figure.

O3: Yield	1.756MT/Ha	2019		• Agro-Economics Survey Offices • DCD	The average National yield level was calculated by dividing the National total quantity of rice harvested (MT) by the National Total area (Ha) harvested with paddy.
O4: Self Sufficiency	0.98	2019	Secondary Data	• Data accessed from the Ministry of Trade and Industry	The team useded the following formula for calculating Self-Sufficiency.(SS)= {Qty produced / (Qty produced + Qty imported - Qty exported)}
R1: Area under Irrigation	4306 Ha	2019	Secondary Data	• APES Data from Agro-Economic Surveys and •	Extracting the figure directly from Round 3 Main APES data file.
R2: Quantity of high-yielding seeds	37.4 MT	2019	Secondary Data	Seed Services Unit of DARS, MoA.	Summation of quantities of seeds produced for each resilient variety.
I1: Level of industrial mills	Capacity Ratio of 1:2 =(0.5) =50%	2022	Secondary & Primary Data	• Department of Crops Development. • Mill owners	Calculated the capacity ratio using the following formula: = (installed capacity of medium and large mills/Installed capacity of all functional mills)
I2: Mechanization ratio	Tractors-28: Cono Weeders-63: Power Tillers-52: Combine Harvesters-0	2019	Primary Data	• DCD. • District Agriculture Offices (DAOs)	Summation of machines used for rice production in rice-producing areas.
C1: Market share of local rice	87%	2022	Primary Data	• Retail shops selling both imported and locally produced rice.	Summation of rice procured and sold by retail shops.
C2: Qty of high-yielding seeds	37.4MT	2019	Secondary Data	• Seed Services Unit of DARS	Added-up quantities of various high-yielding varieties and obtained a sum.
E1 : Farmers' accessibility to Financial services	• 6.5% of the rice farmers had access to finances for rice production.	2022	Primary Data	• Rice farmers	Simple analysis to get a percentage.
Prevailing Prices for Rice	• The average price of Locally produced rice: MwK1813.00 [5](US$1.78) per Kg	2022	Primary Data	• Retail shops	Simple analysis to generate the Mean Price.
	• Average price of imported rice: MwK2943 (US$2.86) per Kg	2022	Primary Data	• Retail shops	Simple analysis to generate the Mean Price.
E2: Farmers' accessibility to technical services	36% of the rice farmers had access to pieces of training in all key areas.	2022	Primary Data	• Rice farmers	Simple analysis to get a percentage.

[5] Exchange Rate of US$1 = MwK1030

3.2 MALAWI'S NRDS-II FORMULATION INDICATORS (36 PARAMETERS)

Malawi's National Rice Formulation-II NRDS has 36 parameters that are aligned to the CARD M&E indicators as well as the RICE approach. There is a slight difference between the set of CARD M&E indicators discussed in section 1 and the NRDS-II formulation indicators discussed in this section. The indicators discussed in 3.1 serves as a datum for measuring progress or change over time. These figures will be checkpoints for comparing progress by the year 2030. In addition to that, the 36 parameters NRDS-II parameters are capturing performance over time. Includes data from more than ten years. This data can be used for making projections on the future performance of different indicators of focus. Details of each indicator are contained in Table 21 Findings for every of the 36 NRSD-II parameters are discussed in the following section.

Table 21: Summary of Key Findings and 2030 Projections for the NRDS Indicators

Indicator Code (Title)	Baseline Figure	Baseline Year	2030 Projection	Comment/Remark from the NRDS team
O1: Production	112,313MT	2019	163,685	The trajectory of production, area harvested and yield was mapped based on the past 10-year data.
O2: Area Harvested	63,971Ha	2019	82,621Ha	
O3: Yield	1.756MT/Ha	2019	2,069MT/Ha	
O4: Self Sufficiency	0.98	2019	1.00	100% will be the ideal target for maintaining the current level of self-sufficiency.
R1: Area under Irrigation	4306 Ha	2019	5000Ha	A decent increase to 5000 ha put under irrigation will be ideal for the team. Emerging and expansions being put under irrigated rice farming can achieve the additional 700 ha.
R2: Quantity of high-yielding seeds	37.4 MT	2019	50MT	High-yielding varieties are equally resilient varieties and they should equally move to 50MT by 2030. More awareness needs to be made to farmers to adopt resilient and high-yielding varieties.
I1: Level of industrial mills	Capacity Ratio of 1:2 = (0.5) = 50%	2022	0.75	A proportion of 25% increase in the capacity ratio by 2030 is the desired target for Malawi.
I2: Mechanization ratio	Tractors-28: Cono Weeders-63: Power Tillers-52: Combine Harvesters-0	2019	Tractors-50: Cono Weeders-100: Power Tillers-75: Combine Harvesters-0	There should be more than a 40% increase in all elements of mechanization except the combined harvester. Appropriate small-sized mechanical implements, devices, and machines are desirable. Members called for small-sized walking tractors as ideal machines for small-scale Malawian farmers.
C1: Market share of local rice	87%	2022	90%	Malawians already prefer their local cultivars. It will be more on maintaining and providing consumers with what they want/demand.
C2: Quantity of high-yielding seeds	37.4MT	2019	50MT	High-yielding varieties are equally resilient varieties and they should equally move to 50MT by 2030. More awareness needs to be made to farmers to adopt resilient and high-yielding varieties.
E1: Farmers' accessibility to Financial services	6.5% of the rice farmers had access to finances for rice production.	2022	20%	There should be a 15% increase in rice farmers accessing financial services. Financial service initiatives have already kick-started in different rice-growing areas.

E2: Farmers' accessibility to technical services	36% of the rice farmers had access to pieces of training in all key areas.	2022	50%	The team envisions that half of the rice farmers should have accessed pieces of training that cover all key elements of the rice-value chain. From deciding to produce rice, planning the production, actual production, and post-harvest processes including processing as well as marketing and distribution.
Price	Av. price of Locally produced rice: MwK1813.00 [6](US$1.78) per Kg	2022	Av. price of Locally produced rice: MwK2,060 (US$2.00) per Kg.	With increased production and more rice available, it will be good to maintain the price at US$2.00 per Kg.
	Av. price of imported rice: MwK2943 (US$2.86) per Kg	2022	Av. price of imported rice: MwK3000 (US$2.91) per Kg	Imported rice will vary depending on the demand.

PRODUCTION, PRODUCTIVITY, AND AREA HARVESTED

3.2.1 INDICATOR 1: Paddy production, Productivity, and Area Harvested

Data Procedure for Parameters 1 to 3:

i. *The Nation's quantity of paddy rice produced, the area harvested with rice, and as well as the yield from 2010 to date were extracted from FAOSTAT (www.faostat.com). The data has been presented in the row "all" in Table 24.*

ii. *The data was presented in Table without alterations or computations. Meaning, it was presented the way it was extracted.*

Parameters 1 to 3 were supposed to be disaggregated by the scale of production. The farmers were supposed to be categorized into two groups. Farmers growing rice on land less than 2 ha were regarded as small farmers and those cultivating rice on land bigger than *2ha and large Scale rice* farmers. As reflected in Table 22, it was noted that almost all farmer that was contacted were growing their rice on pieces of land that were less than 2Ha. Scheme farmers are allocated 0.1 ha per individual farmer. For this reason, the data discussed in this report is not disaggregated by the scale of production of the farmers.

Table 22: A Summary of NRDS for NRDS Parameters 1 to 9

Parameters # and type of Data	Data Sources	Recall Period	Collection Method/s
1) Quantity of paddy rice produced on irrigated land 2) Quantity of paddy rice produced under rain-fed lowland (including dambos) 3) Quantity of paddy rice produced upland under rain-fed (2%)	*APES*	2010 to date	Soft copies of agricultural estimates data were accessed as soft copies from Statisticians.
4) Area harvested with paddy rice produced under irrigation. 5) Area harvested with paddy rice produced under rain-fed conditions (including Dambos). 6) Area harvested with upland rice cultivated under rainfed conditions.	*APES*		
7) Yield performance of paddy rice under irrigated land. 8) Yield performance of paddy rice under lowland rain-fed conditions (including Dambos). 9) Yield performance of paddy rice in upland rain-fed conditions.	*Computed*		

Source: NRDS Baseline Study (2022)

[6] Exchange Rate of US$1 = MwK1030

DISCUSSION FOR PARAMETERS 1 TO 9

Parameter 1: QUANTITY OF PADDY RICE PRODUCED ON IRRIGATED LAND

The results show an increase in the volume of rice produced under irrigation from 2010 (14,314MT) to 2022 (20,206MT).

Parameter 2: QUANTITY OF PADDY RICE PRODUCED UNDER RAIN FED LOWLAND

The quantity being highlighted here as "Rainfed Lowland" includes all rice produced in lowlands including dambos. Results of the study show that the quantity of rice produced by Malawian farmers has constantly increased over the years. A total of 95,792MT was produced in 2010, and a total of 132,118MT was produced in 2022.

Parameter 3: QUANTITY OF PADDY RICE PRODUCED UPLAND UNDER RAIN FED

Upland rice was first released for use in Malawi in 2011. The two released were of the New Rice for Africa (NERICA) series. These two released varieties were NERICA 3 and NERICA 4. It took about four years for the NERICA to be adopted by rice farmers. Consequently, the data for upland rice starts from 2015 onwards. This was the year when considerable quantities of upland rice were cultivated and harvested. The NRDS TF expressed that Upland rice takes less than 2% of the total quantities of paddy rice produced. Therefore, a 2% proportion was the unit of calculation from the national total production.

3.2.2 INDICATOR 2: Total Area Harvested with Paddy Rice

Parameter 4: AREA HARVESTED WITH PADDY RICE PRODUCED UNDER RAIN-FED CONDITIONS

The study also looked at the area harvested with paddy rice cultivated under rain-fed conditions including Dambos. This includes rice grown in Dambos. The results equally show an increase from 55,018 Ha in 2010 to 67,254 in 2022.

Parameter 5: AREA HARVESTED WITH PADDY RICE PRODUCED UNDER IRRIGATION.

Equally, the area harvested with rice cultivated from irrigated paddies has been increasing over the years. The total area harvested with rice grown on irrigated paddies was about 4080 Ha. Over 12 years, in 2022, the total area harvested was 7017 Ha.

Parameter 6: AREA HARVESTED WITH UPLAND RICE CULTIVATED UNDER RAIN-FED CONDITION.

The study also looked at the area harvested with upland rice. These are the latecomers, Nerica 3 and Nerica 4 (See Appendix 1). These are conventionally grown as it is done in maize. These two upland varieties are continually being adopted by non-conventional rice farmers in mid and high-altitude areas. Their cultivation has increased from a total area of 1315 ha in 2015 and a total area of 1,935 Ha in 2022.

3.2.3 INDICATOR 3: Yield per unit area in Tons/Ha

Parameter 7: YIELD PERFORMANCE OF PADDY RICE UNDER IRRIGATED LAND

The general yield performance under irrigation is relatively higher compared to rain-fed as well as upland rice. Reasons for improved yield performance have already been stipulated in section 3.1.3. These yields have increased from 2,384 MT in 2010 to 3,450 MT in 2022.

Parameter 8: YIELD PERFORMANCE OF PADDY RICE UNDER LOWLAND RAIN-FED CONDITIONS

(Including Dambos)

In general, the yield performance of rain-fed rice is quite low because of factors that have already been discussed in section 3.1.3. Even though the rain-fed yield levels were low, It was also found that the rain-fed yield was gradually increasing over the years. Results of the study show that the yield performance of rice procured by Malawian farmers has constantly increased over the years. An average yield performance of 1633 kg/Ha was realized in 2010, while a yield performance of 2,412Kg/Ha was realized in 2022.

Parameter 9: YIELD PERFORMANCE OF PADDY RICE IN UPLAND RAIN-FED CONDITIONS.

The yield performance of the upland has also been on the increase over the year although there was a slight decrease in a few consecutive years. The upland rice varieties registered a yield level of 1,608 MT/Ha in 2015. The yield levels went as low as 1,323MT/Ha due to climatic factors. Thereafter the yield levels steadily increase to 1,935 MT/Ha in 2022.

SUMMARY OF FINDINGS ON PRODUCTION, PRODUCTIVITY, AND AREA UNDER RICE PRODUCTION AND PROJECTION BY 2030

Results of the study (Table 23) show that all elements of the production from the area harvested with rice, rice productivity as well as production, steadily increase over the years.

Table 23: Rice Production, Area Harvested, Yield, and 2030 Projections

Year	Harvested Area (Ha)	Yield (MT/Ha)	Production (MT)
2010	59098	1634	110106
2011	61559	1913	117733
2012	60132	1845	110964
2013	65275	1917	125156
2014	67400	1959	132002
2015	65761	1695	111437
2016	53676	1560	83757
2017	64881	1866	121079
2018	63971	1756	112313
2019	70573	1881	132728
2020	72763	1999	145446
2021	73696	1935	142591
2022	75787	2051	155433
2030	**82621**	**2069**	**163685**

A forecast for 2030 was made using the existing data from 2010 to 2022 using Microsoft excel. The projections established the target to be 82,600Ha for the harvested area, 2070MT/Ha for yield levels, and 164,000MT as targeted National production.

Table 24: Quantity, Area Cultivated & Yield of Paddy Rice (2010-21)

	Parameter #	Paddy Rice	Data Source	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Production (MT)		**All**	FAOSTAT	**110106**	**117733**	**110964**	**125156**	**132002**	**111437**	**83757**	**121079**	**112313**	**132728**	**145446**	**142591**	**155433**
	1	Rainfed (incl. Dambo)	APES	95792	102428	96538	108886	114842	94721	71193	102917	95466	112819	123629	121202	132118
	2	Irrigated (Summer)	APES	14314	15305	14425	16270	17160	14487	10888	15740	14601	17255	18908	18537	20206
	3	Upland (Rainfed)	Computed						2229	1675	2422	2246	2655	2909	2852	3109
Harvested Area (Ha)		All	FAOSTAT	**59098**	**61559**	**60132**	**65275**	**67400**	**65761**	**53676**	**64881**	**63971**	**70573**	**72763**	**73696**	**75787**
	4	Rainfed (incl. Dambo)	APES	55018	57460	55112	60243	62356	59374	47514	58485	56666	63121	65255	66133	67254
	5	Irrigated (Summer)	APES	4080	4099	5020	5032	5044	5072	5088	5098	6026	6041	6053	6089	7017
	6	Upland (Rainfed)	Computed						1315	1074	1298	1279	1411	1455	1474	1516
Yield (MT/Ha)		**All**	FAOSTAT	**1634**	**1913**	**1845**	**1917**	**1959**	**1695**	**1560**	**1866**	**1756**	**1881**	**1999**	**1,935**	**2051**
	7	Rainfed (incl. Dambo)	APES	1633	1680	1738	1,790	1,854	1,994	1,836	2,195	2,066	2,213	2,352	2,276	2,413
	8	Irrigated (Summer)	APES	2,384	2,412	2,447	2,501	2,603	3,645	2,926	3,872	3,087	3,518	3,785	3,701	3,450
	9	Upland (Rainfed)	Computed						1,608	1,311	1,649	1,323	1,514	1,586	1,781	1,935
	APES: Agricultural Production Estimates Survey															

Source: NRDS Baseline Study (2022)

3.2.4 INDICATOR 4: Self-sufficiency rate (rate of rice needed by local production)

10--Quantity of milled rice (Milling recovery rate). 11--Qty rice imported (Milled equivalent). 12--Qty of rice exported (Milled equivalent).	*2010 to date.*	-National Statistics Office - *Malawi Revenue Authority (Blantyre Office)*. Still waiting for approval by the Commissioner General.	- Descriptive Statistics, a %ge Calculated using a formula (defined by FAO): Qty produced / (Qty produced + Qty imported - Qty exported)

The three parameters for calculating self-sufficiency were generated and summarised in Table 25. They are covering a period from 2010. Self-Sufficiency calculations and associated details have been presented in section 3.1.4.

Table 25: Quantity of Milled, Imported, and Exported Rice,

	Quantity	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Parameter 10	***Milled Rice (MT)**	29833	24762	54870	67900	68931	81593	66064	70640	66578	75094	79201	66862	50254	72647	67388	79637
Parameter 11	**Imported (MT)**	8596	15470	3034	3424	6865	5160	783	331	706	979	324	751	8868	1028	27942	1877
Parameter 12	**Exported (MT)**	301	411	513	5070	1528	8071	1754	970	2128	1865	683	125	64	199	116	2
S. -Sufficiency	**Computed**	0.78	0.62	0.96	1.02	0.93	1.04	1.01	1.01	1.02	1.01	1.00	0.99	0.85	0.99	0.71	0.98

DISCUSSION FOR PARAMETERS 10 - 12

Parameter 10: Quantity of milled rice (Milling recovery rate).

It has been established by International Rice Research Institute (IRRI) Most rice varieties are composed of roughly 20% rice hull or husk, 11% bran layers, and 69% starchy endosperm, also referred to as the total milled rice. On the other hand, an ideal milling process will result in giving out **20% husk, 8–12% bran** depending on the milling degree and 68–72% milled rice or white rice depending on the variety, grain maturity, and milling expertise among others. Researchers at Lifuwu expressed that most Malawing varieties give out 55-65% rice after milling. Consequently, 60% was used to calculate the milling recovery rate on National total production from 2010 – 2022.

DATA PROCEDURE

- *Used data on annual rice production from the row titled "All" from Table 24.*
- *The data from 2010 to 2022 was subjected to the milling ratio of 60 parts of milled rice to every 100 parts of husked rice.*
- *The result was the Total milled rice.*

Parameter 11and 12

- 11--Qty rice imported (Milled equivalent).
- 12--Qty of rice exported (Milled equivalent).

DATA PROCEDURE

i. *A letter requesting data on National Imports and exports of milled rice was written requesting Annual Import & Export data of milled rice from 2010 to 2022.*
ii. *Thereafter, it was sent through E-Mail to the following two institutions:*
    - *Malawi Revenue Authority, Imports & Export Section*
    - *National Statistics Office*
    - *Details of the contact person are contained in Appendix 5*

- *The Import and Export data from* the Ministry of Trade and Industry

As shown in Table 25 shows that Malawi imports and Export relatively small quantities of milled rice. This supports the preference of Malawian towards aromatic varieties and grains that separates well when cooked. Being self-sufficient, Malawians consume the rice they produce. The produce responds to the taste and demands of the consumer.

RESILIENCE

3.2.5 INDICATOR 5: Irrigation (Area Harvested under Irrigation)

Parameter 13: Number of functional irrigation schemes

This parameter presents the Total number of functional irrigation schemes for rice production and their locations. These were categorized as small, medium, and large as reflected in Table 27.

Parameter 14: Area harvested under irrigation, in both dry and wet seasons

The data and procedure presented in this sub-section have already been discussed in section 3.1.5. Only, a small discussion under Table 12 is what has been added to this section. Initially, the ToRs requested data for 10 years.

Recall Period	**DataSource**	**Data Collection**
The latest data were guided by the NRDS team.	APES Department of Irrigation	Provided by the Senior Irrigation Officer.

DATA PROCEDURE FOR AREA UNDER IRRIGATION

vii. Contacted the Department of Irrigation (Talked to the Senior Irrigation Office)

viii. Data for functional schemes was provided through an e-mail

ix. Consulted the NRDS TF on functional and non-functional schemes

x. NRDS members removed non-function schemes

xi. Summed up land for all functional schemes in-use and not in-use.

xii. Thereafter, calculate the percentage of land being used under supplementary irrigation.

Table 26: *Irrigated Land for Rice Production in Malawi*

National	Potential Land for Irrigation (Ha)	**Land Size Being Used for Irrigation (Ha)**	The proportion of available being used (%)
For all crops	408,000	**146,000**	36
Specific to rice	11,792	**7,509**	64

Source: NRDS Baseline Study (2022)

The Department of irrigation which is under the Ministry of Agriculture established that Malawi has 408,000 hectares that can potentially be used for irrigation. Unfortunately only is using only 146, 000 Ha (36%) is being utilized by the farmer to grow their crops through supplementary irrigation. It was further expressed that 11,792 is potentially developed for irrigated rice farming and only 7,509 Ha (64%) is in use.

DATA PROCEDURE FOR NUMBER FUNCTION IRRIGATION SCHEMES

i. *A list of all irrigation schemes used for rice production in Malawin was accessed from the Department of Irrigation*
ii. *Irrigation officers in the areas where the schemes were contacted and inquired if the schemes are active and if they are specifically being used for rice production.*
iii. *All schemes irrigation schemes (and their locations as demanded by the parameter) that were claimed to be active were highlighted in yellow in an Excel sheet (See Appendix 3).*
iv. *Thereafter, the list was subjected to critique at the NRDS task meeting.*
v. *NRDS task members isolated irrigation schemes that were not functional.*
vi. *Schemes in the remaining list were categorized as follows: (i) S=small <200Hal, (ii) M=Medium (100-200Ha), and (iii) Large = >200Ha.*

Table 27: Number of Functional Irrigation Schemes for Rice Production in Malawi

CATEGORY	Sizes for Categorisation	Number of Functional Schemes
Small	*<100Ha*	20
Medium	*100-200Ha*	8
Large	*>200Ha*	11
	Total	**39**
Total Number of functionals scheme	39	41.5%
Total Number of the scheme on the list from DoI	94	100%

Source: NRDS Baseline Study (2022)

As shown in Table 27 above, the study has shown that only 42% (39) of all the 94 schemes were actively used for rice production. This clearly shows that more work needs to be done to render the non-functional scheme functional. NRDS task members expressed that the effects of climate change may be one of the factors limiting the utilization of these non-functional schemes. On the other hand, the research team feels that there is a lack of strategic water harvesting arrangements throughout Malawi. Less water is harvested and there is little recharge to the water table. Recent initiatives generally respond to a short-term electoral cycle where politicians drill boreholes quickly and never engage in erecting small water ponds or small dams to harvest the water. Consequently, this partner-up with climate *change* and its impacts adversely minimized the availability of water to be used for supplementary irrigation. NRDS members expressed concern about the drying up of the Bwanje Dam. They felt it might be the consequences of climate change.

3.2.6 INDICATOR 6: Seeds - Quantity of resilient variety seeds

Parameter 15: Names of popular consumer-preferred rice varieties

This parameter caters to both local (in different ecosystems: upland, lowland, irrigated) and imported if any. Thereafter a form of some ranking was done as reflected in Table 28. Quantities of available resilient varieties have been discussed in an earlier section 3.1.6. In this section, the results being discussed are on the listing of popular consumer-preferred varieties.

DATA PROCEDURE ON PREFERENCE

- *A list of all available resilient rice varieties generate by a procedure in section 3.1.6 was used.*
- *Appendix 1 was used for additional details and descriptors of the varieties.*
- *Thereafter, the Research team contacted millers, researchers, shopkeepers (managing rice shelves), and a few farmers requesting their general views on available resilient varieties.*
- *Thereafter, the team summarised the results as shown in Table 28.*

Table 28: Names of popular consumer-preferred rice varieties as well as the imported

Lowland	Rank	Irrigated	Rank	Upland	Rank	Imported	Rank
Kilombero	1	Pussa	1	Nerica 4	1	Varieties were not known	
Faya	2	Mtupatupa	2				
Tambala	3	Kayanjamalo	3				
Wambone	4	Mpats	4				
Lifuwu	5	Katete	5				
Senga	6	Nanzolo	6				
		Mpheta	7				
		Makafaci/Wachangu	8				

Source: NRDS Baseline Study (2022)

It came out clear that the most popular and consumer-preferred rice variety of all time, in Malawi, was Kilombero followed by Faya as shown in Table 28. The same two varieties also took a lead as the most preferred Lowland rice. For the Lowland, Tambala was ranked third, Wambone ranked fourth and the list goes on as shown in the first and second row of Table 28. For the irrigated varieties, Pussa came first, Mtupatupa came second and Kayanjamalo was third as the list continues. Unfortunately, the dynamics of preference are changing owing to the observed weakness of some of the irrigated varieties including Shuttering before harvesting, and breaking when milling among others. In the case of upland rice, Nerica 4 is the only available variety, it had no competitor and it had to come first without any objection. For the imported brands, mostly the varieties were not known, the rice was known for the processes they were subjected to and other characteristics including being para-boiled, brown, for Susha among others.

Parameter 16: Number of active certified seed producers

This parameter established many active producers including farmers' groups, companies, commercial entities, and development projects among others. Also, parameter 16 was expected to indicate the quantity of seed produced by the producers. The Seed Services Unit was only able to provide the names of these active seed producers, not the the quantities produced. This was concerning producers' confidentiality and their quality control purposes.

DATA PROCEDURE

i. *A list of active seed producers for the past 4 years was requested from SSU*
ii. *The information was disaggregated in the categories displayed on the top row of Table 28.*
iii. *The list was subjected to discussion with NRDS TF members who suggested additional active seed multipliers that to part in seed production in the past 4 years (2018-2022).*
iv. *The final list was established as shown in Table 29.*

Table 29: List of Active Seed Producers in the Past 4 Years to Date

COMMERCIAL ENTITIES	FARMERS ORGANISED IN ASSOCIATIONS	NGOs	DEVELOPMENT PROJECTS
• SeedCo • MUSECO • NASFAM (Karonga)	• Bua • Lifuwu • Hara • Bwanje • Domasi • Likangala • Uvwe • Muona • Nkhate • Limphasa • Nkondezi	• World Vision (For Mchinji Farmers) • ICRISAT • CISP (KK) • Hunger Project (GIZ • Goal Malawi • Millenium Challenge • Save the Children • United Purpose (Previous • World Relief • Land O Lakes • COOPI among others	• Agricultural Productivity Program for Southern Africa (APPSA) – World Bank • IRLAD - IFAD • Smallholder Irrigation and Value Addition Project (SIVAP) - ADB • AGRICOM – World Bank • Initiatives at District Agriculture Offices (DAO): Machinga, Phalombe, Zomba, and Nkhotakota

Source: NRDS Baseline Study (2022)

The results of the baseline study demonstrate that there are several certified seed producers including commercial entities, WUAs, NGOs, and initiatives supported by DAOs as well as partner-supported projects.

Parameter 17: Quantity of certified seeds produced

This parameter presented the quantity of certified seed produced by rice seed producers from 2007.

DATA PROCEDURE FOR QUANTITY OF CERTIFIED SEEDS PRODUCED

Data on available resilient Seeds was accessed by contacting the Seed Services Unit (SSU) at Chitedze Research.

i. *A request was sent to the Seed Quality Manager who tasked Seed Inspection Specialists to compile the Data.*
ii. *Some data was in form of soft copies and other data was accessed as hard copies. The hard copies were accessed as photocopies and entered on an MS Excel Sheet.*
iii. *The data was reorganized as shown in Table 30.*

Table 30: Quantity of Seeds Produced from 2007 -2021

Variety	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Qty (MT)
Pussa	11.7	0		13.5					13.9	2.1		12.8			54
Kirombero	9.2	0		34.2	54.7			109.2	95.5	350.3	90.7	105.5	102.9	102.9	1055.1
Wambone	0.9	0		0.9	11.7				2.5	7.5	22.7	3.5			49.7
Faya	14.3	0		25.9	38.5			4.1	40.4	70.1	55.5	71.3	4.1	4.1	328.3
Mtupatupa	5.9	0		22				1.2		1.22			1.2	1.2	32.72
Pussa 33	1.8	0		13.5											15.3
Nunkile	0	0	62.6	83.5	48.9			0.7	15.1		44.9	17.6	0.6	0.6	274.5
Lifuwu	0	0		0.5					1.5			3.5			5.5
*Various**	31.7	3.6				113.3[7]	278.2								426.8
All	75.5	3.6	62.6	194	153.8	113.3	278.2	115.2	168.9	431.22	213.8	214.2	108.8	108.8	2241.9

***Various:** specific names of varieties were not provided

Source: SSU, DARS, MoA 2022

Parameter 18: Quantity of **seeds of locally preferred varieties with resilient characteristics**, locally produced.

Data on preferred varieties have already been discussed in Table 28, Parameter 15. Additionally,

Parameter 19: Quantity of seeds of locally preferred varieties with resilient characteristics, imported

The elements of Parameter 19 that were responded to by the study are contained in Table 31 below.

Table 31: elements of Parameter 19 - Preferred Varieties and Associated Attributes

Elements of Parameter 19	Data Source	Discussion
19.1- Quantity of seeds produced locally by a variety	Seed Services Unit	This variable has already been responded to in Table 29.
19.2 - Quantity of seeds imported by variety.	No varieties are imported into Malawi	The study unveiled that Malawi does not import seeds for use among its farmers. Consequently, this parameter was not applicable.
19.3 - List of rice varieties (to know which variety is considered to be high yielding) "/ *(Quantity of seeds of locally preferred varieties with high-yielding attributes, locally produced and/or imported annually).*	Catalog of released technologies.	The number of seeds of locally preferred varieties with resilient characteristics, locally produced is highlighted in green in Table 29 above. A discussion on their preferences has been discussed in section 3.26. Preferred resilient varieties have been reflected in Table 27, in the column for "irrigate" and "Upland" rice.

Source: SSU, DARS, MoA 2022

Parameter 20: Quantity of seeds of locally preferred

Locally preferred varieties are contained in Table 29. Again, their associated quantities produced are reflected in Table 32.

[7] The available data was not disaggregated by varieties for 2013 and 2014

Table 32: A summary of quantities of rice produced for locally preferred varieties.

Lowland	Rank	Qty from 2007-21 (MT)	Irrigated	Rank	Qty from 2007-21 (MT)	Upland	Qty from 2007-21 (MT)
Kilombero	1	1055.1	Pussa	1	54.0	Nerica 4	Not Documented
Faya	2	328.3	Mtupatupa	2	32.7		
Tambala	3	Not Documented	Kayanjamalo	3	Not Documented		

Source: SSU, DARS, MoA 2022

Parameter 21: Varieties with **high-yielding characteristics,** locally produced

The seeds Comparison on Rice Production and Productivity harvested varieties. Farmers usually recycle some quantities from the harvested grain. Following eating habits, the Scented are the most preferred in Malawi unlike the medium-scented ones are high yielding.

Table 33: Varieties cultivated by farmers and their associated yield levels

	2021			2022			Mean	Rank
Rice Variety	**Area (ha)**	**Production (MT)**	**Yield (MT/ha)**	**Area (ha)**	**Production (MT)**	**Yield (MT/ha)**		
Local	34392	48026	1,396	34981	52886	1,512	1,454	9
Faya	8323	16844	2,024	9159	20529	2,241	2,133	7
Pussa	4486	12951	2,887	3831	11473	2,995	2,941	2
Mtupatupa	8669	22890	3,721	4803	12914	3,829	3,775	1
IET4094(SENGA)	164	330	2,012	201	438	2,179	2,096	8
Wambone	1112	2280	2,05	1220	2742	2,248	2,149	5
Kilombero	19360	45596	2,355	20759	52763	2,542	2,448	3
Nerica 4	400	937	2,343	833	1688	2,026	2,184	4
Av. Across Varieties	**73696**	**142591**	**1,935**	**75787**	**155433**	**2,051**	1,993	
Resilient and high-yielding varieties are highlighted in green.								

Source: SSU, DARS, MoA 2022

Parameter 22: Proportion of farmers using certified seeds (Average for the nation)

An analysis from the simple farmer survey showed that only 4% of farmers were using certified fresh seed. Out of the 62 sampled farmers, only 3, were using certified fresh seed. Further inquiries unveiled that the seed was provided by entities that aimed at realizing uniform pure grain. It was demand-oriented. All the other farmers were using recycled seeds and mere grains.

LEVEL OF MECHANIZATION IN PRODUCTION. *(MODERNISATION OF PRODUCTION)*

This section covers elements associated with upgrading rice processing and modernization of production. Processing touches base on rice mills while modernization of production focuses on mechanics in the production process.

3.2.7a INDICATOR 6: Level of milling sector upgrading

Parameter 23: Number of functional rice mills

Owing to the ToRs, these were categorized as follows: (i) small = <2 t/hr, (ii) medium = 2-5 t/hr, and (iii) large = >5 t/hr and their locations.

DATA PROCEDURE ON FUNCTIONAL RICE MILLS

i. *A list of rice mills in the sampled rice-producing areas was generated*
ii. *Inquiries about their installed capacities were made.*
iii. *Information about occupancy rates during the harvest period was also captured.*
iv. *The mills were categorized to their scale of operation as Small, Medium, and Large.*
v. *Thereafter counting individual mills falling into a particular category was done.*
vi. *The results for number and capacity ratio were generated (See Table 34)*

Table 34: Number of Functional Rice Mills in Selected Rice Growing Areas

	Small (<2 t/hr)			**Medium (2-5 t/hr)**				**Large (>5 t/hr)**			
District	**#**	**MT/ Day**	**MT/ Hr**		**#**	**MT/ Day**	**MT/ Hr**	**Name**	**#**	**MT/ Day**	**MT/ Hr**
Nkhotakota (KK)	62	248	31					Ntalimanja (KK)	1	200	25
								Bua (KK)	1	100	13
Karonga	168	672	84	Karonga (Kapolo)	1	40	5				
			0	Karonga (Hara)	1	40	5				
Salima	21	84	10.5	Salima (Lifuwu)	1	30	4				
Lilongwe	14	56	7	NASFAM (Lilongwe)	1	25	3				
Machinga (Liwonde)	11	44	5.5					ADMARC (Liwonde)	1	300	38
Total	**276**		**107**		**4**		**17**		**3**		**75**
Grand Total (Numbers)	**283**										
Grand Total (Capacity MT/Hr)	**199**				**92**						
RATIOS											
Large & Medium mills: All mills					**S+M**	All					
Number Ratio	**1:40**			**Total**	**7**	**283**					
Capacity Ratio	**1:2 =(50%)**			**Capacity**	**92**	**199**					
Subject to further reviews											

Source: NRDS Baseline Study (2022)

In terms of milling, Malawi is far behind, it still has a long way to go. Efforts need to be made to increase the number of functional Medium and large-scale mills.

3.2.7b INDICATOR 7: Industrialization: Modernization of Processing

Parameter 24: Number of tractors, power-tillers, and combine harvesters (in rice production areas).

These Parameter has been thoroughly discussed in section 3.1.7. where the following Table 14 has been presented. Please refer to that particular section for more details.

3.2.8 INDICATOR 8: Level of mechanization in production

(Modernisation of Production)

Parameter 25: Number of tractors, power-tillers, and combine harvesters in rice-producing areas from 20**18** to date. This was generated using the following procedure discussed in section 3.1.8. The results have already been discussed in that particular section. Please refer to that section for a detailed discussion associated with this parameter.

Parameter 25: Number of agricultural machinery hiring/service centers in rice-producing areas
The NRDS committee advised having the most recent data associated with the parameter. So the following was the data procedure that was followed:

i. *Accessed a list and contacts of Subject Matter Specialists (SMS) for Crops and Irrigation from their relevant Departments.*
ii. *The SMSs were contacted asking about the availability of service providers who hire machines including tractors for rice farmers.*
iii. *A summary of the findings were tabulated in Table 35 below.*

Table 35: Number of Service Providers Hiring Out Machinery in Rice-Producing Areas

AREA/SITE	DISTRICT	Agric. Offices (Previously ADD)	DAO (Previously RDP)	Private Owner/s	Other Farmers	Total
Likangala Complex	Zomba	1 Tractor	0	0	0	1
Lifuwu Research	Salima	2 Tractors	2 Tractors	1 Tractor	1Tractor	4
Hara	Karonga	1	1	0	0	2
Bwanje	Dedza	1	1	0	0	2
	Nkhotakota	1	1	1	0	3
	Zomba	1	0	0	0	1
	Chikwawa	1	2	1	0	3
					Mean	2.3

Source: NRDS Baseline Study (2022)

The study revealed an average of only two hiring-service providers that can be accessed by farmers in rice-producing areas. The machines available were only tractors that when accessed, it is only used for land preparation. SMSs and the NRDS TF also expressed that distance to these service access points as well as the cost of hiring is also an issue. In some instances, these service access points are very farm far from the rice farmers. On the other hand, it was expressed that ownership of tractors among rice farmers is a non-starter because of high maintenance costs.

The baseline study has done a good job of functional rice mills. Another important area was to look at further processing after milling as well as *packaging, branding,* and modes of *selling*. The research team unveiled that customers buy what they see. Rice brands that package their rice in oblique packets, their

product is not highly bought by customers. Brands that were packaged in clear and lucid plastic bags, where the rice grains were visible, sold out like hot cakes.

Aspect	Details
packaging	Shop owners observed that brands that package their rice in oblique packets, their product is not highly bought by customers. rands that were packaged in clear and lucid plastic bags, where the rice grains were visible, sold out like hot cakes.
Brands	About ten brands were visible on the market, and when contacted, three out of the ten had their complete industrial mills. Two out of the Ten just had further processing plants that were removing chuff, destoning, and others. The remaining five were just buying already processed rice and were just packaging.

Most brands don't mill the rice, they buy in bulk from rice millers. Thereafter they just package and sell.

COMPETITIVENESS

3.2.9 INDICATOR 9: Competitiveness: Share of local rice in the market.

INDICATOR	Details of Parameters for Indicator 9	Recall Period	Sources of Data
Indicator 9-Share of local rice in the market. *(Share of locally produced rice in the total quantity of rice procured by major retail stores for a year)*	26--Share of locally produced rice in the total quantity of rice procured by major retail stores for a year. -Quantity of local rice (a) procured and (b) sold -Quantity of imported rice (a) procured and (b) sold" 27--Retail prices for milled rice for the different varieties/types (average monthly prices).	Latest (2022)	major retail stores selling locally produced and imported rice.

Parameter 26: Share of locally produced rice in the total quantity of rice procured by major retail stores for a year.

For this parameter, the NRDS TF advised collecting *only the latest data*. The following procedure was followed to capture the data. This parameter have already been discussed in section 3.1.9. Please refer to that section for more details.

Table 36: Quantity of Rice Procured by Retails Shops in Main Cities of Malawi

	Name of Retail store	City/town	Rice procured in the last 12 Months (Kg).				Qty of Rice Procured (Kg)	Qty of Rice Sold (Kg)	%age of Local rice Procured	%age of Local rice sold
			Imported		Locally produced					
	SHOP	DISTRICT	Procured	Sold	Procured	Sold				
1	Savers Choice	Blantyre	5000	4280	40000	36120	45000	40400	88.9	89.4
2	Sana	Chain Store	21600	17384	106800	103400	128400	120784	83.2	85.6
3	Chipiku	Chain Store	8550	6683	48200	38450	56750	45133	84.9	85.2
4	City Mall	Lilongwe	10500	9540	160000	152160	170500	161700	93.8	94.1
5	Shoprite	Lilongwe	15000	13987	50000	44756	65000	58743	76.9	76.2
6	Luck One	Lilongwe	1000	680	10500	8860	11500	9540	91.3	92.9
7	Santa Plaza	Lilongwe	1500	1480	21000	18343	22500	19823	93.3	92.5
		TOTAL	**63150**	**54034**	**436500**	**402089**	**499650**	**456123**	**87.4**	**88.2**

PREVAILING MARKET PRICES FOR LOCALLY PRODUCED AND IMPORTED RICE

Parameter 27: Retail prices for milled rice for the different varieties/types (average monthly prices) Average Rice Prices of Different Brands in Retail Shops

DATA PROCEDURE (Simple Market Survey)

i. *Visited several major retail stores and open markets selling both locally produced and imported rice.*
ii. *Used the following checklist questionnaire (See Appendix 8) to capture the required information:*
iii. *Details on prices for the following standard packages: 1Kg, 2Kg, 5Kg, and 10Kg.*
iv. *The data was simply organized in MS Excel as shown in Table 15.*
v. *The average prices for each category were simply generated in MS Excel:*

Table 37: Average Prices of Locally produced rice in Retail Shops

Rice Variety	2020		2021		2022	
	Brand Name	**Price (Mwk/Kg)**	**Brand Name**	**Price (Mwk/Kg)**	**Brand Name**	**Price (Mwk/Kg)**
Kilombero	NASFAM and others	950-1200	NASFAM and others	1200-1500	NASFAM	1985.00
					Rice Trust	1500.00
					Farmers Pride	1987.50
					Rambo	1812.50
					Fadams	1645.00
					Rice Moon	2475.00
Faya	NASFAM and others	950-1200	NASFAM and others	1200-1500	NASFAM	1880.00
					Rice Trust	1400.00
					Farmers Pride	1770.00
					Rambo	1600.50
					Fadams	1334.00
					Rice Moon	2365.00
Mean Price		**MwK1000**		**MwK 1,300**		**MwK1813.00**

Source: NRDS Baseline Study (2022)

The two major varieties being sold in major retail shops were Kilombero and Faya. Their current average price was MwK1,800 (Table 35). However, most of the rice in Malawi is sold on the open market. Near roadsides where mills are located. All the other varieties were being sold on the open markets. Their recent average price was Mw920 as shown in Table 36.

Table 38: Average Rice Prices on Open Market (Malawi Kwacha per Kg)

	2020		2021		2022	
Rice Variety	**Brand Name**	**Price (Mwk/Kg)**	**Brand Name**	**Price (Mwk/Kg)**	**Brand Name**	**Price (Mwk/Kg)**
Kilombero	No name	900-1000	No name	1000-1400	No name	1200-1500
Faya	No name	900-1000	No name	1000-1400	No name	1000-1500
Local	No name	850-1000	No name	950-1300	No name	1200-1500
Pussa	No name	700-800	No name	800-850	No name	900-950
TCG 10	No name	700-800	No name	800-850	No name	900-950
IET4094(SENGA)	No name	700-800	No name	800-850	No name	900-950
Wambone	No name	700-800	No name	800-850	No name	900-950
ITA/ Nerica	No name	700-800	No name	800-850	No name	900-950
Mtupatupa	No name	700-800	No name	800-850	No name	900-950
					Mean Price	**MwK920**

Source: NRDS Baseline Study (2022)

On the other hand, the mean price for imported rice was MwK3000 per Kg (See Table 39). However, the prices were highly variable.

Table 39: *Average Rice Prices in Shops for Imported Varieties*

2022		
Rice Type/Variety	**Brand Name**	**Price (Mwk/Kg)**
Para-boiled	Tastic	1,649
Sushi Rice	Tastic	4,425
Jasmine	Tastic	2,755
Basmati	Tastic	6,895
	Mean Price	**MwK2943**

Source: NRDS Baseline Study (2022)

The results that have been discussed in this sub-section have been summarised in the following Box.

Summary Table for E1: *Farmers' accessibility to Financial services and Price for both locally produced and imported rice*

Element of focus	**Year**	**Type of Data**	**Source of Data**	**Analysis**
• 6.5% of the rice farmers had access to finances for rice production. • The average price of Locally produced rice: MwK1813.00 (US$1.78) per Kg • Average price of imported rice: MwK2943 (US$2.86) per Kg	2022	Primary Data	• Rice farmers • Shops	Simple analysis to get a percentage.

3.1.10 INDICATOR 10: Competitiveness: Availability of High-Yielding Varieties

This indicator has been fully discussed in Indicator 3.1.10. Please refer to that section to understand all the associated details.

EMPOWERMENT

Parameter 28: Financial schemes available to rice value chain actors.

To outline financial schemes available in the rice-producing areas, the following data procedure was followed:

DATA PROCEDURE

- Inquiries were made to Agribusiness officers working at DAO
- Thereafter, the listing was done as follows:

Box: 1: List of

- Village Savings and Loaning Schemes are the accessible existing structures across the rice-producing areas. These are handled by the WUAs and Coperatives in schemes. For those outside schemes, they elect a committee that provides leadership for the VSLs.
- Less than 5% of the rice farmers were able to access loans for rice production from Commercial banks.
- In funding projects, rice has been a welcomed commodity but submitted proposals did not meet the criteria for funding (Contacted AGCOM, ATI, Centre for Agricultural Transformation (CAT). This is an issue of lack of capacity to submit qualifying financial proposals.

Parameter 29: Number of financial institutions (Micro, Macro-Commercial banks) offering financial assistance to rice value chain stakeholders.

DATA PROCEDURE:

i. Inquiries were made to Agribusiness officers working at DAO

ii. Thereafter, the listing was done as follows.

iii. Thereafter, the number of such schemes was counted:

Table 40: List of Partners and Initiatives Supporting Rice Farmers with Finances

MICRO (6)	MACRO (3)	INITIATIVES AT COMMERCIAL BANKS (3)
• VSLS • NGOs – Word Vision – inputs, Finance • FUM – inputs • COOPI – Inputs • NASFAM – Inputs • Lake Basin Project	• Africa Institute of Corporate Citizenship (AICC). • AGCOM – Direct Finance for them to handle their assets. • FINES (Working through commercial banks and direct financing). Farmers are provided with finances and trained in procurement, accounting, auditing, contract farming, branding, and marketing among others.	(1) FINESS Project (2) AGCOM (3) CAT -Through partial credit guarantee. -The bank conducts its due diligence. - If Farmers fail to repay, the initiatives pay back. - The two leading projects are FINES & AGCOM (World Bank funded Projects). • Standard Bank • FDH • National Bank • First Capital Bank

Source: NRDS Baseline Study (2022)

The results for both parameter 28 and 29 shows that there are few financial initiatives supporting rice farmers in the rice-growing areas. More financial support initiatives need to be directed toward rice farmers

in rice-growing areas. When this study, farmers expressed that some banks highlighted were mobilizing them to offer them loans although they had not disbursed a single loan by then. They were in the initial stages of organizing loans for the farmers.

Parameter 30: List of projects providing matching grants/financial windows.

DATA PROCEDURE:

This parameter also followed the data procedure for capturing parameter 28.

Box 2: List of Initiatives Providing Matching Grants to Rice Farmers

- AGRICOM – Direct Finance for them to handle their assets.
- FINES (Working through commercial banks and direct financing). Farmers are provided with finances and trained in procurement, accounting, auditing, contract farming, branding, and marketing among others.
- Agricultural Transformation Initiative (ATI).
- Centre of Agricultural Transformation (CAT).

The results equally show that there are few institutions supporting rice farmers in rice-growing areas.

3.2.11 INDICATOR 10: Access to Financial Services among Smallholder Farmers

(% of small-scale rice farmers accessing finance).

Parameter 31: Percentage of smallholders in pre-selected farmers' groups/associations regularly accessing necessary financial services (in rice-producing areas). This followed the procedure contained in section 3.1.11. Following the ToRs, the data was expected to be the most recent one.

Table 41: Access of Finances among Farmers and Between Groups

Variables	Freq.	(N) Out of:	%ntage
Individual Farmers vs. Ind. Farmers	4	62 Sampled Farmers	6.5%
Group Vs, Groups	6	54 Contacted groups	11.1%

Source: NRDS Baseline Study (2022)

As highlighted in section 3.1.11, only 6.5% of the farmers had received financial services on their own for rice production. And for the groups, 11.1% of the groups indicated to have received some form of finances, though not direct cash. For example, some groups indicated that their electricity bills were settled by partner institutions who paid in cash.

Parameter 32: Extension Services (qualifications, total numbers by regions)

DATA PROCEDURE

For Extension Staff, their technical base was collected from the local Government Commission which is responsible for employing extension staff for district DAOs. The contacted Office and Officer are currently housed at the Agro-Economic Surveys. A summary of the accessed numbers is contained in the Table below.

Table 42: Number of Staff Working at District Agricultural Offices across Malawi

ID	DISTRICT	AEDO Establishment	Number of AEDOs	% filled on AEDOs	AEDC Establishment	Number of AEDCs	% Filled on AEDCs	*Number of SMSs	Total Number in each district
1	Chitipa	51	42	82.4	6	2	33.3	9	**53**
2	Karonga	53	28	52.8	6	6	100.0	16	**50**
3	Rumphi	53	24	45.3	7	7	100.0	6	**37**
4	Mzimba	207	113	54.6	22	7	31.8	29	**149**
5	NkhataBay	54	32	59.3	9	9	100.0	13	**54**
6	Likoma	2	1	50.0	1	1	100.0	0	**2**
7	Nkhotakota	77	64	83.1	7	3	42.9	12	**79**
8	Salima	80	47	58.8	7	5	71.4	20	**72**
9	Kasungu	105	71	67.6	8	8	100.0	14	**93**
10	Ntchisi	70	29	41.4	4	6	150.0	15	**50**
11	Dowa	127	83	65.4	10	6	60.0	23	**112**
12	Mchinji	90	71	78.9	6	1	16.7	10	**82**
13	Lilongwe	320	281	87.8	19	11	57.9	40	**332**
14	Dedza	169	73	43.2	10	3	30.0	9	**85**
15	Ntcheu	107	64	59.8	7	1	14.3	8	**73**
16	Balaka	83	75	90.4	6	3	50.0	17	**95**
17	Machinga	140	65	46.4	9	8	88.9	16	**89**
18	Mangochi	187	86	46.0	11	6	54.5	23	**115**
19	Zomba	150	84	56.0	9	4	44.4	11	**99**
20	Chiradzulu	62	57	91.9	3	2	66.7	10	**69**
21	Phalombe	70	31	44.3	6	2	33.3	9	**42**
22	Mulanje	131	33	25.2	5	3	60.0	11	**47**
23	Thyolo	62	50	80.6	6	6	100.0	15	**71**
24	Blantyre	100	105	105.0	5	1	20.0	15	**121**
25	Neno	30	22	73.3	2	1	50.0	5	**28**
26	Mwanza	24	23	95.8	2	1	50.0	8	**32**
27	Chikwawa	124	52	41.9	6	3	50.0	9	**64**
28	Nsanje	60	38	63.3	5	1	20.0	9	**48**
		2788	**1744**	**62.6**	**204**	**117**	**57.4**	**382**	**2243**

Source: NRDS Baseline Study (2022)

Management of Human Resources is fully decentralized at DAES. The numbers are relatively higher because of their collective efforts in the delivery of extension services. Currently, DAOs can employ staff to fill the gaps they have at the district level. Staff labeled as SMSs include includes higher-level staff for Extension, Crops, Land Resources, Livestock, and Planning and Irrigation. These collaborate in delivering district efforts.

3.2.12 INDICATOR 12: Access to Trainings Among Smallholder farmers

(% accessing extension Services).

Parameter 33: Number of training sessions organized for rice farmers-aspect wise

This parameter has been responded to in 3.1.12. Where the study narrowed down on training associated with rice production in the following four areas: (1) production planning, (2) field practices, (3) post-harvest management (storage, processing, packaging), and (4) Marketing. Details of the number of training accessed by individual farmers and the proportion of farmers assumed to be fully trained are all contained in section 3.1.12.

Parameter 34: List of projects and private companies providing training, short- and long-term courses

DATA PROCEDURE ON CAPTURING TRAINING SERVICE PROVIDERS

i. *Inquiries were made to Rice Research Officers, CropOfficers, and Extension Staff on available short-term and long training.*
ii. *Sampled farmers were also asked about the training they receive as well as the duration.*
iii. *Thereafter, the listing was done as shown in Table 38.*

Table 43: *List of Training Providers of the Rice Value Chain*

Type of Training Provide	Institution Providing the Training
Short-Term	• Rice-based Agricultural Research Stations under DARS, MoA Lifuwu, Nkondezi, Baka. • DAES: Frontline Agricultural Extension Workers. • NGOs: World Vision, COOPI among others • Commercial Entities: Mtalimanja Holdings, NASFAM among other • Government projects: APPSA, SAPP, National Breeding Program (On-Farm Testing, Participatorly Variety Assessments (PVA)
Long-Term	ACADEMIA • LUANAR: Recently introduced long-term training programs specific to the rice value chain.

Source: NRDS Baseline Study (2022)

This shows that service providers for both long-term and short-term on the rice value chain are available.

Parameter 35: Percentage of smallholders in pre-selected farmers' groups/associations regularly accessing necessary technical training and services (in rice-producing areas).

- This parameter has been fully covered in section 3.1.12. Please refer to that section for desired details.

RESEARCH ON RICE

Parameter 36: Research (qualification, total numbers by regions) latest.

Data and information for synthesizing this parameter were captured as follows:

DATA PROCEDURE:

i. *A staff return for DARS was accessed*
ii. *Consulted the NRDS TF for the kind of employees to be included on the list.*
iii. *Generated a list of Technical staff working on rice research.*
iv. *Counted and entered numbers as shown in Table 44.*

Table 44: Number of Technical Staff Responsible for Research on Rice

Political Administrative Region of Malawi	Research Station Dealing with Rice	Scientists at Rice Research	Research Technicians	Research Attendants	Total of Research Staff Working on Rice
North	Baka	1	1	3	5
	Mkondezi	1	1	4	6
Central	Lifuwu	4	7	20	31
South	Kasinthula	1	0	4	5
	Domasi	0	0	4	4
Total		**7**	**9**	**35**	**51**

Source: NRDS Baseline Study (2022)

Additionally, a general analysis of the qualifications of all staff working for DARS was generated and presented in Table 45. In general, the results shows that there is a critical mass of qualified research scientist working under DARS. On the other hand,

Table 45: Distribution of Research Staff across the three Regions of Malawi

	SOUTHERN REGION						CENTRAL REGION				NORTHERN REGION											
Qualifications of Staff	**Chikwawa (Kasinthula)**		**Thyolo (Bvumbwe)**		**Zomba (Makoka)**		**Lilongwe Chitedze Research**		**Salima (Chitala & Lifuwu)**		**Chitipa (Bolero)**		**Nkhatabay (Nkondezi)**		**Mzimba South (Mbawa)**		**Mzimba North (Lunyangwa)**		**Karonga (Baka)**		**Across All Stations**	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Doctoral Degree	1	2	2	2	2	3	13	6	1	1							4	4	1	1	26	3
Master's Degree	2	4	8	7	2	3	23	10	3	4					1	3	5	5			46	6
Bachelor's Degree	7	13	15	14	6	8	37	16	7	9			2	9	2	6	7	8	3	4	86	11
Diploma	4	7	19	18	12	15	42	18	14	18	2	20	5	22	4	12	21	23	10	15	133	17
Professional Certificate			1	1			2	1							1	3	2	2			6	1
Secondary School Cert.	5	9	13	12	10	13	15	7	11	14			1	4	7	21	15	16			77	10
Junior Certificate (GCE)	18	33	26	24	11	14	57	25	26	33	4	40	4	17	7	21	19	20	19	28	190	24
Primary School Cert.	17	31	23	21	36	46	41	18	18	23	4	40	11	48	11	33	20	22	34	51	215	28
Total	54	100	107	100	79	100	230	100	80	100	10	100	23	100	33	100	93	100	67	100	779	100

Source: NRDS Baseline Study (2022)

4.0 CONCLUSIONS AND RECOMMENDATIONS

This section concludes with the findings on rice production, productivity, and area harvested with rice. It also conceals results on self-reliance, resilience, industrialization, competitiveness, and empowerment. Also, it gives some insights into experience and reflection on the data collection process. On the other hand, this section is on aspects that have been studied by this baseline study.

4.1 CONCLUSIONS

PRODUCTION, PRODUCTIVITY, AND SELF RELIANCE

Rice production, Productivity, and Area Harvested with Rice:

Results of the study showed that all elements of the production from the area harvested with rice, rice productivity (yield) as well as production, steadily increased over the years. The findings show that three-quarters of the quantity of rice produced in Malawi is produced under rainfed conditions, this includes upland rice. A quarter of rice produced in Malawi is cultivated under irrigated conditions. On productivity, rice produced under irrigated conditions has a higher yield performance. its productivity (yield) is generally three times more than rice produced under rain-fed conditions. This reflection is easily noticed if we just sigle out the 2021-22 farming season where the yield performance under irrigation was 5,168MT/Ha while for rainfed, it was 1,733 MT/Ha.

Self-Sufficient:

The baseline study established that Malawi is self-sufficient in terms of rice as a food commodity. It has a self-sufficiency of 99.79. Showing that Malawi, as a country does not depend on rice produced in other countries to feed its people. This does not mean that there is no rice demand gap.

RESILIENCE

Resilient ProductionSystems (Irrigated rice production):

The study also found that only 36% of the area that can be potentially irrigated for rice production is currently under use to produce irrigated rice. The question that lingers is, what is Malawi doing with the remaining 64%? This is too high to remain idle.

Availability of Resilient and High Yielding Seeds:

The study revealed that there are 19 released rice varieties for cultivation in Malawi. These were approved for use by the Agricultural Technology Clearing Committee. A total of 17, out

of the 19 varieties, are resilient and relatively high yielding. Unfortunately, this study found that yield levels under farmer management were three times lower than the the potential. These low yields may be attributed to the use of poor quality seed, pest infestation, disease infection, negligence, climate change, and poor husbandry practices among others.

Malawian rice farmers rely on locally bred and multiplied seeds for their cultivation. The seeds are either certified or not. It is known that most of them recycle their seed. Importation of seed, there was no information on the importation of certified seeds, only small quantities were imported for research purposes.

INDUSTRIALISATION

Modernisation of Processing:

The study found that Medium and Large Mills only take up 2.5% of the functional rice mills in the selected rice-growing areas. Equally, there is one Medium to Large scale in every 39 functional mills in serious rice-producing areas. It was also known that the existing large mills are operating below their intended capacity. The largest was operating at less than 30% of its designed capacity. As such, more need to be done to upgrade the rice processing sector.

Mechanization of Production Systems:

The study found that there are very few machines that are sparsely hired for the cultivation of rice. The total number of tractors used by rice farmers in all the rice-growing areas was only 22. For the rice farmers, these tractors were usually hired for land preparation. It was also unveiled that the farmers were also using Cono Weeders which were only 41 in total across the rice growing areas. 49 power tillers were being used. The study found that combined Harvesters are no combined harvesters in Malawi for rice farming.

COMPETIVENESS

Market Penetration:

The Malawian rice Market is dominated by Malawian rice varieties. The sampled retail shops were procuring a proportion of 87% of locally produced rice in their shops. It was also found that the market was dominated by two non-resilient and relatively lower-yielding varieties which are Kilombero and Faya. The two varieties were perceived by the Malawian society as flag carriers for their country. Kilemboro was available on almost in shelves of all shops visited. The study also accessed information that some companies were packaging other varieties including Wambone and were selling it as Kilombero, a market fraud with the intent to sell.

EMPOWERMENT

Access to Finances:

A proportion of 6.5% of the farmers was able to access financial services from the financial institution. This access was on an individual basis, as they confirm that the finances were meant for rice production. From a group perspective, the study found that a proportion of 11.1% of the groups (WUAs) was financially supported by partner institutions. In most circumstances, the cash did not go directly into their pockets. The partners directly paid for either goods or services utilized by the groups.

Access to Extension:

The study found that all farmers received some form of training. Further analysis, showed that only 36% of the rice farmers had received board training in all essential elements of rice production.

4.2 RECOMMENDATIONS

PRODUCTION, PRODUCTIVITY, AND SELF RELIANCE

Rice production, Productivity, and Area Harvested with Rice:

It is being suggested that elements of production and productivity need to be strengthened among the rice farmers through the use of appropriate inputs including quality seeds, good rice production practices such as SRI, integrated pest and disease management, and many more. The Research Team and the National Task Force suggested a need to place a strategic approach to either increase rain-fed production or increase area under production under irrigation. It also alluded that caution should be made concerning climate change. It was highlighted that many water sources for irrigation are drying out. On the other hand, Malawi lacks upstream water harvesting technologies such as dams (ponds) that can recharge the water table. Equally, National political campaigns of drilling boreholes on every mile are extractive, they do not come with any water harvesting techniques package to recharge the water extracted by the boreholes. In such a case, deliberate efforts should be made to conserve water resources to be used for irrigated rice farming.

Resilient ProductionSystems (Irrigation):

A lot more has to be done to fully utilize 64% of the irrigatable land that is not being used for irrigated rice farming. In addition, more initiatives need to be put in place to reclaim more land

that can be potentially used for irrigation. We should simply maximize the use of available land resources as well as the increase in area, and establish more schemes for irrigated rice farming.

Availability of Resilient and High Yielding Seeds:

Owing that the study has established that Malawian farmers use locally bred and multiplied seeds, it is important to strengthen the local rice seed system. This can help to increase access to quality seeds among Malawian farmers. Additionally, more efforts need to be imparted to enhance rice productivity among Malawian rice farmers. There is a need to support Malawian rice farmers to move toward achieving the potential yield levels of the rice varieties which they grow. There is also a need to foster a positive attitude towards the farmers so that they can adopt the culture of using quality, fresh and certified pure seeds of the available resilient and high-yielding varieties.

INDUSTRIALISATION

Mechanization of Production Systems:

Appropriate mechanization is the dimension to be followed. Most Malawian farmers are small-scale rice farmers. They are only allocated 0.1 ha of scheme land for their annual rice production. Well-sized small walking tractors, the power tiller, and cono weeders among others, are the appropriate equipment for rice production.

Modernization of Processing:

There is a need to capture the operational capacity of an industrial rice mill. For example, Mtalimanja rice Mill, in Nkhotakota was operating at 30% of its capacity. To improve its capacity, there is a need to thoroughly understand factors affecting or limiting the achievement of the full milling potential. If the limitations are well understood. Future initiatives as well as the National Rice Development Strategy should aim at minimizing them to achieve an increased potential.

COMPETIVENESS

Market Penetration:

There is a need for more awareness and campaigns among the Malawian companies and population to popularise the other varieties that are perceived as inferion but are equally good.

EMPOWERMENT

Access to Finances:

More financial service platforms need to be established to support rice production and strengthen the rice value chain.

Access to Extension:

Rice farmers need to be tailored towards receiving training on good agricultural practices that cut across all elements associated with pre-production, during-production, and post-production.

Future Data Collection Processes for NRDS Monitoring

The general recommendation is that the NRDS Task Force, The Focal Person together with JICA make arrangements with specific institutions that document data required for monitoring the NRDS. The needed data should have frameworks that will appropriately capture the needed data and information. Currently, MoA is developing an Agricultural Information System (AIS). There is a need to liaise with the developers on that platform structure in a way that NRDS monitoring data should easily be accessed from the AIS.

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4.3 EXPERIENCES IN THE DATA COLLECTION PROCESS

Hard-Copies:

In some institutions, the requested data was in hard copies, which required a high level of effort for responsible officers to spare time to scan or take pictures and send them. In such circumstances, it forced research teams to travel and access such data. This was against the team's effort to make the the data collection and future collection exercise as simple and as cheap as possible.

Under Developed ICT Infrastructure:

ICT systems for managing Agricultural data (including rice) are in their infancy. As such, they appear t be weak. *Rec:* There is a need for the Nation, specifically for the Ministry of Agriculture, to fast-track the development of the electronic AIS. The NRDS TF has to partner with members developing the AIS so that data needed for monitoring the upcoming National rice strategy as well as future strategies have to be built within the system. It can be a system where figures such as Self-Sufficiency statistics can be self-generated with a click of a button. Additionally, such a platform can easily show the variability of such statistics at different times of the year.

Some Data not Responsive to the Study Needs:

Some needed data was not available in the desired form. Sometimes, the data had gaps or was not available. In some cases, there were considerable variations in data sets from different sources. This made it difficult to choose data to be used to synthesize findings for a particular indicator.

5.0 APPRECIATIONS

The Research Team feels that it has responded to all the data needs requested by the assignment. This has been achieved through the guidance from JICA (Mr. Aoke & Mr. Makwale) of the NRDS Task Force (Mr. Imani Mr. Kamwaza, Dr. Benesi and among others), The NRDS Focal Person (Mr. Kausi) who guided at every point of the report and the Senior Irrigation Officer, Department of Irrigation (Ms. Chisinsi Chikabvumba) who provided a lot of data and information on Schemes. More appreciation to the CARD secretariat. The special salutation should go to 'Dr. Lilian Muasa', we've interacted a lot in this document. Thumb up, she read the whole report.

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APPENDICES

Appendix 1: Summary of Rice Varieties Released for Use in Malawi

1. Faya 14-M-69: Released in 1973 by the National Rice Breeding Programme. Faya is a tall (130-140 cm) leafy rice variety with thick and weak culms. It was introduced into Malawi by the Arabs more than a hundred years ago. However, the current variety, Faya 14-M-69, is an improved variety selected from amongst traditional Faya mixtures of different strains that differ in grain color, length, breadth, days to maturity, plant height, and other agronomic characteristics. It was selected from collections made in farmers' fields around Makhanga in Chiromo, southern Malawi. It tillers very profusely under favorable conditions and easily lodges even with good management levels. Its culm angle is open (60°) with an intermediate angle of 45° between the lower leaves and its flag leaf. Faya is photoperiod sensitive. It starts flowering from the third week of March to the mid or end of April. If planted at the onset of the rains, the variety matures in about 150-155 days around mid-April or mid-June. The yield potential varies with soil moisture conditions. Under irrigated conditions, yields range between 3.0-5.0MT/Ha, whereas under rain-fed conditions, yields range between 1.0-3.5MT/ha. However, despite good vegetative growth under rain-fed conditions, grain filling is poor because of lower temperatures in March or April when it flowers, leading to sterility and low yields. Generally, yields average 2.0MT/Ha. Faya is susceptible to blast (*Pyricilaria oryzae*), and brown spot (*Cochliobolus miyabeanus*), and it is also attached by stalk-eyed borers, leaf eaters, and gall midges. Faya has been classified as a medium grain variety because its milled grain length measures between 5.0-5.9 mm (FAO classification scale). It is glutinous when cooked, and has a low amylase content of 19%. It is highly favored by all Malawians, and also by a large population in neighboring countries, especially in the absence of long grain and non-glutinous varieties.

2. Blue Bonnet: Released in the 1960s by the National Rice Breeding Programme. Blue Bonnet originated from the United States of America (USA) and is delivered from a cross of Rexoro and Fortuna by a pedigree method of selection. It was introduced into Malawi in the late 1960s and has grown since then. It does well in all low-lying *dambo* areas, which have moderate standing water levels (less than 30 cm) during the growing period. It has an intermediate height (100 cm), although, under high fertility levels, it can grow up to 120 cm. It has an erect culm angle with semi-erect lower leaves and a horizontal flag leaf with excellent panicle exertion, which exposes all the panicles in the open. It has a low tillering capacity, averaging 7 tillers per plant, and lodges easily under high soil fertility conditions. When planted in mid-December to mid-January, the variety matures in 125-130 days. When planted around mid-June to mid-July, it matures in 150-155 days owing to its sensitivity to low temperatures at the seedling stage. Low temperatures during the flowering stage cause complete sterility. It is a moderate yielder, averaging about 2MT/Ha, but with yields varying between 1.5 and 4.0MT/Ha depending on management practices. In the Shire Valley, yields are lower during the dry season due to high temperatures of around 34oC at flowering and maturity. In Karonga, dry season yields are higher than wet season yields because of better management. It is susceptible to brown leaf spots (*Cochliobolus miyabeanus*) and blast (*Pyricularia aryzae*), and various leaf eaters. It is also attacked by insect pests and weevils in storage. This variety is highly acceptable on the export market because of its long grain size and its translucency when milled. The degree of chalkiness is less than some of the introduced varieties. Locally, it is highly acceptable in urban areas, but not so quiet in rural areas where the scented varieties are preferred.

3. Senga (IET 4094): Released in 1987 by the National Rice Breeding Programme. This is an Indian variety introduced into Malawi in 1977 through the International Rice Research Institute (IRRI), in the Philippines. It is a short maturing variety; 116 days in the wet season and 143 days in the dry season. The average plant height is 78 cm, with a high yield potential of 5.5MT/ha in the wet season, and 6.0MT/Ha in the dry season. It has an average grain length of 6.5 mm with a grain ratio of 3.16 compared with Blue Bonnet which has a grain length of 6.8 mm and a ratio of 3.15. Like Blue Bonnet, the grains are translucent. Its milled grain that is not broken (head rice) is 50%, compared with 58% for Blue Bonnet.

4. Changu (IR 1561-250-2-2): Released in 1987 by the National Rice Breeding Programme. This variety was originally developed at IRRI and introduced into Malawi in 1975. This is a short to medium maturing variety; 119 days in the wet season, and 145 days in the dry season, with an average plant height of 76 cm. It has a yield potential of 5MT/Ha during the wet season and 6.0/Ha in the dry season. The mean grain length and grain width ratio are 6.09 mm and 2.92, respectively. The variety is classified as having a medium grain shape with a translucent endosperm appearance, and a head rice of 51%.

5. Vyawo: Released in 2000 by the National Rice Breeding Programme. "*Vyawo*", in the Tonga language, translates into 'theirs'. This name refers to the variety's resistance to rice blasts and particularly to its adaptability to the Nkhata Bay low-altitude areas. This variety is not centered, but its long grain has good flavor. The grain measures 9.1 mm by 2.5 mm, with a 68% milling yield. The variety takes 130 days to mature in the wet season and 150 days in the dry season. It is also suitable for double cropping if sown before 15th June. It is suited for production in all irrigation schemes and has a grain yield potential of 6.0MT/Ha in the wet season and 5.5MT/in the dry season.

6. Mtupatupa: Released in 2000 by the National Rice Breeding Programme. The name "*Mtupatupa*" means expanding in the chi Chewa language, referring to the variety's grain that expands when cooked. The variety is intermediate in height (110-120 cm) with medium-shaped grains that are moderately scented. The grains average 9.2 mm in length and 2.7 mm in width, with a milling percentage of 66%. It matures in 130 days in the wet season and 155 days in the dry season. It is also recommended for double cropping if sown before 15th June. It is suited for production in all irrigation schemes, mainly because of its tolerance to rice disease. It has a yield potential of 6.3MT/ha and 6.0MT/Ha in the wet and dry seasons, respectively.

7. Nunkile (Pussa 33): Released in 2000 by the National Rice Breeding Programme. "*Nunkile*" means "smells good" in the chiNkhonde language, which accurately describes this strongly scented rice variety. It is semi-dwarf (<100 cm) with grains measuring 9.8 mm and 2.3 mm in length and width, respectively; and has a milling yield of 68%. This is a short maturing variety: 112 days in the wet season and 140 days in the dry season. It has potential yields of 6MT/Ha and 5.5MT/Ha in the wet and dry seasons, respectively. It is moderately susceptible to the common rice blast disease (*Pyriculareae oryzae*), hence it is not

suited to blast-prone areas, such as Limphasa Irrigation Scheme, and most of the medium altitude areas (<500 masl) throughout the country. Nunkile matures two weeks earlier than Senga or Changu. Such being case, yield losses due to birds are particularly high. Hence bird scaring should always start early. Because of its strong scent, Nunkile is also very attractive to field mice.
8. Lifuwu (FRX 78-12): Released in August 2003 by the National Rice Breeding Programme. This is an early maturing (90-120 days) high-quality (good milling, cooking, and taste qualities) rice variety with high levels of adaptability. It yields between 4.5-5.0 MT/Ha, which is higher than the average yield of the two recommended local varieties: Faya and Kilombero, which average 2.9 MT/Ha. It is less susceptible to the devastating rice blast disease (RBD). This variety is highly preferred by consumers because of its good aroma and long grains.
9. Wambone (FRX 92-14): Released in August 2003 by the National Rice Breeding Programme. This is a medium maturing (more than 120 days), high quality (good milling, cooking, and taste qualities) rice variety with a high level of adaptability. It is higher yielding (4.5-5.7 MT/Ha). When compared with the two local varieties Faya and Kilombero which average 2,900 kg/ha. It is stable and less susceptible to devastating RBD. It is a semi-dwarf variety that responds to high levels of fertilization without lodging. This variety is also highly liked by consumers in Malawi because it is scented and has long grains.
10. Kameme (IRAT 170): Released in August 2003 by the National Rice Breeding Programme. IRAT 170 is an early maturing (90-120 days), stable rice variety that is highly resistant to RBD. It is adapted to high-altitude areas, such as Chitipa, which are prone to rice blasts. It is slightly lower yielding than the recommended local varieties Faya and Kilombero, which average 2.9MT/Ha, although relatively high yields (of up to 3.7MT/Ha) have been obtained at Meru in Chitipa. This is a semi-dwarf variety that responds well to high levels of fertilization without lodging. Although this variety is not scented, it is preferred by farmers because of its tolerance to rice blasts, especially in upland areas.
11. NERICA 3: Upland rice, **Released by DARS in** November 2011. It yields up to 4.5 tons/ha with a 75% milling yield, suitable for Mchinji, Mzimba, and Chitipa.
12. NERICA 4: Upland rice, **Released by DARS in** November 2011. It yields up to 5.0 MT/Ha with a 74% milling yield, suitable for Mchinji, Mzimba, and Chitipa.
13. Mpatsa (ct18614-9-3-2-7-2): Released by DARS in December 2014. An improved rice variety for lowland cultivation in Malawi The varieties were considerably high yielding (5.8 MT/Ha) and slightly aromatic. The varieties were stable across the sites. Named Mpatsa as a great yield and Kayanjamalo as well adapted to a wide range of agroecology. Have a great aroma. Resistant to many rice diseases including rice blast and brown spot. Pest resilient. Matures within 100 Days,
14. Kayanjamalo (IR80411-B-49-1): Released by DARS in December 2014. An improved rice variety for lowland cultivation in Malawi The varieties are considerably high yielding. The varieties were stable across the sites. Named Mpatsa as a great yield and Kayanjamalo as well adapted to a wide range of agroecology. Have a great aroma. Disease resistant, resistant to rice blast and brown spot. Pest resilient. It yields up to 6.5 MT/Ha. Moderately aromatic. Takes 110 Days to Mature.
15. Katete: Released by DARS in December 2014. An improved rice variety for lowland cultivation in Malawi. It is relatively a high-yielding variety that matures in 94 Days. It is aromatic. It yields up to 6.0 MT/Ha. Moderately aromatic.
16. Mpheta (IR10L121): An improved dwarf rice variety for lowland ecologies released by the National Rice Breeding Program in August 2017. It can be grown both rain-fed and irrigated. High yielding, about 7.0 MT/Ha. Flowers in 80 days and matures in 110 days. The seed shape is slender, and the shattering ability is intermediate. Tastes good and has a good aroma like Mtupatupa. It can be cooked in 15-20 minutes. High tolerance to major rice diseases and Gray beetles. High-stress tolerance to N and P deficiencies.
17. Nanzolo (IR13N144) Released by DARS in August 2017. An improved dwarf rice variety for lowland ecologies. It can be grown both rain-fed and irrigated. High yielding, about 7.0 MT/Ha. Flowers in 85 days and matures in 115 days. The seed shape is medium, and the shattering ability is intermediate. Tastes good and has a good aroma like Mtupatupa. It can be cooked in 15-20 minutes. High tolerance to major rice diseases and Gray beetles. High-stress tolerance to N and P deficiencies.
18. Makafaci (Sahel 328): Released by DARS in July 2020. It is an improved doubled haploid rice variety recommended area. It is a semi-dwarf variety with high tillering ability. The plant height is 96cm. It flowers in 84-90 days. It matures within 105 and 110 days respectively, which is two weeks earlier than Mtupatupa. It gives a potential of 7.0 MT/Ha with a high grain yield. The grain is medium to slender grain shape and long to extra–long, with moderate aroma and the absence of the white belly on the endosperm.
19. Wachangu (SR35285 – HB3469 – 6): Released by DARS in July 2020. It is an improved doubled haploid rice variety recommended area. It is a semi-dwarf variety with high tillering ability. The plant height is 102 cm, flowers in 84-90 days. It matures within 105 and 110 days respectively, which is two weeks earlier than Mtupatupa. It gives a potential of 8.0 MT/Ha with a high grain yield. The grain is medium to slender grain shape and long to extra–long, with moderate aroma and the absence of the white belly on the endosperm.
RICE AGRONOMY
20. System Of Rice Intensification In Irrigation Schemes As A Technology In Malawi (SRI) Released in September 2014. uses one seedling 8-15 days after seedling emergence (DASE), square spacing, organic manure, mechanical weeding, and intermittent flooding (IF) to improve grain yields in farmers' rice fields.

Appendix 2: Quantities of Certified Rice Seed Documented by SSU from 2010-21

Season	Variety	Class	Tested (MT)	Passed (MT)	Failed (MT)
2007/2008	Pussa	Certified	11.7	11.7	0.0
	Kirombero	Certified	9.2	9.2	0.0
	Wambone	Certified	0.9	0.9	0.0
	Faya	Certified	14.3	14.3	0.0
	Mtupatupa	Certified	5.9	5.9	0.0
	Pussa 33	Certified	1.8	1.8	0.0
	Various*	Certified	32.6	31.7	0.9
2008/2009	Various*	Certified	3.6	3.6	0.0
2009/2010	Nunkile	Certified	62.6	62.6	0.0
2010/2011	Faya & Ntupatupa	Certified	37.1	22.0	0.0
	Nunkile	Certified	83.5	83.5	0.0
	Pussa	Certified	13.5	13.5	0.0
	Kilombero	Certified	55.4	34.2	18.7
	Faya	Certified	34.8	25.9	8.0
	Wambone	Certified	0.9	0.9	0.0
	Lifuwu	Certified	0.8	0.8	0.0
2011/2012	Faya	Certified	38.5	38.5	0.0
	Kilombero	Certified	54.7	54.7	0.0
	Wambone	Certified	11.7	11.7	0.0
	Nunkile	Certified	48.9	48.9	0.0
2012/2013	Various*	Certified	113.3	113.3	0.0
2013/2014	Various*	Certified	303.6	278.2	25.4
2014/2015	Faya	Certified	4.11	4.11	0.0
	Kilombero	Basic	6.31	6.31	0.0
	Kilombero	Certified	102.93	102.93	0.0
	Ntupatupa	Certified	1.18	1.18	0.0
	Nunkile	Certified	0.56	0.56	0.0
2015/2016	Faya	Certified	40.4	40.4	0.0
	Nunkile	Certified	15.1	15.1	0.0
	Pussa	Certified	13.9	13.9	0.0
	Kilombero	Certified	95.5	95.5	0.0
	Wambone	Certified	2.5	2.5	0.0
	Lifuwu	Certified	1.5	1.5	0.0
2016/2017	Pussa	Certified	2.1	2.1	0.0
	Kirombero	Certified	350.3	350.3	0.0
	Wambone	Certified	7.5	7.5	0.0
	Faya	Certified	70.1	70.1	0.0
	Mtupatupa	Certified	1.22	1.22	0.0
2017/2018	Faya	Certified	55.5	55.5	0.0
	Kilombero	Certified	90.7	90.7	0.0
	Wambone	Certified	22.7	22.7	0.0
	Nunkile	Certified	44.9	44.9	0.0

2018/2019	Faya	Certified	71.3	71.3	0.0
	Nunkile	Certified	17.6	17.6	0.0
	Pussa	Certified	12.8	12.8	0.0
	Kilombero	Certified	105.5	105.5	0.0
	Wambone	Certified	3.5	3.5	0.0
	Lifuwu	Certified	3.5	3.5	0.0
2019/2020	Faya	Certified	11.4	4.11	0.0
	Kilombero	Certified	202.39	102.93	0.0
	Ntupatupa	Certified	1.18	1.18	0.0
	Nunkile	Certified	3.65	0.56	0.0
2020/2021	Faya	Certified	50.11	4.11	0.0
	Kilombero	Certified	350.3	102.93	0.0
	Ntupatupa	Certified	3.18	1.18	0.0
	Nunkile	Certified	2.56	0.56	0.0

*Not given specific varieties

Appendix 3: List of Functional and Non-Functional Irrigation Schemes of Malawi

Categories: S=smal <200Hal, M=Medium (100-200Ha) and L=Large-scale >200Ha
Functional Schememes are highlighted in Yellow
Number of Schemes: S= 20 M=8 L=11

ADD	DISTRICT	SCHEME	Size (Ha)	Category
Karonga	Karonga	Miyombo	10	
	Karonga	AB Mwakasungula	10	S
	Karonga	Burton	10	
	Karonga	Sanambe 1	10	
	Karonga	Lyamayolo	10	
	Karonga	Tilora	8	
	Karonga	Gumi	5	
	Karonga	Lufilya F	400	L
	Karonga	Wowve F	365	L
	Karonga	Mpinga F	300	L
	Karonga	Hara F	238	L
	Karonga	Chitindi	10	
	Karonga	Chonanga	40	
	Karonga	Ngalamu	10	
	Karonga	Changwina	10	
Kasungu	Kasungu	Lisandwa	60	
Blantyre	Neno	Mtengula	375	
Lilongwe	Dedza	Bwanje F	800	L
Blantyre	Mulanje	Mnembo	120,0	
	Mulanje	Kambenje F	50,0	S
	Mulanje	Lembanguwo	70,0	
Shire Valley	Nsanje	Muona F	475	L
	Nsanje	Chitsukwa	455	
	Nsanje	Masenjere F	350	L
	Nsanje	Mlewa B	215	
	Nsanje	Magodora	213	
	Nsanje	Njale 1	130	
	Nsanje	Nyangoma	72	
	Nsanje	Nkholovuwa	50	
	Nsanje	Matabwa	26	
Shire Valley	Chikwawa	Chilengo F	250	M
	Chikwawa	Nkhate F	245	M
	Chikwawa	Nanzolo A & B F	63	S
Salima	Nkhotakota	Mpamantha Rice F	92	
	Nkhotakota	Mgombe	40	
	Nkhotakota	Chiwale	33	
	Nkhotakota	Chilingali F	58	S
	Nkhotakota	Mwalawazimba	83	
	Nkhotakota	Chikukutu Dam	5	
	Nkhotakota	Lipimbi F	56	S
	Nkhotakota	Kabzanga	36	
	Nkhotakota	Lifuliza F	189	M
	Nkhotakota	Chisambo	32	S
	Nkhotakota	Mtandira	25	
	Nkhotakota	Bua F	320	L
	Nkhotakota	Makhenjere F	6	S
	Nkhotakota	Ngalatete	9	
	Nkhotakota	Kafita F	6	S
	Nkhotakota	Kaombe F	90	S

	Nkhotakota	Balafalomu	32	
	Nkhotakota	Chithowe	32	
Kasungu	Dowa	Dowa Dambo	195	
	Dowa	Khafi	30	
	Dowa	Kawelawela	5	
	Dowa	Kang'ona	4	
	Dowa	Bua F	15	S
	Dowa	Kasangazi/ Kawele	5	
Machinga	Balaka	Khwisa F	120	M
Salima	Salima	Lifuwu F	183	M
	Salima	Mpatsanjoka F	12.5	S
	Salima	Lifidzi F	540	
	Salima	Mkhanje	50	
Mzuzu	Nkhatabay	Chiwana	10	
	Nkhatabay	Chitungula/ Linga	1000	
	Nkhatabay	Lilezi	200	
	Nkhatabay	Luwazi F	45	S
	Nkhatabay	Chipuzumumba	60	
	Nkhatabay	Tiyanjane F	75.7	S
	Rumphi	Lunyina	12	
Machinga	Zomba	Likangala F	410	L
	Zomba	Njala F	120	M
	Zomba	Chiliko F	23	S
	Zomba	Khanda F	74	S
	Zomba	Segula F	32	S
	Zomba	Ndundumala	30	
	Zomba	Limphasa		M
Blantyre	Phalombe	Chakalamba	88	
	Phalombe	Bwanje	92	
	Phalombe	Likhatcha	33	
	Phalombe	Salankhuku	110	
	Phalombe	Makhawani	84	
	Phalombe	Kanjedza	71	
	Phalombe	Nkhulamba		M
Machinga	Machinga	Domasi F	500	L
	Machinga	Lingoni F	15	S
	Machinga	Wenzide F	37	S
	Machinga	Chibulubulu	20	
	Machinga	Tisaiwale	20	
	Machinga	Phandilo F	80	S
Machinga	Mangochi	Kadewere	120	
	Mangochi	Lingamasa F	500	L
	Mangochi	Dimu	50	
	Mangochi	Mnemera	30	
	Mangochi	Mnenje	40	
	Mangochi	Namkwali	120	
	Mangochi	Angona F	11	S

Appendix 4: Gross Margins for Rice Production

Rice under SRI and Conventional Farming (Seed Multiplication Versus Grain Production)

1A. Cost of Certified Seed Production per Ha under SRI farming.		1B. Cost of Grain Production per Ha under SRI farming.		2A-Cost of Certified Seed Production per Ha under Conventional farming.		2B-Cost of Grain Production per Ha under Conventional farming.	
Item	**Amount (MK)**	**Item**	**Amount (MK)**	**Item**	**Amount (MK)**	**Item**	**Amount (MK)**
Material inputs		**Material inputs**		**Material inputs**		**Material inputs**	
Seed - SRI	14000	Seed - SRI	14000	Seed -conventional	60000	Seed -conventional	60000
Basal dressing fertilizer cost	140000	Basal dressing fertilizer	140000	Basal dressing fertilizer	140000	Basal dressing fertilizer	140000
Top dressing fertilizer cost	70000	Top dressing fertilizer	70000	Top dressing fertilizer	70000	Top dressing fertilizer	70000
cono weeder (0ptional)	25000	cono weeder	25000				
sacks	28800	sacks	28800	sacks	21600	sacks	21600
5 Sickles	15000	5 Sickles	15000	5 Sickles	15000	5 Sickles	15000
Sheet for threshing	20000	Sheet for threshing	20000	Sheet for threshing	20000	Sheet for threshing	20000
Thread and Needle	5000	Thread and Needle	5000	Thread and Needle	7000	Thread and Needle	7000
Total inputs	**317800**	**Total inputs**	**317800**	**Total inputs**	**333600**	**Total inputs**	**333600**
Labor		**Labor**		**Labor**		**Labor**	
Land preparation - labor	100000	Land preparation - labor	100000	Land preparation - labor	100000	Land preparation - labor	100000
Nursery labor	10000	Nursery labor	10000	Nursery labor	5000	Nursery labor	5000
harrowing	50000	harrowing	50000	harrowing	50000	harrowing	50000
Transplanting - labor	100000	Transplanting - labor	100000	Transplanting - labor	100000	Transplanting - labor	90000
Weeding - labor	90000	Weeding - labor	90000	Weeding - labor	78000	Weeding - labor	78000
Fertilizer - labor	10000	Fertilizer - labor	10000	Fertilizer - labor	10000	Fertilizer - labor	10000
Border cleaning	10000	Border cleaning	0	Border cleaning	10000	Border cleaning	0
Removing off-types twice	18000	Removing off-types	0	Removing off-types	18000	Removing off-types	0
Harvesting (cutting, threshing)	150000	Harvesting (cutting, threshing)	150000	Harvesting (cutting, threshing)	150000	Harvesting (cutting, threshing)	150000
Total labor cost	**538000**	**Total labor cost**	**510000**	**Total labor cost**	**521000**	**Total labor cost**	**483000**
Service payments		**Service payments**		**Service payments**		**Service payments**	
Registration	2000	Registration	0	Registration	2000	Registration	0
Inspection (3 visits)	6000	Inspection (3 visits)	0	Inspection (3 visits)	6000	Inspection (3 visits)	0
Membership fee	3000	Membership fee	0	Membership fee	3000	Membership fee	0
Packaging	28800	Packaging	28800	Packaging	21600	Packaging	21600
Transportation (field to home)	19200	Transportation	19200	Transportation	14400	Transportation	14400
Seed sampling and lab tests	750	Seed sampling & testS	0	Seed sampling & tests	750	Seed sampling & tests	0
Total service payments	59750	Total service payments	48000	Total service payments	47750	Total service payments	36000
Total cost	**915550**	**Total cost**	**875800**	**Total cost**	**902350**	**Total cost**	**852600**
Total Production Qty (Kg/Ha)	4800	Total Production Qty	4800	Total Production Qty	3600	Total Production Qty	3600
Seed Price (MwK/Kg)	1400	Grain Price (MwK/Kg	600	Seed Price (MwK/Kg)	1400	Grain Price (MwK/Kg	600
Revenue	**6720000**	**Revenue**	**2880000**	**Revenue**	**5040000**	**Revenue**	**2160000**
Income	**5804450**	**Income**	**2004200**	**Income**	**4137650**	**Income**	**1307400**

Appendix 5: Research Design Matrix (Indicators and Parameters under Study)

Theme	Indicator	Type of Data	Recall Period	Data Sources	Collection Method/s	Data Analysis
Overall	Quantity of paddy production *(Dissagregated by Scale of production where small-scale is <=2ha and large-Scale is >2ha).*	1) Produced under irrigated land 2) Produced under rain-fed lowland (including Dambos) 3) Produced upland under rain fed	*2010 to date*	District Agric. Planning Office APES (Agricultural Estimates)	Survey Data Extraction Accessing data from Central Database	- Descriptive Statistics (Sum, Mean, etc.) of the produced quantities.
	Total area harvested *(Dissagregated by Scale of production where small-scale is <=2ha and large-Scale is >2ha)*	4) Harvested under irrigated land. 5) Harvested under rain-fed lowland (including Dambos). 6) Harvested from upland under rainfed.	*2010 to date focusing on the Second quarter of the year for rainfed (Harvested in May) and the third quarter of the year (Harvested in Sept).*	-District Agric Offices -APES and -Rice farmers (Schemes)	Survey Data Extraction Accessing data from Central Database	- Descriptive Statistics (Sum, Mean, etc.) for area planted with rice.
	Yield per unit area *(Dissagregated by Scale of production where small-scale is <=2ha and large-Scale is >2ha)*	7) Yield under irrigated land. 8) Yield under rain-fed lowland (including Dambos). 9) Yield from upland under rain-fed.	*2010 to date.*	-Lifuwu Research Station -Seed Services Unit -Catalogue of released technologies	Interviews and Review of Secondary Data	Content Analysis The weighted value derived from the yield calculation of grain moisture of 12.5%
	Self-sufficiency rate (rate of rice needed by local production)	10) Qty of milled rice (Milling recovery rate). 11) Qty rice imported (Milled equivalent). 12) Qty of rice exported (Milled equivalent).	*2010 to date.*	- APES - District Offices - National Statistics Office - Dept of Crops HQ	Interviews and Review of Secondary Data	- Descriptive Statistics, a %ge Calculated using a formula (defined by FAO): Qty produced / (Qty produced + Qty imported - Qty exported)

Continued...: *Research Design Matrix*

Theme	Indicator	Type of Data	Recall Period	Data Sources	Collection Method/s	Data Analysis
Resilience	Irrigation (Area under irrigation)	13) Number of active/functional irrigation schemes (small-, medium- and large-scale) for rice production and their locations 14) Area harvested under irrigation, in both dry and wet seasons	-- *Latest* *--2010 to date.*	-District Agric Offices -APES and -Rice farmers (Schemes)	- Survey - Data Extraction - Accessing data from Central Database	- Descriptive Statistics (Sum, Mean, etc.) for areas planted with rice under irrigation.
	Seeds (Quantity of resilient variety seeds).	15--Names of popular/consumer-preferred rice varieties (both local [in different ecosystems: upland, lowland, irrigated] and imported) (if possible, with ranks) -	*Latest*	-Lifuwu Research Station -Catalogue of released technologies -National Statistics Office	Interviews and Review of Secondary Data	- Comparative Analysis - Listing - Descriptive Statistics (Sum, Mean, etc.)
		16--Number of active certified seed producers/companies and their seed production quantities -	*At least for the past 4 years*	-Seed Services Unit (SSU)	- Accessing data from Central Database	- Listing - Descriptive Statistics (Sum, Mean, etc.)
		17--Quantity of certified seeds produced and sold/marketed/distributed -	*2010 (or earlier) to date*	-Seed Services Unit (SSU)	- Accessing data from Central Database	- Listing - Descriptive Statistics (Sum, Mean, etc.)v
		18--Quantity of seeds of locally preferred varieties with resilient characteristics, locally produced.	*2010 (or earlier) to date*	-Rice Farmers, DAES, APES	-Simple Survey -Accessing Data	-Synthesis from Planted Area
		19--Quantity of seeds of locally preferred varieties with resilient characteristics, imported	*2010 (or earlier) to date*	-Rice Farmers, DAES, APES	-Simple Survey -Accessing Data	-Synthesis from Planted Area
		20--Quantity of seeds of locally preferred 21--varieties with high-yielding characteristics, locally produced	*2010 (or earlier) to date*	-Rice Farmers, DAES, APES	-Simple Survey -Accessing Data	-Synthesis from Planted Area
		21--Quantity of seeds of locally preferred varieties with high-yielding characteristics, imported	*2010 (or earlier) to date*	-Rice Farmers, DAES, APES	-Simple Survey -Accessing Data	-Synthesis from Planted Area
		22--Proportion of farmers using certified seeds (Average for the nation) -	*Latest*	-Rice Farmers, DAES, APES	-Simple Survey -Accessing Data	-Synthesis from Planted Area

Continued...: *Research Design Matrix*

Theme	Indicator	Type of Data	Recall Period	Data Sources	Collection Method/s	Data Analysis
Industrialization (Mechanisation)	Level of milling sector upgrading. *(Ratio of installed capacity of medium and large mills among all functional mills)*	23--Number of functional rice mills (small [<2 t/hr], medium [2-5 t/hr], and large [>5 t/hr]) and their locations. --List of rice mills in the country (or rice-producing areas) with the installed capacity of each mill and information about occupancy rate during the harvest period.	--2018 to date	- Dept. of Trade & Industry - Rice Millers (Industry) - Rice Millers (At major rice markets such as Mchesi, Salima, and Karonga Boma)	Survey using a structured questionnaire	• Dsecriptive Statistics (Ratio, Sum, Mean, etc.).
	Level of mechanization in production. *(Modernisation of Productn)*	24--Number of tractors, power-tillers, and combine harvesters (in rice production areas). 25--Number of agricultural machinery hiring/service centers (in rice-producing areas)	--2018 to date	-Rice Schemes -Rice farmers --Agric Engineering Depts	Survey using a structured questionnaire	• Descriptive Statistics (Sum, Mean, etc.).
Competitiveness	Share of local rice in the market. *(Share of locally produced rice in the total quantity of rice procured by major retail stores for a year)*	26--Share of locally produced rice in the total quantity of rice procured by major retail stores for a year. 27--Retail prices for milled rice for the different varieties/types (average monthly prices). -Quantity of local rice (a) procured and (b) sold -Quantity of imported rice (a) procured and (b) sold"	-2018 to date -2010 to date	--Rice Outlet Points	Rapid Market Assessment - "Simple market survey (several major retail stores)"	• Descriptive Statistics (Sum, Mean, etc.).
	Quantity of high-yielding variety seeds.	-Quantity of seeds produced locally, by a variety -Quantity of seeds imported, by a variety -List of rice varieties (to know which variety is considered to be high yielding) "*/(Quantity of seeds of locally preferred varieties with high-yielding attributes, locally produced and/or imported annually*).		-Seed Services Unit -Plant Protection Unit (DARS). -Rice Research Station	-Data extraction from SSU (Lifuwu, Bvumbe & Chitedze).	• Descriptive Statistics (Sum, Mean, etc.). • Listing • Comparative Analysis
Empowerment	**Finance:** Smallholder farmers' access to financial services. (% accessing finance).	28--Financial schemes available to rice value chain actors. 29--Number of financial institutions (Micro, Macro-Commercial banks) offering financial assistance to rice value chain stakeholders	--Latest --Latest	-Agribusiness Office -Extension Methodology Officer. -Rice Famer	A survey using a structured questionnaire.	• Descriptive Statistics (Sum, Mean, etc.). • Listing

		30--List of projects providing matching grants/financial windows. 31--Percentage of smallholders in pre-selected farmers' groups/associations regularly accessing necessary financial services (in rice-producing areas). -Number of randomly selected rice farmers accessing financial services for rice production. Ind. Farmers vs. Ind. Farmers/Grps vs. Grps.	--Latest --2015 to date			
	Smallholder farmers' accessibility to technical training or services. (% accessing extension Services).	32--Extension Services (qualifications, total numbers by regions) 33--Number of training sessions organized for rice farmers-aspect wise (e.g. seed, water management, etc.) 34--List of projects and private companies providing training, short- and long-term courses 35--Percentage of smallholders in pre-selected farmers' groups/associations regularly accessing necessary technical training and services (in producing areas). -Number of randomly selected rice farmers accessing extension services on rice production.	--Latest --Latest --Latest --20**15** to date	-Extension Methodology Officer. -Rice Famers -DAES	A survey using a structured questionnaire.	• Descriptive Statistics (Sum, Mean, etc.). • Listing
Research on Rice		36--Research (qualification, total numbers by regions) Latest	--Latest	Department of Agricultural Research Services	-KII using a checklist Questionnaire	• Listing
Additional indicator						
Price	Retail prices for representative rice brands/varieties for both domestic and imported rice	Different rice brands, Varieties versus their market prices.		Markets, Shops, Superettes, Aggregators, and Processors along the the value chain.	A survey using a structured questionnaire.	• Descriptive Statistics (Sum, Mean, etc.).

Appendix 6: List of Registered and Unregistered WUAs

(Accessed on16/11/2022 from DOI)

#	ADD	DISTRICT	SCHEME	Area Developed Under Irrigation	Cultivated Under Rice (Ha) Irrigation	Cultivated Under Rice (Ha) Rain-fed	WUA REGISTRATION	M	F	T
1	Karonga	Karonga	Miyombo	10	10	10	Registered in 2008	22	27	49
2		Karonga	AB Mwakasungula	10	10	10	Not Registered	36	28	64
3		Karonga	Barton	10	10	10	Not Registered	47	35	82
4		Karonga	Sanambe 1	10	10	10	Not Registered	28	26	54
5		Karonga	Lyamayolo	10	10	10	Not Registered	49	31	80
6		Karonga	Tilora	8	8	8	Not Registered	40	32	72
7		Karonga	Gumi	5	1	5	Not Registered	12	6	18
8		Karonga	Lufilya	400	200	400	Registered in 2001	767	378	1145
9		Karonga	Wowve	365	365	365	Registered in 2002	747	363	1110
10		Karonga	Mphinga Complex	300	300	300	Not Registered	483	164	647
11		Karonga	Hara	238	238	238	Registered in 2001	541	90	631
12		Karonga	Chitindi	10	1	10	Not Registered	22	50	72
13		Karonga	Chonanga	40	40	40	Registered in 2001	45	65	110
14		Karonga	Ngalamu	10	10	10	Not Registered	27	19	46
15		Karonga	Changwina	10	10	10	Not Registered	46	28	74
16	Kasungu	Kasungu	Lisandwa	60	20	60	Not Registered	108	140	248
17	Blantyre	Neno	Mtengula	375	180	375	Not Registered	642	420	1062
18	Lilongwe	Dedza	Bwanje	800	550	800	Not Registered	983	1084	2067
19	Blantyre	Mulanje	Mnembo	120	5	120	Registered	388	642	1030
20		Mulanje	Kambenje	50	50	50	Not Registered	206	288	494
21		Mulanje	Lembanguwo	70	55	70	Registered	87	263	350
22	Shire Valley	Nsanje	Muona	475	475	475	Registered	1200	4320	5520
23		Nsanje	Chitsukwa	455	435	455	Not Registered	526	817	1343
24		Nsanje	Masenjere	350	125	350	Registered	180	289	469
25		Nsanje	Mlewa B	215	165	215	Not Registered	213	498	711
26		Nsanje	Magodora	213	136,5	213	Not Registered	420	900	1320
27		Nsanje	Njale 1	130	123	130	Not Registered	620	958	1578
28		Nsanje	Nyangoma	72	68	72	Not Registered	42	61	103
29		Nsanje	Nkholovuwa	50	15	50	Not Registered	150	100	250
30		Nsanje	Matabwa	26	6	26	Not Registered	30	56	86
31	Shire Valley	Chikwawa	Chilengo	250	25	250	Not Registered	60	48	108
32		Chikwawa	Nkhate	245	245	245	Not Registered	840	517	1357
33		Chikwawa	Nanzolo A & B	63	15	63	Not Registered	90	80	170
34	Salima	Nkhotakota	Mpamantha Rice	91,85333	83	91,85333	Not Registered	54	46	100
35		Nkhotakota	Mgombe	40	20	40	Not Registered	25	10	35
36		Nkhotakota	Chiwale	33,33333	20	33,33333	Registered	41	21	62

37		Nkhotakota	Chilingali	58,13953	50	58,13953	Registered	34	74	108
38		Nkhotakota	Mwalawazimba	83,33333	50	83,33333	Not Registered	48	22	70
39		Nkhotakota	Chikukutu Dam	4,5	3	4,5	Not Registered	13	6	19
40		Nkhotakota	Lipimbi	55,55556	50	55,55556	Registered	36	28	64
41		Nkhotakota	Kabzanga	36	30	36	Registered	16	22	38
42		Nkhotakota	Lifuliza	188,6792	100	188,6792	Not Registered	86	49	135
43		Nkhotakota	Chisambo	32	8	32	Not Registered	19	25	44
44		Nkhotakota	Mtandira	25	10	25	Not Registered	21	22	43
45		Nkhotakota	Bua	320,3333	310	320,3333	Registered	540	250	790
46		Nkhotakota	Makhenjere	6	3	6	Not Registered	14	17	31
47		Nkhotakota	Ngalatete	9	3	9	Not Registered	8	12	20
48		Nkhotakota	Kafita	6	3	6	Not Registered	15	13	28
49		Nkhotakota	Kaombe	90,3125	85	90,3125	Registered	132	165	297
50		Nkhotakota	Balafalomu	32	8	32	Not Registered			0
51		Nkhotakota	Chithowe	32,14286	15	32,14286	Registered	20	32	52
52	Kasungu	Dowa	Dowa Dambo	195	0	8	Not Registered	45	20	65
53		Dowa	Nkhafi	30	0	10	Not Registered	20	7	27
54		Dowa	Kawelawela		0	5	Not Registered	10	5	15
55		Dowa	Kang'ona		0	4	Not Registered	12	2	14
56		Dowa	Bua		0	15	Not Registered	27	13	40
57		Dowa	Kasangazi/ Kawele		0	5	Not Registered	12	6	18
58	Machinga	Balaka	Khwisa	120	78	120	Not Registered	245	140	385
59	Salima	Salima	Lifuwu	183	50	183	Registered	76	79	155
60		Salima	Mpatsanjoka	12,5	10	12,5	Not Registered	30	50	80
61		Salima	Lifidzi	540	17	540	Registered	90	130	220
62		Salima	Mkhanje		50		Not Registered WUA is being formed now.			0
63	Mzuzu	Nkhatabay	Chiwana	10	7	10	Not Registered	35	10	45
64		Nkhatabay	Chitungula/ Linga	1000	600	1000	Not Registered	10	15	25
65		Nkhatabay	Lilezi	200	160	200	Registered	76	99	175
66		Nkhatabay	Luwazi	45	45	45	Not Registered	35	40	75
67		Nkhatabay	Chipuzumumba	60	48	60	Registered	78	48	126
68		Nkhatabay	Tiyanjane	75,7	75,7	75,7	Not Registered	112	52	164
69		Rumphi	Lunyina	12	12	12	Not Registered	20	34	54
70	Machinga	Zomba	Likangala	410	400	400	Registered in 2009	1000	684	1684
71		Zomba	Njala	120	0	42	Registered in 2012	118	113	231
72		Zomba	Chiliko	23	11	23	Registered in 2012	41	56	97
73		Zomba	Khanda	74	0	74	Registered in 2011	184	192	376
74		Zomba	Segula	32	0	32	Registered in 2011	72	72	144
75		Zomba	Ndundumala	30	0	29		23	27	50
76	Blantyre	Phalombe	Chakalamba	88	17	35	Registered	59	91	150
77		Phalombe	Bwanje	92	20	30	Registered			0

78		Phalombe	Likhatcha	33	7	13	Registered	63	87	150
79		Phalombe	Salankhuku	110	15	55	Not Registered	69	71	140
80		Phalombe	Makhawani	84	5	40	Not Registered	10	30	40
81		Phalombe	Kanjedza	71	10	30	Not Registered	91	127	218
82	Machinga	Machinga	Domasi	500	120	500	Registered	89	118	207
83		Machinga	Lingoni	15	15	15	Not Registered	35	28	63
84		Machinga	Wenzide	37	8	37	Not Registered	970	1087	2057
85		Machinga	Chibulubulu	20	20	20	Not Registered	25	31	56
86		Machinga	Tisaiwale	20	20	20	Not Registered	28	36	64
87		Machinga	Phandilo	80	50	80	Registered	96	168	264
88	Machinga	Mangochi	Kadewere	120	120	120	Not Registered	50	50	100
89		Mangochi	Lingamasa	500	500	500	Not Registered			850
90		Mangochi	Dimu	50	50	50	Not Registered	23	15	38
91		Mangochi	Mnemera	30	30	30	Not Registered			210
92		Mangochi	Mnenje	40	40	40	Not Registered			0
93		Mangochi	Namkwali	120	120	120	Not Registered	54	73	127
94		Mangochi	Angona	11	11	11	Not Registered	10	70	80

Appendix 7: Tools Used for the Baseline Study

Introductory Note

TOOL 1: BASELINE FOR THE NATIONAL RICE DEVELOPMENT STRATEGY (2022)
JICA & CREATIVITY ENTREPRENEURS

Preamble

Hello. My name is _____. I am working with Creative Entrepreneurs, a consulting firm that has been assigned by JICA to learn from you about the Production and Marketing of rice in your area. Our discussion aims at collecting information that will help in making production and marketing decisions on rice and associated products. I will prefer to talk to the person/s who makes farming decisions in this household.

[If another respondent joins while started, introduce yourself again and continue]

Can I have a conversation with you?

*[If the answer is **No**, End the Interview]*

*[If the answer is **yes,** thank the respondent and re-assure the confidentiality of the collected information. Explain to them that the information will be used to prepare general reports and will not include any specific names. If you have a complex question about the survey, link them to/ or call our team leader (Hector Malaidza) at +265999 33 00 61.*

IDENTIFICATION

Interview Date: *[dd/mm/yyyy |……..||……. ||……|*

Interviewer's name:

Name of interviewee/s: Position (if any):

District_____ EPA _____ Section _____ Village _____

City/Town T/A

Respondent name _____ Sex of respondent **1=Male 0=Female**

Category of interviewee: 1=SMS/2=Farmer/3=Stakeholder/4=National level/5=Shop Owner-Keeper/88=Others (Specify)

Latitude (***Use UTM)*** …….. Longitude……

Altitude (Elevation):

Signed by supervisor (name): Date: *[dd……/mm……/yyyy……..]*

1= Karonga 2= Nkhatabay 3=Nkhotakota 4= Salima 5= Machinga 6= Zomba 7= Chikwawa

Tool1: Questionnaire for Rice Farmers
Assessing Production, Productivity & Empowerment Among Rice Producers

D.1 Smallholder farmers' accessibility to technical training or services. (% accessing extension Services). -Number of randomly selected rice farmers accessing extension services on rice production.

PRODUCTION AND PRODUCTION AMONGST RICE FARMERS

What type of rice seeds do you use for rice production?

#	Rain-fed				Irrigated			
	Type of Variety	Source of Seed	Size of area planted (M^2)	Volume harvested (Kg)	Type of Variety	Source of Seed	Size of area planted (M^2)	Volume harvested (Kg)
1.								
2.								
3.								
4.								
5.								

INDUSTRIALISATION AMONG THE FARMERS

What type of machines do you use for your rice production?

Name of Machine or Equipment *Do you use a?*	1=Yes 0=No	Description	Source
1. Tractor			
2. Tillers			
3. Planters			
4. Cone Weeders			
5. E.t.c			
6.			

Codes A: *1=Production, 2=Market information, 3=Sales, 88=others (Specify).....*
Code B: *1=when to produce 2= what to produce 3=progress of enterprise 4= Marketing 5= others (specify)*

FARMER GROUPS AND SOCIAL CAPITAL

Assessing if the farmers belong to other structures that exist in their communities.

i. *Do you belong to a farmer group working on rice production or marketing in your area? ------ **1**=Yes; **0**=No*
   a. *Farmer group—a club ------- **1**=Yes; **0**=No*
   b. *Association, or ---------- **1**=Yes; **0**=No*
   c. *Cooperative? ---------- **1**=Yes; **0**=No*

ii. *If Yes, please provide the following information*

#	**Type of farmer group (Code C)**	**Main Services Accessed (Code D)**	**How satisfied are you with the services provided (Lickert Scale 1-5)**	**Main Reason for joining (Code E)**	**Main activities are done by members (Code F)**
1					
2					
3					
	Codes C: 1=Farmer club 2= Association 3= Cooperative 88 = Others (specify)		1=Highly satisfied 2=Satisfied 3=Neutral 4=Dissatisfied 5=Highly Dissatisfied		**Codes F:** 1= Sharing of production practices 2= Seed multiplication 3= Grain bulking 4= Grain marketing 5 = Saving and credit

					6= Others (Please specify)

Codes D *(Services Provided)*: 1=Info on Production info./ 2= info on harvesting/ 3=Info on processing/4=info on storage/ 5= Market information / 6=Access to market – *eg. Contracts, supermarkets*/ 7= Access to financial services, VSL/ 8= Inputs (seed. Fert.. Pesticides etc) 9 = Aggregation of harvested rice grain/ 10=Warehousing 88= Other (specify) ---

Codes E *(Reasons)*: 1=Easy access to market 2= Easy access to credit 3=part of the condition to join VSL 4= To access seed 5 =Easy access to extension 6=Access to market information 88=Others (please specify) ----------

SUPPORT SERVICES ON RICE PRODUCTION

TRAINING RECEIVED BY THE RICE FARMERS

1. Did you receive any training related to rice production in the last 5 years ---- 1=Yes/0=No
2. If Yes, how many: ..... Training

TYPE OF TRAINING

Training #	When? Month/ Year	Type of training (Code G)	Facilitators (Code H)	Who organized that training (Code J)

Code G	Code H	Code J
1=Rice production 2=Rice Marketing 3=Group dynamics 4=Governance 5=VSL 6=Financial management 7=Post-harvest handling 8=Processing 88=Other (specify) ----------	1= Government 2= NGOs *(such as NASFAM)* 3= Staff outside the district 4= Consultants 5 =Traders/Business expert 6=Lead farmers 88=Other (specify) ----------	1= Government 2= NGOs *(such as NASFAM)* 3= Private Sector 4= Development Partners (eg. JICA) 5 =Traders 88=Other (specify) ----------

Type of technical support received by farmers

Did you receive technical advice on rice production in the past 5 years (2016-2021) ***(1=yes/2=no)***	Type of technical support received	Source **Code K**	Was the advice received beneficial? ***(1=yes/2=no)***
Code K *(Source of technical support):*	1= Fellow farmer organization member, 2= Extension officer 3= Research institution, 4=NGOs, 88=Others *(Specify)*		

Type of technical: 1= Accessed quality seed/ 2=Access to inputs/ 3= agronomic management/ 4= pest and disease management/ 5 = Irrigation/ 6 = harvesting/ 7 = post-harvest handling/ 8=Processing/ 9=Marketing

ACCESS TO EXTENSION SUPPORT

1. Did you receive any horticultural information from the following sources in the 2019 to 2020 cropping season?

Source	***1=Yes 0=No***	**Source**	***1=Yes 0=No***	**Source**	***1=Yes 0=No***
Family/friend		*Women groups e.g., VSLs*		*Phones/Mobile Alerts*	
Fellow farmer		*Faith-based Groups*		*Newspaper*	
Lead farmer		*CBOs*		*Brochures/pamphlets*	
Extension worker		*NGOs*		*Posters*	
Agro-dealer		*Private company*		*Internet*	
Plant doctors		*University/Research institution*		*JICA initiatives*	
Plant Clinic		*Radio*		*Others (Specify)…*	
Farmer groups		*TV*			

ACCESS TO FINANCIAL SERVICES & CREDIT FOR RICE PRODUCTION

Smallholder farmers' access to financial services. (% accessing finance). -Number of randomly selected rice farmers accessing financial services for rice production. Ind. Farmers vs. Ind. Farmers/Grps vs. Grps.

1-Did you access any form of Credit as an individual farmer? ..... as a group? .....

2-Please provide information on demand for and access to credit and associated details:

Credit for	**Did you borrow in the last 5yrs (2016-21)?** *1=Yes/0=No*	**Where did you borrow it?** (Codes L)	**Did you borrow as an** *1=Individual farmer 2=Part of a farmer group*	**If Yes, did you get the amount needed?** 1=Yes/0=No	**If Yes, how much did you borrow?** (Value in MK)	**If No, why?** (Codes M)
1. Cash/Finance						
2. Seed						
3. Fertilizer						
4. Farm equipment/implements						
5. Business or trade						
6. Pesticides & Fungicides						
7. Land						
Others *(specify)*						

Code L: (*Where did you borrow*): 1=VSL/2=Banks/3=Microfinance Institution/4=Agro-dealer/5=Government Program/6=NGO/7=Friend-Relative or Peer/8=Advance from a Rice Buyer/9=

Codes M: 1=I did not need credit/ 2=Interest rate is too high/ 3=I have no access to any credit source / 4=Other (specify……

THANK YOU FOR YOUR TIME

SECTION A. RICE PRODUCTION

B.1.3 Rice production area under rain-fed

year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Area (ha)												

B.1.4 Rice production area under upland

year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Area (ha)												

B.1.2 Rice yield under irrigation, dry and wet seasons (tons)

year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Small<2 ha													
Large >2ha													
Total :													

B.1.3 Rice yield under rain-fed (tons)

year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Small <2ha:												
Large>2ha												

B.1.4 Rice yield under upland

year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Small<2ha												
Large>												

Tool 2: Checklist for National Level, Millers, Rice Processors, and Other Stakeholders

SECTION B: RESILIENCE

Source of Data:

Time of Data Collection:

Contact/s of data provider: **Name:** **Position:**

B.1.1. Number of active/functional irrigation schemes (small-, medium- and large-scale) for rice production and their locations

Small <2ha:

Large>2ha:

B.1.2 Rice production area under irrigation, dry and wet seasons

year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Dry season:													

Wet
season:

Total :

B.2 QUANTITY OF RESILIENT VARIETY SEEDS
Source of Data:
Time of Data Collection:
Contact/s of data provider: **Name:** **Position:**

B.2.1 Names of popular/consumer-preferred rice varieties (both local [in different ecosystems: upland, lowland, irrigated] and imported) (if possible, with ranks)	Upland: Lowland: Irrigated:
B.2.2 Number of active certified seed producers/companies	Company: Small-scale producers:
B.2.3 Quantity of certified seeds produced and sold/marketed/distributed**(tons/kgs)**	Produced: Marketed: Distributed:
B.2.4 Quantity of seeds of locally preferred varieties with resilient characteristics**(tons/kgs)**	Locally produced: Imported:
B.2.5 Quantity of seeds of locally preferred varieties with high-yielding characteristics**(tons/kgs)**	Locally produced: Imported:
B.2.8 Proportion of farmers using certified **seeds (Average for the nation)**	

SECTION C: INDUSTRIALIZATION

C.1. Number of functional rice mills (small [<2 t/hr], medium [2-5 t/hr], and large [>5 t/hr]) and their locations ***Indicate how many are in each category***	small [<2 t/hr: medium [2-5 t/hr: large [>5 t/hr]):	
C.2. Number of tractors, power-tillers, and combine harvesters (in rice production areas) **How many?**	1. Tractors: 2. Power tillers: 3. Combine harvesters:	
C.3. Number of agricultural machinery hiring/service centers (in rice-producing areas)	***Area name and quantity. g salima =2*** ***Area 1:***	***Number of hiring centers***

SECTION D: RICE MARKETING

D.1 Share of locally produced rice in the total quantity of rice procured by major retail stores for a year	Rice produced: Rice procured	Percentage/share:
D.2 Retail prices for milled rice for the different varieties/types (average monthly prices)	Average price:	

Thank You So Much for the Responses

CHECKLIST FOR VARIOUS DEPARTMENTS UNDER THE MINISTRY OF AGRICULTURE
DEPARTMENT OF AGRICULTURAL RESEARCH SERVICES (DARS)

SEED SERVICES UNIT

16--Number of active certified seed producers/companies and their seed production quantities in the past 4 years

17--Quantity of certified seeds produced and sold/marketed/distributed from 2010 to date

18--Quantity of seeds of locally preferred varieties with resilient characteristics, locally produced from 2010 to date

HUMAN RESOURCES UNIT

36--Research (qualification, total numbers by regions) latest.

32--Extension Services (qualifications, total numbers by regions)

QUALIFICATION	NUMBER OF POFESSIONALS
PhD	
Masters	
BSc	
Diploma	
Professional Certificate	
Other Tertiary Certificates	
MSCE	
JCE	
PSLC	

34--List of projects and private companies providing training, short- and long-term courses

Farmers Assessment

33--Number of training sessions organized for rice farmers-aspect wise (e.g. seed, water management, etc.)

35--Percentage of smallholders in pre-selected farmers' groups/associations regularly accessing necessary technical training and services (in rice-producing areas).

-Number of randomly selected rice farmers accessing extension services on rice production.

Appendix 9: Distribution of Qualifications across clusters of Technical Staff for Research

Designation of Agricultural Research Staff	Qualification	Freq.	%
Directors of Agricultural Research Services (incl. Deputies)	Doctoral Degree	6	60,0
	Master's Degree	4	40,0
	Total	10	100,0
Principal Agricultural Research Scientist	Doctoral Degree	8	50,0
	Master's Degree	6	37,5
	Bachelor's Degree	2	12,5
	Total	16	100,0
Chief Agricultural Research Scientist/Officer-CTO	Doctoral Degree	9	50,0
	Master's Degree	7	38,9
	Diploma	2	11,1
	Total	18	100,0
Chief Economist	Master's Degree	1	100,0
Agricultural Research Scientist/Officer (ARS/ARO)	Doctoral Degree	3	6,4
	Master's Degree	19	40,4
	Bachelor's Degree	15	31,9
	Diploma	10	21,3
	Total	47	100,0
Assistant Agricultural Research Officer (AARO/SAARO)	Master's Degree	9	4,9
	Bachelor's Degree	59	32,2
	Diploma	111	60,7
	Professional Certificate	3	1,6
	Secondary School Leaving Cert.	1	,5
	Total	183	100,0
Farm Manager/Assistant Farm Manager	Bachelor's Degree	2	28,6
	Diploma	3	42,9
	Secondary School Leaving Cert.	2	28,6

	Total	7	100,0
Tractor Operator/Driver	Secondary School Leaving Cert.	1	50,0
	Primary School Leaving Certificate	1	50,0
	Total	2	100,0
Senior Research Attendant	Secondary School Leaving Cert.	16	15,5
	Junior Certificate of Education (GCE)	44	42,7
	Primary School Leaving Certificate	43	41,7
	Total	103	100,0
Research Attendant	Bachelor's Degree	1	,3
	Diploma	6	1,7
	Professional Certificate	2	,6
	Secondary School Leaving Cert.	46	13,1
	Junior Certificate of Education (GCE)	136	38,9
	Primary School Leaving Certificate	159	45,4
	Total	350	100,0