Monitoring Baseline Study Report of the National Rice Development Strategy (NRDS) in Kenya

Plate 1: Rice Field in Mwea: Photo Credit, Wilson Oyange, May 2022

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LIST OF ABBREVIATIONS AND ACRONYMS

AGRA	-	Alliance for a Green Revolution in Africa
AMS	-	Agricultural Machinery Services
CABE	-	Centre for African Bio-Entrepreneurship/ CABE Africa Limited
CARD	-	Coalition for African Rice Development
CaDPERP	-	Capacity Development Project for Enhancement of Rice Production
CDA	-	County Director of Agriculture
FAO	-	Food and Agriculture Organization of the United Nations
FAOSTAT	-	Food and Agriculture Organization Statistics
FP	-	NRDS Focal Point person
HYV	-	High Yielding Variety
JICA	-	Japan International Cooperation Agency
KALRO	-	Kenya Agricultural and Livestock Research Organization
KEPHIS	-	Kenya Plant Health Inspectorate Service
KIIs	-	Key Informant Interviews
KNBS	-	Kenya National Bureau of Statistics
KRA	-	Kenya Revenue Authority
MIAD		Mwea Irrigation Agricultural Development Centre
M&E	-	Monitoring and Evaluation
Mha	-	Million hectare
MMT	-	Million Metric Tons
MoALFC	-	Ministry of Agriculture, Livestock, Fisheries and Cooperatives
MTIED	-	Ministry of Trade, Industry & Enterprise Development
MRM	-	Mwea Rice Mills
MRGM	-	Mwea Rice Growers Co-operative Society
NIA	-	National Irrigation Authority
NRDS	-	National Rice Development Strategy
R.I.C.E	-	Resilience, Industrialization, Competitiveness and Empowerment
RPP	-	Rice Portion Programme
SISO		Smallholder Irrigation Scheme Organization (SISO)
SSR	-	Self Sufficiency Rate
TF	-	NRDS Taskforce
ToR	-	Terms of Reference
WUA	-	Water Users Association

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EXECUTIVE SUMMARY

The Coalition for African Rice Development (CARD) undertakes to improve the rice production in the Sub-Saharan Africa to support food security initiatives by leading to improve interventions, both in quantity and quality by supporting the country level formulation and implementation of the National Rice Development Strategy (NRDS). The first phase of CARD's initiatives achieved its goal of doubling rice production by 2018. However, there is still a significant demand-supply gap amid increased demand for rice in the Sub-Saharan Africa. CARD's second phase targets doubling rice production to 56 million tons by 2030. CARD sought to evaluate the progress of the NRDS in Kenya through a Monitoring and Evaluation (M&E) baseline survey based on the approved RICE (Resilience, Industrialization, Competitiveness and Empowerment) approach with a focus on twelve indicators. The indicators include quantity of paddy production, total area harvested, yield per unit area, self-sufficiency rate, area under irrigation, quantity of resilient variety seeds, level of milling sector upgrading, level of mechanization in production, share of local rice in the market, quantity of high-yielding variety seeds, smallholder farmers' accessibility to financial services and Smallholder farmers' accessibility to technical training or services. The M&E baseline survey sought to collect necessary data for each of the twelve indicators, identified in the Kenya's NRDS M&E framework, to analyse the data and prepare a report to inform decision making.

This report presents the background of the M&E framework, the methodology adopted in collecting the data for each indicator, and presentation of the baseline survey findings for each indicator. The M&E survey was undertaken in two phases. The first phase entailed a desk review where the identified secondary data sources for each indicator were reviewed to gather secondary data and evidence to support measurement of each indicator. In cases where the secondary data was not sufficient, gaps were identified and filled by the primary data sources. This entailed collection and analysis of the primary data of the identified indicators to supplement the secondary data.

Primary data was collected from Kirinyaga, Kisumu and Naironi counties from 40 respondents in public institutions, farmer cooperatives and organisations, financial institutions, rice millers, and supermarkets, NRDS Task Force and CARD. The data collected from secondary sources were organized by indicator, source, and author, year of publication, geographical coverage, and method of data collection. A synthesis of data was made by integrating the various sources available to ascertain authenticity, reliability, representativeness, and completeness to be used for baseline. In addition to the visualized findings (e.g., through tables), qualitative analysis is presented in the form of narrations on findings and remarks or decisions on the base year, base values and the main source(s) of data on the respective CARD M&E Indicators are summarised in the following tables.

Summary of overall indicators

Table 1: Summary of baseline data on overall indicators

Indicator	Source of data	Baseline indicator	Base year	Method of data collection
Total Quantity of Paddy Production (tons)	NRDS 2	166,099	2018	Data reporting by MoALFC in NRDS 2
Total Area Harvested (Ha)	NRDS 2	50,751	2018	Data reporting by MoALFC in NRDS 2
Yield under irrigation (t/ha)	NRDS 2	4.2	2018	Data reporting by MoALFC in NRDS 2
Yield Rain-fed lowland(t/ha)	NRDS 2	2.1	2018	Data reporting by MoALFC in NRDS 2
Yield Rain-fed upland (t/ha)	NRDS 2	1.4	2018	Data reporting by MoALFC In NRDS 2
Self Sufficiency Rate (%)	NRDS 2	17	2018	Data reporting by MoALFC in NRDS 2 and Trade Map

Source: Consultant's compilation (2022)

The main sources of secondary data for monitoring the overall indicators will be MOALFC for production data and MTIED for data on imports and exports.

Summary of secondary data on RICE indicators

Table 2 summarizes secondary data and information on two RICE indicators: (i) area under Irrigation (ii) and ratio of total installed capacity to total functional capacity of mills.

Table 2: Summary of baseline data on R.I.C.E. indicators

Indicator	Source of data	Baseline indicator	Base Year	Method of data collection
Area under Irrigation (Ha)	MoALFC	40,120	2018	Secondary data reporting by MoAFC
The ratio of functional capacity of medium and large mills to the total installed (%) and ratio	CaDPERP	30 58.5:194	2018	-Adapt the methodology used by Njuguna and Oyange (2018)[1] Primary data required forup-to-date statistics

Source: Consultant's compilation (2022)

The study team sought primary data and information from Kirinyaga, Kisumu and Nairobi Counties to establish the respective base values and base years for each indicator.

Summary of data on RICE indicators in Kirinyaga County

Table 3 summarizes data on RICE indicators in Kirinyaga County. There was systematic secondary data on all the RICE indicators except data from a study on Analysis of Millers in Kenya's Rice Value Chain undertaken by Njuguna and Oyange (2018), and from project data collection on tractors and combine harvesters compiled by CaDPERP.

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[1] This involves secondary and primary data sources through structured questionnaires, key informants, and physical visits and updating the most recent data.

Table 3: Summary of data on RICE indicators in Kirinyaga County

Indicator	Source of data	Indicator Description	Baseline indicator	Base Year	Method of data collection
Area under Irrigation (Ha)	NIA-Mwea	NIA-Managed	12,146	2018	NIA annual reports augmented by KIIs
Quantity of Resilient Variety Seeds Locally Produced and adopted (tons)	NIA/MIAD	Basmati 370	458.4	2021	Data reporting by NIA /MIAD seed reports and MRGM
	NIA/MIAD	Basmati 217	58.4	2021	Data reporting by NIA /MIAD seed reports
	NIA/MIAD	IR 2793	25.5	2021	Data reporting by NIA /MIAD seed reports
	NIA/MIAD	ITA 310	6.0	2021	Data reporting by NIA /MIAD seed reports
	NIA/MIAD	Komboka	356	2021	Data reporting by NIA /MIAD seed reports and MRGM
	NIA/MIAD	Nerica 1	1.2	2021	Data reporting by NIA /MIAD seed reports
	NIA/MIAD	Nerica 4	0.7	2021	Data reporting by NIA /MIAD seed reports
	NIA/MIAD	Nerica 10	0.3	2021	Data reporting by NIA /MIAD seed reports
	NIA/MIAD	Nerica 11	0.5	2021	Data reporting by NIA /MIAD seed reports
	NIA/MIAD	BW 196	12.3	2021	Data reporting by NIA /MIAD seed reports
The ratio of functional capacity of mills to the total installed capacity to total (%)	CaDPERP	Mills	71 30.5:43	2018	Adapt the methodology used by Njuguna and Oyange (2018)[2]
Mechanization in production and harvesting	CaDPERP	Tractors	72	2022	Formalize data reporting by CaDPERP in 2021/22
	CadPERP	Combine	62	2022	Formalise data reporting by CaDPERP in 2021/22
SHFs farmers accessibility to financial services	MRGM	Number of farmers	2,741	2021	Data reporting by MRGM
	MRGM	Total loans per year (Kes Million)	55	2021	Data reporting by MRGM
SHFs accessibility to training and technical services	MIAD	Number of farmers	6,230	2021	Data reporting by MIAD

Source: Consultant's compilation (2022)

NIA/MIAD and MRGM were the key sources of primary data for most of the RICE indicators in Kirinyaga County. Thus, the study team recommends these sources as the main sources of data and information. On competitiveness indicator, rice millers provide free storage of paddy before and after milling, offer milling services at a cost and a space for Marketing milled rice which is a unique business practice in Kirinyaga County and Kenya. This study recommends that the share of local rice in the market from a miller-trader perspective be tracked and lessons drawn for millers in Kisumu County and elsewhere in the country.

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[2] This involves secondary and primary data sources through structured questionnaires, key informants, and physical visits and updating the most recent data.

Summary of baseline data on R.I.C.E. indicators in Kisumu County.

Table 4 summarizes data and information on RICE indicators in Kisumu County. Like Kirinyaga County, apart from a study on Analysis of Millers in Kenya's Rice Value Chain undertaken by Njuguna and Oyange (2018) and the internal project data collection on tractors and combine harvesters compiled by CaDPERP, there is no framework for systematic data collection in Kisumu to provide evidence for the in Kisumu County.

Table 4: Summary of baseline data on R.I.C.E. indicators in Kisumu County

Indicator	Source of data	Indicator Description	Baseline indicator	Base Year	Method of data collection
Area under Irrigation (Ha)	CDA-Kisumu	Total area	5.970	2018	Data collected and filled by the County Crops Officer
Quantity of Resilient Variety Seeds	NIA-Aheo	IR 2793-80-1	83.2	2021	Data reporting by NIA –Ahero Station
	NIA-Ahero	Basmati 370	0	2021	Data reporting by NIA –Ahero Station
	NIA-Ahero	ARIZE TEJ GOLD	0	2021	Data reporting by NIA –Ahero Station
	NIA-Ahero	AT-054	0	2021	Data reporting by NIA –Ahero Station
The ratio of total installed capacity to total functional capacity of mills (%)	CaDPERP	Mills	100 19.5:19.5	2018	Adapt the methodology used by Njuguna and Oyange (2018)[3]
Mechanization in production and harvesting	CaDPERP	Tractors	17	2021	Formalise data reporting by CaDPERP in 2021/22
	CadPREP	Combine	10	2021	Formalise data reporting by CaDPERP in 2021/22
Quantity of High Yielding Variety Seeds Preferred - Locally Produced	NIA-Ahero	IR 2793-80-1	73	2021	Data reporting by NIA –Ahero Station
	NIA-Ahero	AT054	3.5	2021	Data reporting by NIA –Ahero Station
	NIA-Ahero	Basmati 370	5	2021	Data reporting by NIA –Ahero Station
	NIA-Ahero	Arize Tej Gold	0.3	2021	Data reporting by NIA –Ahero Station
SHFs farmers accessibility to financial services	NIA-Ahero	Number of farmers	1,149	2022	Data reporting by NIA –Ahero Station
	NIA-Ahero	Total loans per year (Kes Million)	-	2022	Data reporting by NIA –Ahero Station
SHFs accessibility to training and technical services	NIA-Ahero	Number of farmers	3,390	2021	Data reporting by NIA –Ahero Station

Source: Consultant's compilation (2022)

NIA-Ahero and the County Directorate of Agriculture (CDA) were the key sources of primary data for most of the RICE indicators. There were two hybrid varieties Arize Tej Gold, was introduced in 2017, and AT054. Introduced in 2021. AT054 is the most preferred hybrid imported variety.

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[3] This involves secondary and primary data sources through structured questionnaires, key informants, and physical visits and updating the most recent data.

Summary of Share of Local Rice in the Market in Nairobi

Table 5 summarises the baseline values of the share of local rice in supermarkets in Nairobi City. Supermarkets (i.e., Quickmart, Naivas and Carrefour) carried 70 rice brands as of 17th May 2022. Imported and repackaged, and local brands account 54% and 36% respectively.

Table 5: Summary of baseline data on the share of local rice in the market in Nairobi

Indicator	Source of data	Indicator Description	Baseline indicator	Base Year	Method of data collection
Share of Local Rice in the Market in Nairobi (%)	Supermarkets	Local brands	40-45%	2022	Data collected from supermarkets in Nairobi
	Supermarkets	Imported and repackaged brands	48-52%	2022	Data collected from supermarkets in Nairobi

Source: Consultant's compilation (2022)

There is a need for NRDS TF to build on the links initiated the study with three supermarkets (viz. Naivas, Quick Mart and Carrefour) for data collection for this indicator from next year

Summary of single figure of the indicator base values

Table 6 summarises single figure of the indicator base values and notes. The study arrived at a single figure by (i) taking a direct figure, and (ii) computing the figure (see section 5.5.

Table 6: Indicators baseline values

	Indicator	Baseline figure	Base year	Notes on measurement unit
1	Quantity of paddy	166,099	2018	tons
2	Total Area Harvested	50,751	2018	ha
3	Yield	3.3	2018	t/ha
4	Self Sufficiency Ratio	17	2018	%
5	Area under Irrigation	40,120	2018	ha
6	Quantity of resilient variety	1001.5	2021	tons
7	Level of milling sector upgrading	36 58.5:164.5	2018	%
8	Level of mechanization in	115 72	2022	Number of tractors Number of combine
9	Share of local rice in the	36	2022	%
10	Quantity of preferred high-	695	2022	ton
11	Smallholder farmers	3890	2020	Number of farmers
12	Smallholder farmers	9620	2021	Number of farmers

Source: Consultant's compilation (2022)

1. INTRODUCTION

1.1 Background

The Coalition for African Rice Development (CARD) is a consultative group of bilateral and multilateral donors and African/international institutions formed by Alliance for a 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. CARD envisions improving the rice production in the Sub-Saharan Africa to support food security initiatives by leading to improve interventions, both in quantity and quality. While the initiative achieved its goal of doubling rice production by 2018, the demand-supply gap remained significant, due to continuing increase in demand for rice. The CARD entered its second phase in 2019, targeting to double rice production from 28 million tons in 2018 to 56 million tons in 2030.

JICA (Kenya) sought the services of CABE Africa Limited (CAL) to conduct an M&E baseline survey in Kenya to collect and analyse data to inform policy geared to doubling rice production based on twelve indicators. CAL worked in liaison with and under supervision of the NRDS Taskforce (TF) team, led by NRDS Focal Point person (FP), and JICA office. The project sought to:

i. Collect the necessary data for each indicator, identified in the Kenya's NRDS M&E framework, including the twelve common indicators,

ii. Analyse the collected data and compile a report to be submitted to Ministry of Agriculture, and

iii. Prepare a technical manual on data collection methods which was used for the data collected under i)

The main deliverables expected from the project include:

i. An inception report detailing the methodology to be applied in data collection and analysis, the potential risks and mitigation measures, and the resources required for successful delivery.

ii. The draft report following conclusion of the study to provide for the input and feedback from NRDS Taskforce (TF), NRDS Focal Point person (FP), and JICA office.

iii. A final report incorporating the feedback received in (2) with an executive summary suitable for a high-level presentation to stakeholders to inform policy and strategy implementation.

1.2 Purpose of this document

This is a final report by CABE Africa Limited (CAL), presenting the description of methodology adopted to collect and analyse data and the findings of the baseline results for each of the twelve indicators. The M&E baseline survey data submitted to Japan International Cooperation Agency (JICA Kenya Office) will inform the assessment of the progress and to support further implementation and progress of National Rice Development Strategy (NRDS) supported by the Coalition for African Rice Development (CARD). The report provides a baseline value of each indicator, describing the methodology adopted to collect data, data sources and findings.

1.3 Justification for developing CARD M&E Indicator Framework

One of the main activities of CARD at the country level is the provision of assistance in formulating and implementing National Rice Development Strategy (NRDS). Currently, CARD is supporting its original 23 member countries in revising their NDRS and the new 9 member countries in formulating their NRDS. NRDS is tailored to each member country, and it involves mapping out the pathways for developing the rice sector in the respective country. Kenya is in the progress of implementing the second NRDS phase (NRDS 2). In the second phase, CARD intends to focus more on implementation and monitoring and evaluation (M&E) of NRDS through the Resilience, Industrialization, Competitiveness and Empowerment (RICE) Approach to monitor the progress of NRDS implementation in the member countries. The M&E baseline survey undertaken by CAL, therefore, undertakes to inform CARD and the stakeholders on the progress of implementation of the NRDS in Kenya to guide decision making, strategy implementation and policy formulation on doubling rice production capacity.

1.4 Organisation of report

The report is organized in five sections. The first section presents the introduction, highlighting the background of the project, and CARD; the purpose of the M&E and the need for the report. The second section presents the overview of the M&E approach and the description of indicators. The section particularly presents the various data sources to be used, both primary and secondary. The third section describes methodology for data collection and how the collected data is managed and analysed. Section four presents data and findings of the desk review and primary data collection findings. The findings on each M&E indicator are presented in a tabular format. This is followed by a narration to provide meaningful data and information on the state of rice production for each indicator, remarks to support decision making on the base year, base values and the recommended sources of data for NRDS 2 M&E indicators. The last section presents the synthesis and recommendations for NRDS TF on the single figures for each of the 12 M&E baseline indicators, and methods of the future data collection. \

2. AN OVERVIEW OF M&E APPROACH AND INDICATORS

2.1. RICE Approach

CARD developed a R.I.C.E Approach of evaluation that seeks to measure the eight indicators under the facets of Resilience, Industrialization, Competitiveness and Empowerment in addition to the four overall indicators. These indicators are considered important indicators for the rice sector development in each member country under the CARD initiative. They enable tracking of the changes in the entire rice value chain in the process of NRDS implementation. The RICE framework also provides an understanding by CARD in approaching the set targets. This chapter presents the definition of the indicators adopted by CARD, base year and base year statistics, target year statistics, key secondary data source and the existing data gap (from secondary sources) to be filled by primary data for each indicator.

2.2 Description of Indicators

2.2.1 Overall Indicators

The overall indicators assess the total annual rice production level by examining the total paddy produced in terms of the area harvested and the yield. The indicators seek to evaluate the CARD's set rice production targets in the NRDS against the actual production levels.

Quantity of paddy production

The indicator measures the quantity of paddy produced locally. It is measured by the sum of paddy produced each year in different rice producing schemes across Kenya. Rice production is expected to grow from 128,000 MT of paddy production in 2018 to 846,000 MT by 2030. The main secondary data source for the quantity of paddy production in Kenya is the MoALFC. There are no primary data needs for this indicator.

Total area harvested

The indicator measures the total area harvested in Hectares on which rice is harvested. The total area harvested is the sum of rice-harvested area from all rice-growing schemes in Kenya. These include irrigated rice under NIA, rain-ed rice production and out-rice growers. Rice was harvested on 43,619 Ha in 2018 and is expected to increase to 174,000 Ha in 2030 (areas under irrigation from 32,988 to 132,000 Ha; rain-fed lowland from 6,400 to 35,000 Ha and rain-fed upland from 4,231 to 7,000 Ha). Secondary data will mainly be obtained from the data reported by MoALFC. There are no primary data needs for this indicator.

Yield per unit area

The indicator measures the average quantity of paddy grains harvested per hectare of land (measured in tons per hectare). It seeks to assess the changes in on-farm productivity of rice ecosystems across the country during the NRDS period. The yield is obtained by dividing the quantity of paddy produced by the area harvested. A yield of 4.0 t/Ha was achieved in 2018 for rice production under irrigation and is expected to increase to 7.5 t/Ha by 2030. The yield in rain-fed lowland is expected to increase from 2008's 2.0 to 3.5 t/Ha by 2030, while the yield in rain-fed upland is expected to increase from the 1.4 t/Ha reported

in 2018 to 2.5 t/Ha by 2030. The secondary data will be obtained from the MoALFC. There are no primary data needs for this indicator.

2.2.4 Self-sufficiency rate

The indicator measures the coverage rate of rice needs by local production. It seeks to evaluate the extent to which the domestic rice production is sufficient to meet domestic rice consumption needs. The total domestic production viz a vis total domestic demand of rice is influenced by Total Quantity Demanded Locally (in tons), Total Quantity of Rice Produced Locally (tons), Total Quantity of Rice Imported and Total Quantity of Rice Exported. The self-sufficiency rate is calculated by the following formula:

SSR = (Rice Production x 100 / (Rice Production + Rice Imports – Rice Exports)).

To compute the self-sufficiency rate, data for the different variables will be sourced from diverse sources. The data of rice production will be sought from the Ministry of Agriculture, Livestock, Fisheries and Cooperatives (MoALFC). The data of rice imports and exports will be sought from the Ministry of Trade, Industry and Enterprise Development (MTIED) reported on Trade Map portal, the Kenya Revenue Authority (KRA) data and supplemented by other sources such as KNBS. There exists lack of already computed rates for the indicators, hence the need to compute the value based on the available data. There are no further primary data collection needs. However, it is worth noting that there is a significant volume of rice trade transactions over the black markets, which do not pass through the formal trading channels, hence not captured in the existing data from the identified sources.

2.2.2 R.I.C.E. Indicators

2.2.2.1 Resilience

Area under irrigation
The indicator measures the area under rice cultivation with supplementary irrigation that could mitigate the negative impacts of weather fluctuations on rice production. It is measured as the area of rice field under irrigation, being the sum of rice fields with water control. According to the CARD framework, where double cropping is practiced under irrigation, areas for both seasons shall be counted. The key secondary data source will be National Irrigation Authority (NIA), and Rice Cooperatives. It is important to note that the data for this indicator was collected as a part of the overall indicator, i.e., "Area harvested" (Area Harvested (overall indicator) = area harvested under irrigation [this indicator] + area harvested under rain fed upland + area harvested under rain fed lowland). Apart from data from irrigation schemes, there was need to capture data from out-growers. Consequently, there was need for primary data collection from the areas with water control using small and micro scale irrigation, which may not be part of the available data and shall be sought from the NRDS focal point and taskforce members.

Quantity of resilient variety seeds

The indicator measures the quantity of seeds of locally preferred varieties with resilient characteristics, whether locally produced and/or imported annually. The indicator is meant to assess the preparedness of rice farmers on climate resilience and pest outbreaks through the evolution of the quantity of resilient varieties adopted from year to year. The quantity of resilient variety seeds available for farmers' purchase each year shall be estimated by the sum of such seeds locally produced and imported in a year. Since the adoption rate of improved seeds by farmers cannot be easily captured, availability of seed volumes is used instead. There might be a concern on the difference between availability and actual adoption, but it is usually minimised by the market forces. The evaluation team obtained information from Kenya Plant Inspectorate Services (KEPHIS), the seed certification unit and plant protection unit in charge of sanitary and phytosanitary measures, to identify the resilient variety seeds registered in Kenya. The quantity produced will be obtained from the production record of each seed variety registered by KEPHIS. As well, the quantity imported shall be obtained from the registration record of KEPHIS. Further data collection will be required in cases where KEPHIS does not provide information on issued license to produce rice seed for producers yearly -for seed production variety by variety.

2.2.3 Industrialization

2.2.3.1 Level of milling sector upgrading

The indicator aims at assessing the level of industrialization by following the level of upgrading the milling sector. It was measured by the ratio of installed capacity of medium and large-scale mills (2 tons/hour or larger) to the total installed capacity of all functional mills in the country. This indicator is selected based on the expectation that larger share of rice milled by medium to large-scale modern mills, rather than small-scale artisanal mills, and can be considered as a major drive for industrialization of the whole rice value chain. The evaluation took note of the installed capacity, capacity utilization, and a full list of milling machines (i.e., small, medium, and large) available in the country. There is a need to capture data on milling capacity and efficiency and by tracking the industrialization process to evaluate the level of milling sector upgrading from seed production to milling of processed grain. The need to capture information on efficiency is because not all installed machineries are optimally utilized in the production process. The data collection obtained the number of mills, their locations and capacity to sort and grade rice. Secondary data was supplemented by primary data obtained after visiting the milling facilities in Kisumu County and Kirinyaga County Irrigation Schemes for on-site data collection and conducting interviews with key respondents.

2.2.3.2 Level of mechanization in production

The indicator measures the number of machinery available at production stage in rice producing areas. The indicator assesses the level of industrialization through the improvement in the modernization of production systems. To measure it, we use the change in number of tractors and harvesters in representative rice producing areas.

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Machinery use in production is more than ploughing. It includes use of ox-drawn, machinery use for levelling, direct seeding, water pump irrigation, weeding, spraying, pump irrigation, direct seeding level, use of machinery in harvesting and threshing etc. The focus on mechanization in rice production is structurization at the county level. While the number of tractors is important in measuring the level of mechanization in production, as recommended by CARD, the level of machine use is also important. It is necessary to consider the overall reduction in manual labour in rice farms and rice processing due to the use of machines as an industrialization process. Key source of secondary data shall be the Rice Cooperatives in Mwea and Ahero Irrigation Schemes and review of published reports from individual studies. The data was complemented by surveys conducted by directorates in charge of agricultural mechanization and/or commercialization within the MoALFC and others available sources. Additional primary data was collected from identified target rice producers' group through key informant interview to gather information on mechanization at the production and harvesting stages.

2.2.4 Competitiveness

2.2.4.1 Share of local rice in the market

The indicator measures the share of locally produced rice in the total quantity of rice procured by major retail stores. The indicator aims at assessing the level of competitiveness of local rice compared to imported rice. It was measured by the share of local rice in the total quantity of rice purchased by the major retail stores in Kenya. The assumption is that most countries want to produce high quality rice and that supermarket store captures the best value of both the local and imported rice to consumers. Unlike the self-sufficiency rate which may decline by increase in demand relative to supply, this indicator measures how the locally produced rice competes with the imported rice in terms of quality, cost, adequacy, and branding. There was need for a market survey in selected major retail outlets in Kenya including Naivas, Quick Mart, Carrefour in Nairobi, and Kisumu as well as Khetia in Kisumu Counties to collect primary data about the indicator.

2.2.4.2 Quantity of high-yielding variety seeds

The indicator measures the quantity of seeds of locally preferred varieties with high-yielding attributes, locally produced and/or imported. Unlike the share of local rice in the market indicator, which measures the ratio of local rice and imported rice to roughly assess local rice's competitiveness and covers multiple aspects of consumer preference over rice such as taste, aroma, colour, price and so forth. On the other hand, the quantity of high yielding variety indicator is to measure production capacity to make local rice available in the market because if local rice is not available constantly then it cannot be competitive. CARD singled out seed among several elements of production capacity, because of the low level of adoption of improved seed being a major challenge that keeps the production level in sub-Sahara Africa low; hence, the need to understand the level of availability of seeds of high-yielding varieties (HYV). The indicator was measured by the quantity of HYV seeds available for farmers' purchase each year as approximated by the sum of such seeds locally produced

and imported. When HYV seeds by farmers cannot be easily captured, availability of seed volumes will be used instead. The main source of secondary data were the records of Seed certification unit, plant protection unit at KEPHIS. Further data was obtained from the MoALFC to identify varieties with high-yielding characteristics and other characteristics which attract local consumers. To complement KEPHIS data, there was a recent study conducted by KALRO in Kwale, Kilifi, Tana River and Taita Taveta. As well, there is another study conducted in Busia County, which is now under peer-review. The study indicates that farmers prefer a rice quality based on aroma, stickiness, and swelling. Additional Primary data was collected from other private companies dealing with rice seed and KIIs with contact persons within the county governments.

2.2.5 Empowerment

2.2.5.1 Smallholder farmers' accessibility to financial services
The indicator measures the ratio of smallholder farmers having access to financial services for land preparation, and acquisition of seed, fertiliser, agrochemicals, spraying service teams, harvesters, threshers, and other farm inputs. This indicator assesses the capacity of smallholder rice farmers investing in their farming operations, evaluated by the degree of their access to financial services that can support and upgrade their rice production system. This required listing the available financial services and the number (or percentage) of farmers accessing such services by source such as cooperatives, banks, micro-finance, SACCOs, other lenders. Secondary data of the smallholder farmers' access to financial services was primarily sourced from the rice cooperatives in Kenya especially with respect to Mwea and Ahero Irrigation Schemes. Other appropriate sources include individual studies and reports of financial institutions such as saccos, banks and other microfinance institutions providing finance and financial services to rice farmers. Primary data was collected from the rice cooperative and saccos and from Intermediaries of farmers and lenders such as Mwea Rice Growers Multipurpose Cooperative (MRGM) to supplement the secondary data.

2.2.5.2 Smallholder farmers' accessibility to technical training or services
The indicator measures the ratio of farmers accessing necessary technical training and extension services in rice production areas. Availability of irrigated fields and better inputs like seeds can help produce more paddies if they are guided by appropriate technological backstopping which is normally provided by the public extension system. This indicator captured not only the extension services by the public but also by private sectors. Secondary data was obtained mainly from Cooperative societies such as MRGM because it offers multiple services to farmers. In Kirinyaga County, MRGM and MIAD working under NIA were good sources of data. Other sources of data include KALRO, which conducts research and provides extension service; CDA is equally important source of information, which should be considered as key informants and other individual studies. Targeted primary data collection was done on selected rice cooperatives, and key informant interviews with the county agricultural extension officers.

3. METHODOLOGY

The M&E baseline survey adopted a mixed methodology, adopting both qualitative and quantitative techniques. Adopting the approach, the study collected both quantitative and qualitative data. The data was collected from diverse instruments, including both primary and secondary data sources. The mixed approach allowed for mixing research methods for comprehensive data collection, analysis, and interpretation to gather evidence for all indicators.

3.1 Secondary data collection

The study collected both secondary and primary data, using qualitative and quantitative methods for each indicator. Secondary data sources were obtained from online sources:

- Use of both Google and Bing search engines
- Search of key words online for the indicator
- Retrieving scholarly articles from Google scholar
- Seeking sources cited in reviewed publications for further information and data
- Visiting specific websites for publications downloads, including the MoALFC website, Trade Map and FAO.

The sources were subjected to inclusion exclusion criteria. First, the sources used were required to be within a time frame of five years from 2016 to date. Secondly, the source ought to have provided relevant informational findings and/or statistics about any of the intended indicators. Thirdly, it ought to have had a reliable publisher, including the MoALFC, FAO, reputable journal, or other recognized agricultural bodies such as KALRO and AGRA. Based on the third criteria, personal blogs were disregarded as reliable sources (see Table 7).

Table 7: Summary of key secondary data sources

Indicator	Source of data (Author, year of publication)	Method of data collection	Comments on adequacy of data
Quantity of paddy production	MoALFC (2020). NRDS 2	Survey in Kenya rice farming areas, including both irrigated and rainfed	Adequate to measure the indicator. The source covers data from both irrigation schemes and rainfed rice growing areas
Total area harvested	MoALFC (2020). NRDS 2	Survey in Kenya rice farming areas, including both irrigated and rainfed	Adequate to measure the indicator. The source covers data from both irrigation schemes and rainfed rice growing areas
Yield per unit area	MoALFC (2020). NRDS 2	Survey in Kenya rice farming areas, including both irrigated and rainfed	Adequate to measure the indicator. The source covers data from both irrigation schemes and rainfed rice growing areas
Self-sufficiency rate (SSR)	MoALFC (2020). NRDS 2	Survey in Kenya rice farming areas, including both irrigated and rainfed	Adequate to measure the indicator. The source covers data from both irrigation schemes and rainfed rice growing areas
	MTIED (2021). International Trade Data reported on Trade Map	Reports the volume and value of rice imported into Kenya and exported from Kenya on international trade done through formal transaction channels	Adequate source for the data of imports and exports

Area under irrigation	MoALFC (2020). NRDS 2	Survey in Kenya rice farming areas, including both irrigated and rain-fed	Adequate to measure the indicator. The source covers data from both NIA-managed irrigation and other irrigated schemes not under NIA
Quantity of resilient variety seeds	KEPHIS	Records the quantity of certified resilient variety seeds	No quantitative data reported. Needed primary data collection
	MRGM (2020). Public Case Report	Survey in Mwea Irrigation Scheme	The source is insufficient in reporting production data because it is limited to Mwea only. Need for actual primary data from MIIAD and NIA-Ahero
Level of milling sector upgrading	Samuel Njuguna Ndirangu & Wilson A. Oyange (2019). Analysis of millers in Kenya Rice Value Chain	Adopted mixed approach to collect data from Mwea, Thika, Garsen, Kisumu, Ahero, Sagana, Busia, Siaya, Kirinyaga, Lamu, Kwale, Kaloleni and Taveta	Adequate for baseline but it was a seasonal report --not published annually. Additional primary data to provide up-to-date statistics of milling capacity and millers in Kirinyaga and Kisumu Counties.
Level of mechanization in production and Harvesting	Wawire. et al., (2016). The Status of Agricultural Mechanization in Kenya	Adopted a mixed approach to collect data from a sample of rice growing areas in Bungoma (Rainfed rice) and Kirinyaga (Irrigated rice)	Adequate for baseline. However, the study is not published annually, and the reported data may have changed. Need for primary data and information.
Share of local rice in the market	No reliable secondary source		Data collected from primary sources involving millers and supermarkets
Quantity of high-yielding variety seeds	KEPHIS	Records the quantity of certified resilient variety seeds	No quantitative data reported. Needed physical visit to seek the data
	Danda et al., (2022). Farmers' Preference for Rice Traits: Insights from Farm Surveys in Busia County, Kenya	Collected primary data from 88 respondents in Busia County using a cross sectional survey.	The data focused in Busia, a low volume rice growing area, hence inadequate to represent the national outlook
	Kengo Danda, John Kimani, Lee Sang-Bok (2021). Farmers' Demonstrate Rationality and Transitivity in Variety Choice: Empirical Evidence from Two Rice Growing Niches in Coastal Kenya	Collected primary data from 166 respondents in Kwale and Taita Taveta using survey, structured questionnaires and KIIs.	The data focused in Kwale, a low volume rice growing area, hence inadequate to represent the national outlook Primary data collected from Kirinyaga and Kisumu counties in order to track track certified seed registered by KEPHIS for multiplication.
Smallholder farmers' accessibility to financial services	MRGM	Survey among farmers in Mwea	Inadequate source. It only provides status of access and no quantitative data.
	Paul Omanga (2016). IFDC / 2scale Western Kenya Rice Agribussiness Cluster Value Chain Development in Western Kenya	Survey among irrigation schemes in Kisumu	The source is inadequate because it covers the rate five years ago. Hence a need for primary data collection to bridge the gap.
Smallholder farmers' accessibility to technical training or services	MRGM	Survey among farmers in Mwea	Inadequate source. It only provides status of access and no quantitative data.
	Wawire. Et al (2016). The Status of Agricultural Mechanization in Kenya	Adopted a mixed approach to collect data from a sample of rice growing areas in Bungoma (Rainfed rice) and Kirinyaga (Irrigated rice)	Adequate for baseline. However, the study is not published annually, and the reported data may have changed. Need for primary data collection on for monitoring M&E.

Source: Compiled by Consultants (April 2022)

3.2 Primary data collection

Primary data was collected from 40 respondents, mainly through key informant interviews who are purposively selected based on their expertise, leadership position in the target institutions and experience in the subject matter. The interview tool (or topic guide) was used to guide the discussion through the indicators in a systematic manner and responses recorded as notes (Data collection tool attached in the annex). For each indicator, the respondent provided either published or soft copy reports to support the assertions for review and analysis to obtain indicator data. The consultants triangulated information from different sources by making physical visits, phone calls and writing emails to request data and information (See Table 8).

Table 8: Actors and individuals interviewed in Rice Value chain

Stakeholders	County Government			No. of key informant interviews conducted with	
Name of organisation	Nairobi	Kisumu	Kirinyaga	Groups	Individuals
County Directorate of Agriculture	0	3	1	0	4
National Irrigation Authority	0	2	1	2	3
Mwea Irrigation Agricultural Development	0	0	1	0	1
Kenya Agricultural and Livestock Research Organisation	0	0	1	0	1
Lake Basin Development Company	0	1	0	0	1
National Cereals and Produce Board	0	0	1	0	1
Mwea Rice Mills	0	0	1	0	1
Mwea Rice Growers Multipurpose Cooperative Society Limited	0	0	4	2	4
Water Users Association	0	0	1	0	1
Equity Bank	0	0	1	0	1
Lainisha Sacco	0	0	1	0	1
TAI Rice Millers Ltd – Kirinyaga	0	0	1	0	1
Digital Nice City -Supermarket and Miller	0	0	1	0	1
Golden Grain Rice Miller's Location Mwea	0	0	1	0	1
Tana Group Rice Millers	0	0	1	0	1
Quickmart	1	1	0	0	2
Naivas	1	0	0	0	1
Carrefour	1	0	0	0	1
NRDS Task Force	10	0	0	10	10
Coalition for Africa Rice Development	3	0	0	0	3
TOTAL	16	7	17	14	40

Source: Authors' compilation.

3.3 Data entry and analysis

The data collected from the different secondary sources were synthesized and key information entered into a table format that is organized by indicator, source, author, year

of publication, geographical coverage, and method of data collection. Data for each indicator from each source is collected and presented in a matrix as illustrated below.

A synthesis of data was made by interrogating the various sources available to ascertain its authenticity, reliability, representativeness, and completeness to be used for baseline. The analysis focused on the author of the indicator, year of publication, geographical coverage for representativeness and methodology used, so that it could be adapted in future. This was followed a by a narration of the findings in three parts i) a 'narration' to provide meaningful data and information on the status of rice production for each indicator, ii) identification of missing data or 'data gaps', and iii) remarks/decision on the next steps of data collection.

For qualitative data, the first step was transferring all the interview and observation notes and secondary data collection matrices to a word document and excel for conducting content analysis. Triangulation focused on critical analysis of the data findings from diverse sources to identify ways the findings from different sources relate to one another and highlight any gaps in the data. It focused to identify any trends and whether they are drawn from a single or from multiple data source(s). Triangulation was done to compare the various data sources and methods to identify key information, data, and trends for each indicator. It was also necessary to derive any inconsistencies in the collected data for corrective action, and/or convergence points for the data to establish credibility of the data collected. This contributed to having new, credible findings about the indicators and creates new ways of looking at it.

3.4 Presentation of findings

The baseline survey sought to gather and analyze data that informs CARD on decision making about NRDS implementation in Kenya, hence need for a precise and easy to understand findings. The quantitative findings are presented in tables, for each indicator both for secondary and primary sources. The summary of the indicator values is summarized and presented by infographics. In addition to the visualized findings, the qualitative analysis is presented in form of narrations in three folds. First, for each indicator findings presented in the table, narrations are presented to discuss the major findings and their implications to NRDS. Second, the narrations discuss the status (adequacy or inadequacy) of each data source, and third, gives a conclusion on the desired data source among the variety of data sources used.

3.5 Ethical behaviour and COVID Guidelines

The design program process for the primary data collection was done in a professional and ethical manner, with the avoidance of personal risk. Interviews were conducted after obtaining informed consent through verbal agreement and consent from the MoALFC to undertake the data collection. Anonymity was ensured in the datasets by removing names

(unless where necessary) and removing personal data from reports prior to data entry. Another consideration was the potential risks that the COVID-19 pandemic poses for researchers and for research disruption. However, the declining pandemic allowed face to face interactions with the respondents while following relevant domestic guidelines regarding social distancing, use of face masks among others. To stay in line with the Covid-19 guidelines, the research team utilized online platforms for meetings and non-critical research engagements among the team, taskforce and the key informants.

3.6 Limitations of the study

Undertaking the M&E baseline survey, being the first one, experienced several limitations, including:

i. There was insufficient literature to provide adequate secondary data for desk review. The collected evidence from the desk review did to provide sufficient evidence on all the 12 indicators, hence a need for additional primary data collection.
ii. Some secondary sources from which evidence was obtained were one-time status reports which are not reported annually to provide continuous evidence for measurement of the indicators. However, these reports provided useful insights for primary data collection and methods for future data collection.
iii. KEPHIS, one of the identified secondary data sources, did not have am online data repository or database from where data of high-yielding variety seeds could be obtained. To overcome the challenge, the study made physical visits to the relevant offices to collect primary data.

Primary data was collected mainly from two counties, Kisumu and Kirinyaga for a sample of irrigation schemes. These two counties account for about 80%[4] of the total rice produced in Kenya. Hence, data and information collected in these counties are representative of the rice growing areas in the country.

i. The nature of M&E Framework did not provide for data collection by survey from farmers. Accordingly, the study missed the actual insights from the rice farmers.
ii. The study also faced challenges in the collection of data on the share of local rice brans in the market from the relevant supermarkets. The selected major supermarkets were reluctant to provide data on the quantity of milled procured and sold. Thus, the study collected by observing the rice brands and prices per kg packets displayed on the shop shelves of the supermarkets.

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[4]http://kilimodata.developlocal.org/dataset/kenya-rice-production-by-counties/resource/2d0f66ab-c88d-48b2-95ad-199b76202ba5?inner_span=True

4. DATA AND FINDINGS

4.1 Introduction

The initial phase of data collection involved gathering evidence and indicators data from the secondary sources through desk review. The second phase entailed collection of supplementary data findings from primary sources in Kisumu, Kirinyaga and Nairobi. Findings from desk review are presented in a tabular form. A synthesis of the data is provided to determine the baseline value based on the authenticity, representativeness, and completeness. A narration, gap synthesis and remarks are made for the data presented from various sources. The secondary data sources were identified at the Inception of the assignment for each indicator and data gaps expected to be filled by the primary data source identified.

4.2 Desk Review (Secondary data collection)

4.2.1 OVERALL INDICATORS
Indicator 1.1 Quantity of paddy production (tons)

The indicator measured the total volume of paddy production in Kenya, from irrigation schemes, out grower farmers and rainfed rice production. Table 9 presents data from NRDS 2 and KNBS for the year between 2016 and 2020.

Table 9: Quantity of paddy production

Indicator	Source of data	Year of publication	Author	2016	2017	2018	2019	2020	Geographic coverage	Method of data collection
a) Under irrigation	NRDS 2[5]	2020	MoALF&C	-	-	146,887	201,281	280,524	Kenya	Survey in Kenya rice farming area
b) Rainfed lowland	NRDS 2	2020	MoALF&C	-	-	13,120	16,380	19,780		
c) Rainfed upland	NRDS 2	2020	MoALF&C	-	-	6,092	6,603	7,132		
Total Quantity of Paddy Production	NRDS 2	2020	MoALF&C	-	-	166,099	224,264	307,436		
Total Quantity of Paddy	Economic Survey[6]	2021	KNBS	92,088	73,662	102,154	145,680	164,101	Kenya[7]	Secondary data collected by NIA from

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[5] http://kilimo.go.ke/wp-content/uploads/2021/01/NRDS-2-2019-2020-14-July.pdf

Production										the irrigation schemes

Narration:

The MoALFC in NRDS 2 reported data of actual production from 2018 to 2020 and does not capture data for the period 2016 and 2017. At the same time, the NRDS 1 reported only projected data for 2016 and 2017, hence, there is no actual data from the source for the two years. The economic survey data reported by KNBS presents actual production data for the period 2016 to 2020 for the NIA-managed schemes. This only represents a proportion of the total production levels. Nonetheless, this gap is covered by data reported by MoALFC which reports on all rice growing areas (i.e., NIA managed and community-managed) and rainfed rice production areas.

Remarks/Decision

- The study recommends **2018** as the base year, and the total quantity of paddy production is **166,099 tons** as reported by MOALFC in NRDS 2.
- The main source of data for this indicator will be MOALFC. MoALFC collects and compiles indicator data through County governments' field officers. It also conducts validation visits to the counties to establish the reliability of the data.

Indicator 1.2 Total Area Harvested (Hectares)

The indicator measures the total area harvested in Kenya, from irrigation schemes, out grower farmers and rainfed rice production. Table 10 presents data from NRDS and KNBS for the year between 2016 and 2020.

Table10: Total Area Harvested (ha)

Indicator	Source of data	Year of publication	Author	2016	22017	2018	2019	2020	Geographic coverage	Method of data collection
a) Under irrigation	NRDS 2	2020	MoALF&C	-	-	40,120	51,795	68,438	Kenya	Survey in Kenya rice farming area
b) Rainfed lowland	NRDS 2	2020	MoALF&C	-	-	6,400	7,800	9,200		
c) Rainfed	NRDS 2	2020	MoALF&C	-	-	4,231	4,462	4,692		

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[6] https://www.knbs.or.ke/wp-content/uploads/2021/09/Economic-Survey-2021.pdf
[7] Data collected from Mwea, Ahero, West Kano, Bunyala, South West Kano, North Kano, Bura, Tana and Lower Kinja rice growing areas.

upland										
Total Quantity of Paddy Production	NRDS 2[8]	2020	MoALF&C	0	0	50,751	64,057	82,330		
Total Quantity of Paddy Production	Economic Survey	2021	KNBS	14,586	21,949	27,383	32,324	31,591	Kenya[9]	secondary data collected by NIA from the irrigation schemes

Narration

The MoALFC in NRDS 2 reported data of total area harvested from 2018 to 2020 but does not report data for the period 2016 and 2017. On the other hand, the Economic Survey (2021) reported data for the total area harvested under NIA-managed schemes for the period 2016 to 2020. The MOALFC covers this gap by reporting data on the total rice growing areas under both NIA-managed and community-managed schemes. The MoALFC's measurement of total area harvested comprises the first season crop irrigated area, rainfed lowland areas and rainfed upland areas.

Remarks/ Decision

- The study recommends **2018** as the base year, and the total area harvested is **50,751ha** as reported by MOALFC in NRDS 2.
- The main source of data for this indicator will be MOALFC.

Indicator 1.3 Yield per Unit Area

The indicator measures the yield per unit area, measured as the quantity of paddy produced per hectare, from irrigation schemes, out grower farmers and rainfed rice production. Table 11 presents data from NRDS and KNBS for the year between 2016 and 2020.

Table 11: Yield per Unit Area

Indicator	Source of	Year of	Author	2016	2017	2018	2019	2020	Geographic	Method of data

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[8] A slight discrepancy is observed in the data reported within the NRDS 2, with the reported highlights of area under rainfed totaling 10,631Ha while area under irrigation is 32,988Ha (Pg xi), providing total area harvested as 43,619Ha, different from the data reported on pg 27 of the same source.

[9] Data collected from Mwea, Ahero, West Kano, Bunyala, South West Kano, North Kano, Bura, Tana and Lower Kinja rice growing areas.

	data	publication							coverage	collection
a) Yield Under irrigation (t/ha)	NRDS 2	2020	MoALF&C	-	-	4.2	4.6	5.3	Kenya	Survey in Kenya rice farming area
b) Yield Rainfed lowland (t/ha)	NRDS 2	2020	MoALF&C	-	-	2.1	2.1	2.2		
c) Yield Rainfed upland (t/ha)	NRDS 2	2020	MoALF&C	-	-	1.4	1.5	1.6		

Narration

The MoALFC measured yield per unit area for the first season crop based on an assumption that the subsequent season(s) alongside ratoon crops are associated with lower yields.

Remarks/ Decision

- The study recommends **2018** as the base year, and the yield per unit area is for area under irrigation **(4.2)**, rainfed lowland **(2.1)** and rainfed upland **(1.4)** as reported by MOALFC in NRDS 2.
- The main source of data for this indicator will be MOALFC.

Indicator 1.4 Self Sufficiency Rate

The self-sufficiency rate is an indicator based on multiple variables including production quantity, value of imported rice and value of exported rice. It is a computed variable using data from diverse sources (Table 12).

Table 12: Self Sufficiency Rate

Indicator	Source of data	Year of publication	Author	2016	2017	2018	2019	2020	Geographic coverage	Method of data collection
Rice production	NRDS 2	2020	MoALF&C	-	-	166,099	2242,64	307,436	All rice growing schemes in Kenya	Survey in Kenya
Rice imports	FAOSTAT[10]	2022	FAO	-	-	528,348	544,766	528,100	By rice importers across Kenya	Data reported to FAO by the MoALFC

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[10] https://www.fao.org/faostat/en/#data/TI

Rice exports	FAOSTAT	2022	FAO	-	-	318	450	122	Exported from Kenyan schemes to foreign markets	Data reported to FAO by the MoALFC
Rice production	Public Case Report[11]	2020	MRGM	-	-	110000	-	-	Mwea Irrigation Scheme	Survey in Mwea
Rice imports				-	-	975000	-	-		
	Economic Survey	2021	KNBS	92,088	73,662	102,154	145,680	164,101	Data collected from[12]	Used the secondary data collected by NIA from the irrigation schemes
Rice imports	Kenya Rice International Trade[13]	2021	Trade Map	460841	567107	543720	551692	548,322	World exports and imports of rice from and into Kenya	Import and export data reported by MTIED
Rice exports				997	1173	5645	833	396		

Computed Self Sufficiency Rates

A self-sufficiency rate is not directly reported by all sources explored. Thus, the study team calculates the rate from the following data sources: production data reported by the MoALFC (2018 – 2020), production data by KNBS (2016 – 2017) and exports and import data reported by MTIED on Trade Map portal (2016 – 2020). Kenya's self-sufficiency rate in rice production is computed using the following formula: **SSR = (Rice Production x 100 / (Rice Production + Rice Imports – Rice Exports))** (see Table 13).

Table 13: Computed Self-Sufficiency Rates

Year	Source	2016	2017	2018	2019	2020
Production (MT)	MoALFC	92,088	73,662	166,099	224,264	307,436
Imports (MT)	MTIED	460,841	567,107	543,720	551,692	548,322
Exports (MT)	MTIED	997	1,173	5,645	833	396

[11] https://www.idhsustainabletrade.com/uploaded/2020/11/200828_MRGM-Case-Final-Public-Report.pdf

[12] Mwea, Ahero, West Kano, Bunyala, South West Kano, North Kano, Bura, Tana and Lower Kinja rice growing areas.

[13] https://www.trademap.org/Country_SelProductCountry_TS.aspx?nvpm=1%7c404%7c%7c%7c%7c1006%7c%7c%7c4%7c1%7c1%7c1%7c2%7c1%7c2%7c2%7c1%7c1

Apparent consumption	MTIED	551,932	639,595	704,173	775,123	855,361
Self Sufficiency Rate	**Computed**	**17%**	**12%**	**24%**	**29%**	**36%**
Import dependency rate	Computed	83%	88%	76%	71%	64%

Narration

The MoALFC reported data on production, while data on rice imports and exports is sourced from Trade Map as reported by MTIED, an online portal of volume of products exchanged in the international trade[14]. Owing to the different sources of variables for computing SSR, a disparity may exist in absence of a single computed SSR.

Remarks/ Decision

- The study recommends **2018** as the base year, and the self-sufficiency rate is **17%,** as computed in table 13.
- The main source of data for this indicator will be MOALFC for production data and MTIED for data on imports and exports.

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[14] https://www.trademap.org/Country_SelProductCountry_TS.aspx?nvpm=1%7c404%7c%7c%7c%7c1006%7c%7c%7c4%7c1%7c1%7c1%7c2%7c1%7c2%7c2%7c1%7c1

4.2.2 RICE INDICATORS

4.2.2.1 RESILIENCE
Indicator 4.2.2.1.1 Area Under Irrigation (Hectares)

Table 14: Area Under Irrigation

Source of data	Year of publication	Author	2016	2017	2018	2019	2020	Geographic coverage	Method of data collection
NRDS 2	2020	MoALF&C	-	-	40,120	51,795	68,438	Kenya	Survey in Kenya
Economic Survey	2021	KNBS	14,586	21,949	27,383	32,324	31,591	Data collected from[15]	Used the secondary data collected by NIA from the irrigation schemes

Narration

The data reported by NIA (published by KNBS) is based on the rice produced under irrigation schemes managed by NIA as reported by KNBS (2021). The MoALFC reports data on both the NIA-managed and community managed irrigated area. However, data reported from both sources may not cover expanded area under both NIA-managed and community-managed irrigation schemes in the country,

Remarks/ Decision

- The study recommends **2018** as the base year, and the area under irrigation is **40,120,** as reported by MOALFC in NRDS 2 (Table 14).
- Additional primary data was required on expanded area and unreported under both NIA-managed and community-managed irrigation schemes mainly in Kirinyaga and Kisumu Counties which are unique and account for about 80% of the total rice production in the country.
- The main source of data for this indicator at the national level will be MOALFC.

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[15] Mwea, Ahero, West Kano, Bunyala, South West Kano, North Kano, Bura, Tana and Lower Kinja rice growing areas.

Indicator 4.2.2.1.2 Quantity of Resilient Variety Seeds (tons)

Table 15: Quantity of Resilient Variety Seeds

Source of data	Year of publication	Author	Geographic coverage	Method of data collection
Public Case Report	2020	Mwea Rice Growers Multipurpose	Mwea Irrigation Scheme	Survey of rice farmers in Mwea

Narration

The MoALFC reported 26 varieties of certified resilient variety seeds available in Kenya (Details in appendix 5). The public case report for Mwea (2020) (Table 15) presents evidence that there are available resilient seeds supplied to the farmers through the Seed Multipliers within the MRG, who provide certified seeds for rice production in Mwea irrigation Scheme. KEPHIS is the authorised body to provide data of all resilient certified rice seeds. However, there is no secondary data available published by KEPHIS.

Remarks/ Decision

The study team sought primary data and information from Mwea Irrigation Agricultural Development Centre (MIAD) and NIA-Ahero Research Station on the resilient seed varieties registered in Kenya locally produced and imported.

4.2.2.2 INDUSTRIALIZATION

Indicator 4.2.2.1 Level of Milling Sector Upgrading

The indicator aims at assessing the level of industrialization by following the level of upgrading the milling sector. It is measured by the ratio of installed capacity of medium- and large-scale mills (2 tons/hour or larger) to the total installed capacity of all functional mills in the country. Table 16 presents a summary of large and medium mills from the indicated sources.

Table 16: Level of Milling Sector Upgrading

Source of data	Year of publication	Author		2018	Geographic coverage	Method of data collection
Analysis of Millers in Kenya's Rice Value Chain	2019	Samuel Njuguna Ndirangu & Wilson A. Oyange[16]	Number of large and medium mills[17]	25	Mwea, Thika, Garsen, Kisumu, Ahero, Sagana, Busia, Siaya, Kirinyaga, Lamu, Kwale, Kaloleni and Taveta	Utilised both secondary and primary data sources through structured questionnaires, key informants, and physical visits, updating the most recent data as at October 2010
			Total Milling capacity for large and medium mills (t/hr)	58.5		
			Total functional capacity (t/hr)	194		
			Number of single pass mills	256		

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[16] https://www.researchgate.net/publication/336142075_Analysis_of_Millers_in_Kenya's_Rice_Value_Chain
[17] Medium and large mills as used by Ndirangu and Oyango have at least 1.5t/hr

Narration:

A study undertaken by Ndirangu & Oyange (2019) provides information on large, medium, and single pass mills located throughout Kenya. The study shows that the number of medium and large mills is 25 out of the 281 total mills (25 + 256), and had total milling capacity of 66 tons per hour in 2018 (see Annex 6). However, limiting the definition of medium and large mills as described in chapter 1 to have a capacity of at least 2.0t/h, there are 18 medium and large mills, with a total capacity of 58.5t/hr. The total installed capacity

Plate 2: A modern Rice Mill in Kirinyaga County

for all mills is 194t/hr. The study was conducted once in 2018 and published in 2019. There is a possibility that additional machinery and mills (plate 2) were acquired and installed, or others disposed in subsequent two years to 2020.

Remarks/ Data

- The study recommends **2018** as the base year for this indicator, and the ratio of total milling capacity of medium and large mills is 58.5 **tons per hour** to the total installed capacity of 194 tons**/ hour** (58.5:194) in the country. This provides the level of milling sector upgrading to 30%.
- Additional primary data was required to provide up-to-date statistics of milling capacity and millers in Kirinyaga and Kisumu Counties.
- Adapt the methodology used by the study undertaken by Ndirangu & Oyange (2019) for future systematic data collection on the indicator.

Indicator 4.2.2.2 Level of mechanization in production and harvesting

The indicator measures the number of machinery available at production and harvesting stages in rice producing areas. The indicator assesses the level of industrialization through improvement in the modernization of production systems. The measurement uses the change in number of tractors and harvesters in representative rice producing areas.

Table 17: Level of mechanization in production and harvesting

Source of data	Year of publication	Author		Data	Geographic coverage	Method of data collection
Agribusiness Indicators in Kenya[18]	2013	The World Bank	Number of tractors and machinery	14,400	Sub-Saharan Africa	Survey
The Status of Agricultural Mechanization in Kenya[19]	2016	Noah W. Wawire., Charles Bett., Reuben C. Ruttoh., John Wambua., Fatuma G. Omari., Rachael Kisilu., Justus Kavoi., Josphat Omari., Nasirembe W. Wanyonyi and Patrick Ketiem For KALRO	Level of mechanization in irrigated rice	47%	Sample included rice farmers in Bungoma (Rainfed rice) and Kirinyaga (Irrigated rice)	secondary sources, Key informant interviews and use of the semi-structured questionnaires.
			Level of mechanization in rainfed rice	13%		

Narration

The Agribusiness Indicators in Kenya study conducted by the World Bank in 2013 shows that there were 14,400 tractors in Kenya. However, this study does not specify tractors used in rice production. Another Report on The Status of Agricultural Mechanization in Kenya Conducted in Kenya in 2016 (Annex 5) provides information on the level of mechanization in the rice value chains. This report focuses on the disaggregation of mechanization based on farm activities by farm scale and by irrigation and rain-fed rice production; and does not provide the number and type of tractors available for rice production. The available sources are more of status reports and samples do not represent national outlook. Moreover, while the World Bank report details the number of available tractors and farming machinery, the report is out of date and may not present the current true state of affairs See Table 17).

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[18] World Bank. (2013). Agribusiness Indicators: Kenya.
[19] https://www.kalro.org/sites/default/files/kafaci_report.pdf

Remarks/ Decision

There is need for a systematic way of data collection on level of mechanization in rice production and harvesting. Thus, the study team sought primary data and information from Kirinyaga and Kisumu Counties.

4.2.2.3 COMPETITIVENESS

Indicator 4.2.2.3.1 Share of local rice in the market

The indicator measures the share of locally produced rice in the total quantity of rice procured by major retail stores. The indicator aims at assessing the level of competitiveness of local rice compared to imported rice. It measures the share of local rice in the total quantity of rice purchased by the major retail stores in Kenya.

Narration

The study team sought to establish data in published market survey reports conducted in urban supermarkets including Naivas, Quick Mart and Carrefour and supported by the data held by NRDS focal points and taskforce members. However, there was no published reliable data from a verifiable source on the indicator.

Remarks/ Decision

There was need for primary data collection from the selected major retail outlets in Kenya including Naivas, Quick Mart, Carrefour in Nairobi, Kirinyaga and Kisumu Counties. As well, it was important to visit milling companies that market local rice in Kirinyaga Counties because this provides a unique perspective.

Indicator 4.2.2.3.2 Quantity of high-yielding variety seeds

The indicator measures the quantity of seeds of locally preferred varieties with high-yielding attributes, locally produced and/or imported. Review of secondary data yielded a list of certified high yielding variety seeds (Annex 5) as reported by MoALFC from KEPHIS. But the variety list does not provide information on locally produced or imported seed variety.

Table 18: Quantity of high-yielding variety seeds

Source of data	Year of publication	Author	Varieties grown	Data	Geographic coverage	Method of data collection
Farmers' Preference for Rice Traits: Insights from Farm Surveys in Busia County, Kenya	2022	Kengo Danda, John Kimani, Kyung-Ho Kang[20]	Pakistan Bedinego Vietnam Kaiso Supa China Winter-Nile Upland variety	48.4% 21.0% 11.3% 9.7% 6.5% 6.5% 4.8%	Busia County, Kenya	Adopted a cross sectional survey using multi-stage sampling for site selection and purposive sampling for growers. Collected primary data from 26 key informants and 62 individual respondents using FGD guided by structured questionnaire
Farmers' Demonstrate Rationality and Transitivity in Variety Choice: Empirical Evidence from Two Rice Growing Niches in Coastal Kenya	2021	Kengo Danda, John Kimani, Lee Sang-Bok[21]	Pachanga Supa Kibawa-cha-inzi Kitumbo Makonde Pishori Mtumbatu Kioo Macho-macho Moshi Others**	44.8% 25.4% 22.4% 20.9% 17.9% 14.9% 13.4% 11.9% 10.4% 10.4% 9.0%	Kwale and Taita-Taveta counties of coastal lowland Kenya	The survey used multi-stage sampling for site selection and systematic sampling for growers. Collected primary data from 137 individuals and 29 AESPs using semi-structured questionnaires and KIIs.

Narration

The study by Danda et al., (2022) found that a majority of the farmers in Busia County (48.4%) prefer growing Pakistan rice and Bedinego rice varieties (21%). The choice of the seed variety is 80.67% influenced by the need for high yielding, 77.4% by need for early maturity, 40.3% by need for high grain recovery at milling, 14.5% need cooks well (nonsticky grain), 12.8% are driven by rice taste, 8.1% by high tillering ability, 8.1% by aroma, 4.8% by ease of threshing while the rest were influenced by other factors (drought tolerance, weed competition). The information on the quantity of locally produced and/or imported rice seeds of preferred varieties with high-yielding attributes in missing (See Table 18).

Remarks/ Decision There was need for primary data on the quantities of preferred high yielding varieties, produced in Kirinyaga and Kisumu Counties.

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[20] Danda, K., Kimani, J., & Kang, K.-H. (2022). Farmers' Preference for Rice Traits: Insights from farm surveys in Busia County, Kenya. International Journal of Agriculture, 7(1), 1-12.

[21] https://www.iprjb.org/journals/index.php/IJA/article/view/1464

4.2.2.4 EMPOWERMENT

Indicator 4.2.2.4.1 Smallholder farmers' accessibility to financial services
The indicator measures the ratio of smallholder farmers having access to financial services for land preparation, seed, fertiliser, agrochemicals, spraying service teams, harvesters, threshers, and other farm inputs. This indicator assesses the degree of farmers' access to financial services to support and upgrade their rice production system. Table 19 provides a summary of findings from various sources.

Table 19: Smallholder farmers' accessibility to financial services

Source of data	Year of publication	Author	Findings	Geographic coverage	Method of data collection
Public Case Report	2020	Mwea Rice Growers Multipurpose	Farmers access financing through organised farmer groups to acquire inputs	Mwea Irrigation Scheme	Survey study in Mwea
Agribusiness Indicators in Kenya	2013	The World Bank	There is less lending to farmers by banks, with high interest rates on such loans	Sub-Saharan Africa	Survey
IFDC / 2SCALE WESTERN KENYA RICE AGRIBUSSINESS CLUSTER VALUE CHAIN DEVELOPMENT IN WESTERN KENYA[22]	2016	Paul Omanga	Low uptake (6%) outside the NIB organised credit and large percentage (90%) accessing credit through NIB	Kisumu County	Survey in irrigation schemes in Kisumu

Narration
The public Case Report (2020) in Mwea reported that Lainisha Sacco provides farmers in Mwea access to finances and provide welfare loans and advances to farmers for purchasing inputs. The financial aid is offered in convenience with repayment for such advances being deducted from the provisional value of the paddy rice delivered by the farmer to MRGM. The findings by World Bank (2013) present evidence of low uptake of loans among farmers from the commercial banks in Kenya. According to the findings,

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[22] Omanga, P. (2016). IFDC/ 2SCALE Western Kenya Rice Agribusiness Cluster Value Chain Development in Western Kenya. Status Report, ICRA, BoP Innovative Centre & IFDC.

only 5.7% of the loans were held by farmers from Kenya's banks, less of the government's recommended 17–20% of the loan portfolio. The share of farmers' loans in KCB's portfolio was 6%. Notably, very high interest is charged on the agricultural loan's consequent to high risk of default. Interest on commercial loans by banks to farmers range between 20–25%, higher than the industry's 14% average.

A study undertaken by Omanga (2016) indicates that there are several financial institutions in Kisumu County (Banks and Microfinance Institutions (MFIs)) that are ready to give credit but farmers in the county are aversive to credit. The study also reports low uptake of credit with (6%) of farmers outside the NIB irrigation schemes reported having taken loans in one form or the other. The report further indicates a large percent (90%) of farmers benefitting from a revolving fund credit from the FAO funded project and the Government Economic Stimulus Program (ESP) that were implemented in 2009 to 2013. This report however does not report the number of rice farmers accessing credit for disaggregated farm activities. However, these findings date back to over four years ago from selected rice growing area of Kirinyaga and Kisumu Counties, and also do not provide disaggregated information on the number farmers accessing credit by source and purpose.

Remarks
The available secondary data on the indicator is not conclusive, hence a need for primary data collection to bridge the gap.

Indicator 4.2.2.4.2 Smallholder farmer's accessibility to technical training or services

The indicator measures the ratio of farmers accessing necessary technical training and extension services in rice production areas. This indicator seeks to capture the extension services by the public and private sectors (Table 20).

Table 20: Smallholder farmer's accessibility to technical training or services

Source of data	Year of publication	Author	Findings	Geographic coverage	Method of data collection
Public Case Report	2020	Mwea Rice Growers Multipurpose	Stakeholders within Mwea provide technical and extension services to farmers	Mwea Irrigation Schemes	Survey in Mwea

The Status of Agricultural Mechanization in Kenya	2016	Noah W. Wawire., et. al. For KALRO	The government offers technical services through the Agricultural Technology Development Centres under the MoALFC	Sample included rice farmers in Bungoma (Rainfed rice) and Kirinyaga (Irrigated rice)	Secondary sources, Key informant interviews and use of the semi-structured questionnaires.
			Farmers have access to Agricultural machinery services (AMS) devolved to counties		
			The government seeks donor funded projects for rice irrigation schemes managed by NIA to empower farmers		

Narration

The public Case Report   (2020) found that farmers within Mwea Scheme have access to technical training and extension services provided by the other stakeholders including fertilizer and crop protection suppliers, Lainisha SACCO representatives and local health workers are involved in farmer training. They train farmers on GAP, financial management and basic health, respectively. The findings of Wawire et al. (2016) present evidence that the government offers Agricultural Engineering services to the farmers through the division within the Ministry of Agricultural, Livestock and Fisheries providing mechanization, land and environmental services. Farmers have access to the twenty-three agricultural machinery services (AMS) available across the country, which have been devolved to the County governments. The AMS provide hire tractor machinery services for the farmers. These centres generate revenue for the ministry of agriculture (county governments), regulate cost of hiring tractor and provide service to farmers. However, they are insufficient. The reported data date back to four years for Wawire et al. report and two years for MRGM report.

Remarks/ Decision

There was a need for primary data collection on smallholder farmer's accessibility to technical training or services in Kirinyaga and Kisumu counties

4.3 Primary Data Collection

4.3.1 Kirinyaga County

CABE Africa Limited (CAL) made a field visit to Kirinyaga County between 9th May 2022 and 13th May 2022. The purpose of the visit was to collect primary information and data to augment secondary sources; and to establish methods of collecting data systematically for NRDS with specific focus on Kirinyaga County where the rice value chain is unique from Kisumu County. CAL also established contacts and rapport with key stakeholders for future data collection.

The institutions visited included County Director of Agriculture - Kirinyaga County, KALRO – Mwea Station, National Irrigation Authority – Mwea, Mwea Irrigation Agricultural Development (MIAD), Mwea Rice Growers Multipurpose Cooperative Society (MRGM), Lainisha Sacco, Mwea Rice Mills, National Cereals and Produce Board (NCPB) - Sagana, Nice Millers, TAI Rice Millers Ltd, Golden Grain Rice Millers, Tana Group Rice Millers, Digital Nice City Supermarket and East Matt Supermarket. The following section presents data and information for Kirinyaga County organized by RICE (i.e. Resilience, Industrialization, Competitiveness and Empowerment) indicators.

4.3.1.1 RICE INDICATORS

Resilience
Area under Irrigation (Hectares)

Table 21: Area under Irrigation

Source of data	Area under irrigation (Hectares)[23]					Method of data collection
	YR 2016	YR 2017	YR 2018	YR 2019	YR 2020	
NIA – Mwea Station	12,146	12,146	12,146	12,146	12,146	Key Informant Interviews

Source: Compiled by consultant from data provided by NIA-Mwea Station
Note: NIA uses the following conversion ratio 1 hectare = 2.47 acres

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[23] Area under irrigation reported in acres but calculated in hectares

Narration:

The total original NIA-Managed Schemes gazetted area under irrigation was 30,050 acres (12,166ha). The current irrigated area under rice production is 30,000 acres (12,146ha). This entails 20,000 acres (8,097ha) originally gazetted and 10,000 acres (4,049ha) new additional area. The total area under irrigated rice production has same infrastructure and management in collaboration with Water Users Association (WUA).

Remarks/ Decision:

- The baseline data of **12,146ha (2018)** reported by NIA is a recommended measure for this indicator (see Table 21).
- Sources of data and information will be NIA annual reports augmented by key informant interviews.

Quantity of Resilient Variety Seeds (tons)

Quantity of Resilient Variety Seeds Locally Produced (tons)

Table 22: Quantity of Resilient Variety Seeds Locally Produced

Variety of Seed	Quantity of Resilient Variety of Seed (tons)										Source of Data
	2017		2018		YR 2019		YR 2020		YR 2021		
	Quantity Produced	Quantity Adopted	Quantity Produced	Quantity Adopted	Quantity Produced	Quantity Adopted	Quantity Produced	Quantity Adopted	Quantity Produced	Quantity Adopted	
Komboka (IR05N221)	-	-	-	-	-	-	10	2	272	160	KALRO
	-	-	-	-	-	-	-	-	84	84	MRGM
NERICA 1	-	-	-	-	-	-	-	-	1.2	-	KALRO
NERICA 4	-	-	-	-	-	-	-	-	0.7	-	KALRO
NERICA 10					-	-	-	-	0.3	-	KALRO
NERICA 11					-	-	-	-	0.5	-	KALRO
BW 196	-	-	-	-	20	20	-	-	-	-	MRGM
	13.7	7.5	12.3	6.3	12.2	8.7	10.0	8.4	12.3	11.5	NIA/MIAD
Basmati 370	-	-	-	-	210	210	210	210	210	210	MRGM
	24.7	24.3	269	243	258.3	234.4	249.4	208.7	248.4	247.4	NIA/MIAD
Basmati 217	-	-	-	-	30.0	30.0	34.0	34.0	34.0	34.0	MRGM
	19.8	12.0	23.3	21.0	23.0	19.4	25.3	20.3	24.4	23.0	NIA/MIAD
IR 2793	24.5	12.5	25.7	20.4	24.2	22.3	24.8	22.9	25.5	23.3	NIA/MIAD
ITA 310	7.5	4.5	7.6	6.4	7.0	6.2	7.0	6.3	6.0	5.1	NIA/MIAD

Source: Compiled by consultant (May 2022)

Narration:
KALRO is the developer of Early Generation Seed (EGS), NIA/MIAD is the main producer/multiplier of certified seed while MRGM is a small producer/multiplier and merchant of certified seed. All the seed varieties in Mwea Irrigation Scheme are produced under irrigation. Basmati 370 accounts for the largest amount of rice seed produced- with a less amount of Basmati 217 because it is being replaced by the former. It is important to note that Komboka variety which is recently introduced (2020) is gaining momentum.

There is high uptake of Basmati 370 because it is aromatic, has good taste and cookability qualities that are valued by farmers. This is followed by the Komboka variety because of its high yielding, semi-aromatic and separable. The variety makes is easily blended with Basmati varieties. The NERICA varieties were introduced in 2021 but are yet to be adopted.

Remarks/ Decision:
- NIA/MIAD is the main producer/multiplier of locally-produced certified seed.
- The baseline data for quantity produced (tons) and quantity adopted (tons) in **2019** for; Basmati 370 (258.3 and 234.4), Basmati 217 (30.0 and19.4), IR 2793 (24.2 and 22.3), ITA 310 (7.0 and 6.2). **2019** is recommended as a base year because of completeness of data.
- The main source of data and information will be NIA/MIAD seed reports (see Table 22).

Quantity of Resilient Variety Seeds Imported (tons)
There was no information on imported variety of seeds in Kirinyaga County

Industrialization
Level of Milling Sector Upgrading
The section below presents data and information on millers in Kirinyaga County organized by name/type of milling machine, year of installation, the status, capacity installed and capacity utilization between 2018 and 2021. The secondary data and information were drawn from a study on Analysis of Millers in Kenya's Rice Value Chain undertaken by Njuguna and Oyange (2018)[24]. This was augmented by primary data collection from physical visits to six millers in Kirinyaga County including Mwea Rice Mills (MRM), Mwea Rice Growers Multi-purpose, Tai Rice Millers Limited, Nice Millers, Tana Group Rice Millers and Golden Grain Rice Millers.

Table 23: Mills in Kirinyaga County by Capacity

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[24] Ndirangu, S. N., & Oyange, W. (2019). Analysis of Millers in Kenya's Rice Value Chain. *IOSR Journal of Agriculture and Veterinary Science, 12*(1), 38-47. doi:10.9790/2380-1201033847

Name of Miller	Name/ type of Milling Machine	Year Installed	No. of Mills	Status	Installed Capacity (tons/ hour)	Capacity Utilization (tons/hour) and %							
						2018		2019		2020		2021	
						(tons/hr)	(%)	(tons/hr)	(%)	(tons/hr)	(%)	(tons/hr)	(%)
MRM	German	1968	3	Non- Functional	3 lines 2.5 each (7.5 combined)	5	22%	0	0	0	0	0	0
MRM2	Indian	1972	2	Non- Functional	5 ton/hr each (10 combined)			0	0	0	0	0	0
MRM3	China Towin	2014	2	Functional	2.5 each, 5.0 combined			-	-	5	100%	5	100%
MRGM1	Chinese Model	2005	1	Non-Functional	1.5tons/hr	2.5	62.5%	0	0	0	0	0	0
MRGM2	Chinese Model	2012	1	Functional	2.5 ton/hr			2.5	100%	2.5	100%	2.5	100%
Nice	Human Towin	1 -2012 2- 2019	3	2 Functional (1 non-functional)	1-(2.5 tons/hr) 2-(2.5. each 5.0 combined)	2.5	100%	4.0	80%	4.0	80%	4.0	80%
Euros	Not Specified	2010	1	Functional	2.5	2.5	100%	-	-	-	-	-	-
Top Grade	Not Specified	2016	1	Functional	2.5	2.5	100%	-	-	-	-	-	-
Boma	Not Specified	2015	1	Functional	2. 5	2.5	100%	-	-	-	-	-	-
TAI	Human Towin	2016	1	Functional	2.5	2.5	100%	1.5	60%	1.0	40%	1.5	60%
Golden	Not specified	Unspecified	1	Functional	3.0	2.5	83%	2.8	93%	3.0	100	1.8	60%
Global	Not Specified	2011	1	Functional	2.5	2.5	100%	-	-	-	-	-	-
Bephero	Not specified	2011	1	Functional	1.0	1	100%	-	-	-	-	-	-
Tana	Human Towin	2016	1	Functional	5.0	-	-	-	-	-	-	4.0	80%
Dozer	Not specified	2018	1	Functional	1.0	1.0	100%	-	-	-	-	-	-

Source: Compiled by consultant (May, 2022)

Narration:

The total number of rice mills installed in Kirinyaga County since 1968 is 21, with an installed capacity of 43 tons/hr. Out of these mills, 14 are functional and operated at a functional capacity 30.5 tons/hr as at 2018. Since 2010 the functional mills are increasingly having an installed capacity of at least 2.5tons/hr.

The utilisation capacity between 2010 and 2018 was 100% but thereafter there was a gradual decline. The actors affecting utilization include availability of paddy for milling given the increased number of mills, mechanical challenges, availability of mills' spare parts, power shortage and weather conditions that affected moisture content of paddy. The study found out that there is no systematic data collection on rice millers except for a study done by Njuguna and Oyange (2018), and this was a one-time exercise.

Remarks/Decisions:

- The secondary data and information drawn from a study by Njuguna and Oyange (2018) provides systematic data on rice mills both nationally and Kirinyaga County. Thus, we recommend a ratio of 43 tons/hr of installed capacity to 30.5ton/hr **(43:30.5)** of functional capacity mills as at **2018** In Kirinyaga County (see Table 22).
- Adapt the methodology used by Njuguna and Oyange (2018)[25].

Level of Mechanization in Production and Harvesting

The data in table 24 presents the number of tractors and combine harvesters for land preparation and harvesting respectively and is disaggregated by individual private and institutional ownership.

Table 24: Combine harvesters and tractors in Kirinyaga County

Tractors			Combine Harvesters		
Ownership	Make/ Model	Number	Ownership	Make/ Model	Number
Individual private owners	Not specified	51	Individual private owners	World DR208	11
				Liulin 70.7 HP	2
				KBROS 88HP	5
				Others (Not specified)	25
MRGM	Holland 80HP	18	MRGM	Kubota DC	10
				World DR208	2
			Mutithi RFCS	Kubota DC 70HP	5
MIAD	New Holland	1	MIAD	Kubota DC 70HP	1
KALRO	Not specified	2	KALRO	Yanmar	1
Total		72		Total	62

Source: Compiled by Consultant (May, 2022)

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[25] This involves secondary and primary data sources through structured questionnaires, key informants, and physical visits and updating the most recent data.

Plate 3: *Land preparation in Mwea*

Narration: Mechanization in Kirinyaga County is predominantly delivered by private machine owners. The cumulative number of tractors in Kirinyaga County in 2022 is 72 (Plate 3). The ownership of these tractors is as follows: Individual private ownership (51) and institutional (21). The cumulative number of combine harvesters in Kirinyaga County in 2022 is 62: of which 43 are privately owned by individual as at 2022.

There is no systematic data collection on tractors and combine harvesters, apart from internal project data compiled by CaDPERP (Capacity Development Project for Enhancement of Rice Production in Irrigation schemes in Kenya). The primary sources of these data were MRGM and MIAD for the institutions and a key informant interview with Wilson Oyange of CaDPERP for the privately owned tractors and combine harvesters.

Remarks/Decisions:

- The baseline number of tractors and combine harvesters as at **2022** is **72** and **62** respectively (see Table 23).
- Adapt and formalize the methodology used by CaDPERP to report data on tractors and combine harvesters in 2021/22.

Competitiveness

Paddy rice from Kirinyaga County is milled within the county and only sold as milled rice. Millers provide free storage of paddy before and after milling, offer milling services at a cost and a space for trading milled rice. Large quantities of milled rice are sold by the traders at the space provided, even though millers also sell their own milled rice. This kind of milling and trading arrangement is very unique to **Kirinyaga County**. Thus, supermarkets in Kirinyaga County rarely sell locally produced rice. They often stock and sell imported rice brands (Plate 4).

Based on a sample of six (6) rice mills surveyed out 14 functional mills, the quantity of milled rice and the varied unit prices per kilogram can be used as a proxy measure of locally produced and sold rice in Kirinyaga County. This study found out that only Nice Supermarket in Mwea, stocks and sells NICE-branded rice that is locally produced.

Plate 4: Marketing space for rice traders at Nice Millers in Mwea

Share of Local Rice in the Market: Miller Perspective

Table 25: Share of Local Rice in the Market – Millers Perspective

Name of the Mill	2026/2017			2017/2018			2018/2019			2019/2020			2020/2021		
	Quantity of Milled White Rice (tons)	Quantity White Rice Sold (tons)	Price (Ksh /kg)	Quantity of Milled White Rice (tons)	Quantity White Rice Sold (tons)	Price (Ksh /kg)	Quantity of Milled White Rice (tons)	Quantity White Rice Sold (tons)	Price (Ksh /kg)	Quantity of Milled White Rice (tons)	Quantity White Rice Sold (tons)	Price (Ksh /kg)	Quantity of Milled White Rice (tons)	Quantity White Rice Sold (tons)	Price (Ksh /kg)
MRM	-	-	-	-	-	-	-	-	-	6202.2	50.65	170	9728.8	38.23	170

MRGM	3461	-	-	3729	-	-	6798	3729	Prices[26]	9364	4380	Prices[27]	9439	5155	Prices[28]
NICE	-	35	110	-	30	100	-	27	120	-	40	150	-	-	-
Golden Grain	800	28	130	800	28	130	800	28	130	800	28	130	800	28	130
Tana Group	-	-	-	-	-	-	20000	20000	Not given	20000	20000	Not Given	20000	20000	Not Given

Remarks/Decisions:

- Based on Table 25, this study recommends that the share of local rice in the market from a miller-trader perspective be tracked

Quantity of High Yielding Variety Seeds Preferred

Quantity of High Yielding Variety Seeds Preferred - Locally Produced

There is preference of Basmati 370 because its aromatic, taste and cookability qualities that is preferred and demanded by consumers. As a result, farmers consider it as a cash crop because it attracts good prices. But these prices fluctuate often between Ksh110 and Ksh200 of milled rice. Although Basmati 217 has higher aroma than Basmati 370, it has been replaced by the latter mainly because of the low yields[29] obtained from the former. Unlike the Basmati varieties (i.e., Basmati 217 and Basmati 370) which are preferred as cash crops, BW196 –a non-aromatic variety is considered a food crop mainly due to low market prices averaging at Ksh100 per kg. This is in spite of BW 196 being relatively high yielding30 with good ratooning characteristics.

Komboka is a high yielding[31] variety which was recently introduced in Kirinyaga County in 2020 by KALRO and partners, combines the preferred qualities of Basmati and BW varieties –especially high aroma and good ratooning characteristics. The grain quality of

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[26] 2018/2019 Prices/Kg: Kenya Select = 192; SPR=176; MRG=192; BW 196=90; Bulk=140
[27] 2019/2020 Prices/Kg: Kenya Select = 192; SPR=176; MRG=185; BW 196=90; Bulk=140
[28]2020/2021 Prices/Kg: Kenya Select = 186; SPR=169; MRG=138; BW 196=90; Bulk=138
[29] Basmati 217 yields **1.8-2.2tons/acre** while Basmati 370 yields **2.5-2.8 tons/ acre** (KALRO,2022)
[30] BW 196 Yields 3.2-4.0 tons/acres
[31] Yield 3.8 -4.0 tons/acre

Komboka variety makes it easy for blending Basmati varieties. The price of milled Komboka variety at an average of Ksh110-120 per kg makes it preferable by government institutions. This is the same price obtained from the imported non-aromatic Pakistan milled rice, which also blends easily with locally produced Basmati varieties because of its similarities with the latter.

Table 26: Quantity of high yielding variety seeds preferred -locally produced

Variety of Seed	Quantity of Resilient Variety of Seed (tons)										Source of Data
	2017		2018		YR 2019		YR 2020		YR 2021		
	Quantity Produced	Quantity Adopted	Quantity Produced	Quantity Adopted	Quantity Produced	Quantity Adopted	Quantity Produced	Quantity Adopted	Quantity Produced	Quantity Adopted	
Komboka (IR05N221)	-	-	-	-	-	-	-	-	84	84	MRGM
BW 196	-	-	-	-	20	20	-	-	-	-	MRGM
	13.7	7.5	12.3	6.3	12.2	8.7	10.0	8.4	12.3	11.5	NIA/MIAD
Basmati 370	-	-	-	-	210	210	210	210	210	210	MRGM
	24.7	24.3	269	243	258.3	234.4	249.4	208.7	248.4	247.4	NIA/MIAD
Basmati 217	-	-	-	-	30.0	30.0	34.0	34.0	34.0	34.0	MRGM
	19.8	12.0	23.3	21.0	23.0	19.4	25.3	20.3	24.4	23.0	NIA/MIAD

Source: Compiled by consultant (May 2022)

Narration: Table 26 summarizes the quantities of high yielding variety seeds preferred that are locally produced and adopted. Basmati 370 variety has the largest quantity of locally produced seed and adopted for the period between 2017 and 2021. This is followed by Komboka variety which was introduced in the year 2020.

Remarks/Decisions:

- This study recommends **2021** as the base year. The baseline values on the quantities of high yielding variety seeds preferred that are locally produced and adopted are as follows: Basmati 370 (458.4 tons and 457.4 tons) and Komboka (84 tons and 84 tons).
- The main source of data and information will be MIAD and MRGM seed reports.

Quantity of High Yielding Variety Seeds Preferred Imported

Narration: Based on key informants, the study established that all the rice varieties adopted in Kirinyaga County were locally produced.

Remarks/Decisions:
The main source of data and information for M&E on this indicator will be MIAD.

Empowerment

Smallholder farmers' accessibility to financial services

MRGM provides various services to farmers along the rice value chain including land preparation, rotavating, disk ploughing, levelling, seeds, transplanting, farm inputs, harvesting and transporting of the paddy to the mill. These services are provided on credit. Members can also access cash advances which ensure that the total member advances not exceed 70% of the paddy delivered. The interest charged on loans is 13.5% annually. The amount of loan is pegged in the quantity of paddy delivered to the milling company and previous credit history. Table 27 presents data on the number of farmers accessing inputs and services on credit and cash loans.

Table 27: Smallholder farmers' accessibility to financial services

Year	Number of Farmers Accessing Financial Services	Qualifying farmers	Type/ Purpose of Financial Services Accessed			
			Land Preparation	Seed	Fertilizers	Agrochemicals
2016/17	Number of Individual Farmers	1,579	1,112	1,261	1,524	1,083
	Total Amount of Credit (Loan +Interest) (Kes)		10,584,225	6,405,100	30,291,769	439,050
	Number of Farmer Groups		0	0	0	0
	Total Amount of Credit (Loan +Interest) (Kes)		0	0	0	0
2017/18	Number of Individual Farmers	1,465	959	1,153	1,413	1,113
	Total Amount of Credit (Loan +Interest) (Kes)		8,937,782	6,061,850	32,736,600	21,770
	Number of Farmer Groups		0	0	0	0
	Total Amount of Credit (Loan +Interest) (Kes)		0	0	0	0
2018/19	Number of Individual Farmers	no update was done	884	1,068	1,548	56
	Total Amount of Credit (Loan +Interest)		8,264,345	6,061,850	41,683,787	260,495
	Number of Farmer Groups	no update was done	0	0	2	0
	Total Amount of Credit (Loan +Interest) (Kes)		0	0	5,865	0
2019/20	Number of Individual Farmers	1,684	833	1,141	1,590	956
	Total Amount of Credit (Loan +Interest) (Kes)		8,114,820	6,397,700	41,683,787	260,495
	Number of Farmer Groups		0	0	0	0
	Total Amount of Credit (Loan +Interest) (Kes)		0	0	0	0
2020/21	Number of Individual Farmers	2,741	628	1,128	1,521	1,137
	Total Amount of Credit (Loan +Interest) (Kes)		6,651,070	7,307,360	38,531,871	1,740,305
	Number of Farmer Groups		0	0	2	2
	Total Amount of Credit (Loan +Interest) (Kes)		0	0	15,065	2,085.00

Source: Compiled by consultant (May, 2022) from data provided by MRGM

Narration:

Members of MRGM are accessing credit and cash loans as individuals instead of groups. At the same time, the number of farmers accessing financial services from MRGM on average was 1,500 per year between 2016/17-2019/2020. This number increased by 65 percent from 1684 in 2019/2020 to 2741 in 2020/21. The total amount of loans given to farmers in the first two years (2016/17 and 2017/18) was below Ksh50 Million and in the next three years increased to an average of Ksh55Million per year. Loans given for fertilizers for the years (2016/17 and 2017/18) accounted for about 66% and increased to over 70% of the total loans (see Table 26).
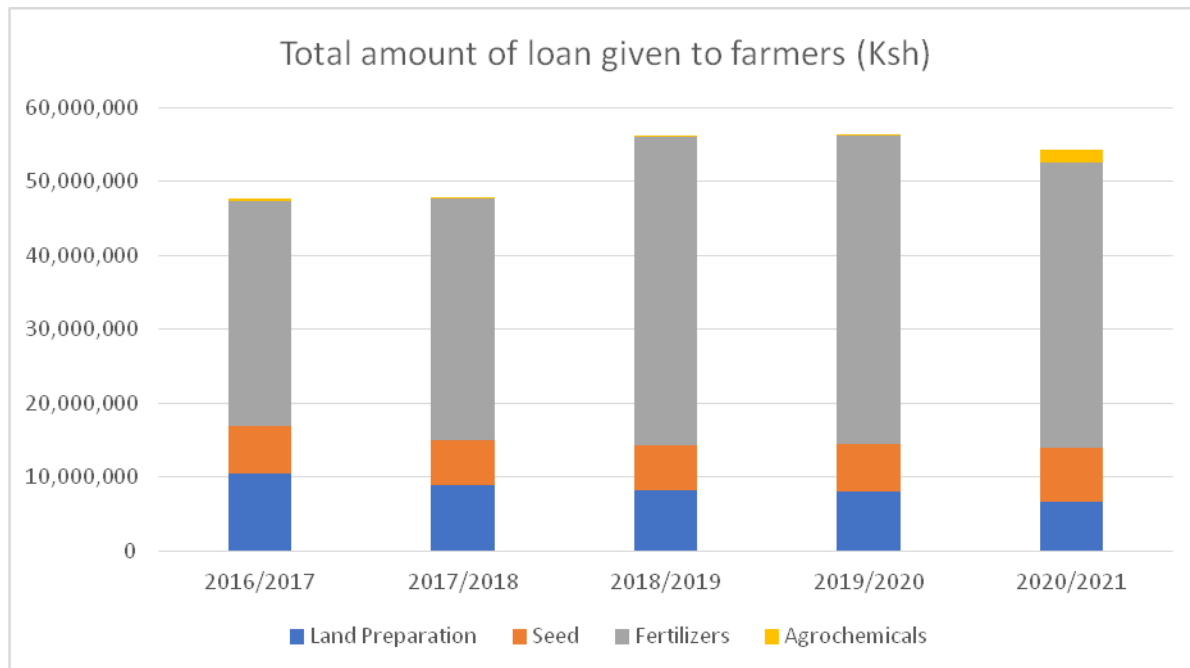
Figure 1: Total amount of loans given to farmers

Remarks/Decisions:

- This study recommends **2021** as the base year. The baseline values on the smallholder farmers accessibility to financial services is **2,741** as reported by MRGM.
- The total amount of loans received in the period 2020/2021 was Ksh 54million (see Figure 1).
- The main source of data and information for M&E on this indicator will be MRGM.

Smallholder farmers' accessibility to training and technical services

Mwea Irrigation Agricultural Development Centre (MIAD) is the main research and training station on rice production in Kirinyaga County. Training and technical services delivered by MIAD to farmers include farm water management, land preparation, soil testing and management, rice husbandry and cropping techniques, seed production, choice and propagation, fertilizer application as well as pest and disease control. MIAD works in collaboration with KEPHIS, NIA, CaDPERP, KALRO, Agrodealers, County Agricultural Officers to deliver training and technical services to rice farmers. KALRO provides training and technical support on seed choice and propagation. Other private institutions such as MRGM and Tana Group Millers have employed full-time agronomists who provide training and extension services to farmers who supply them with rice.

Table 28 below shows smallholder accessibility to training and technical services by institution between the year 2017 and 2021.

Table 28: Smallholder farmers' accessibility to financial services

Institution	Service Provider	2017		2018		2019		2020		2021	
		No. of Groups	Individual Farmers	No. of Groups	Individual Farmers	No. of Groups	Individual Farmers	No. of Groups	Individual Farmers	No. of Groups	Individual Farmers
KALRO	KALRO Staff	-	-	-	-	-	-	0	500	0	3500
Tana Group Millers	Agronomist	-	-	-	-	0	700	0	700	0	700
MIAD	KEPHIS, NIA, CaDPERP, KALRO, Agrodealers, County Agricultural Officers	2	700	2	750	5	750	4	850	6	1030
MRGM	Agronomist	-	1000	-	1000	-	1000	-	1000	-	1000
	Total	**2**	**1700**	**2**	**1750**	**5**	**2450**	**4**	**3050**	**6**	**6230**

Source: Compiled by consultant (May, 2022)

Narration: There has been a steady increase in the number of individual farmers receiving training and technical services between the year 2017 and 2021 (see Table 28).

Remarks/Decisions:
- The baseline number of groups and individual farmers is **2** and **6,230** respectively for the base year **2021**.
- The main source of data and information for M&E on this indicator will be MIAD.

4.3.2 Kisumu County

CABE Africa Limited (CAL) made a field visit to Kisumu County between 28th March 2022 and 1st April 2022. The purpose of the visit was to collect primary information and data to supplement secondary data sources; and to establish methods of systematic M&E data collection for NRDS 2 indicators. CAL also established contacts with key stakeholders for future data collection.

The institutions visited included Kisumu County Director of Agriculture, National Irrigation Authority – Ahero, Department of Trade Enterprise, Cooperatives and Marketing, Lake Basin Development Company, Quick Mart Supermarket and Khetias Supermarket. The following section presents data and information for Kisumu County organized by RICE (i.e., Resilience, Industrialization, Competitiveness and Empowerment) indicators.

4.3.2.1 RICE Indicators in Kisumu County

Resilience

   (i) Area Harvested under Irrigation

Rice in Kisumu County in mainly grown under irrigation in NIA-managed schemes and community managed schemes. Table 29 presents the area harvested under irrigation for the period 2017 - 2021.

Table 29: Area harvested under irrigation (Hectares) – Kisumu County

Indicator	Area under irrigation (Hectares)					Geographic coverage	Method of data collection
	2017	2018	2019	2020	2021		
Total Area harvested under main irrigation schemes *(ha)*	5,750	5,970	6,030	6,135	6,300	Kisumu East, Nyando, Muhoroni, Nyakach, Kisumu Central Kisumu West & Seme	Data collection tool filled in by the County Crops Officer
Area harvested under main irrigation schemes (NIA-Managed) *(ha)*	1,780	1,780	1,775	1,320	1,460	Ahero and West Kano	
Area harvested (Community-managed) *(ha)*	3,970	4,190	4,255	4,815	4,840	Not Specified	

Source: **Compiled by Consultant (April 2022) from data provided by CDA Kisumu County & County Crops Officer**

Narration: The study established that there was increase in the total area harvested from 5,750ha in 2017 to 6,300ha in 2021. Also, the area under community- managed schemes increased from 3,970ha in 2017 to 4,840ha in 2021. The increase in total area harvested is attributed to opening up of new areas of community-managed schemes supported by NIA (Plate 5). At the same time, the area harvested under NIA-managed schemes (i.e. Ahero and West Kano) decreased from 2019 due to flooding and backflow of the lake waters.

Remarks/ Decision:
- The baseline data of **5,970ha (2018)** reported by CDA Kisumu County is a recommended measure for this indicator.
- The source of this data and information will be Kisumu County Director of Agriculture.

Plate 5: Rice seed transplanting in Ahero

Quantity of Resilient Variety Seeds (tons)

Quantity of Resilient Variety Seeds Locally Produced (tons)

Table 30: Quantity of Resilient Variety Seeds Locally Produced and Absorbed - Kisumu County

Variety	2017	2018	2019	2020	2021	Geographic coverage	Method of data collection
IR 2793-80-1 Quantity Locally Produced (tons)	150	150	156.1	162	82.2	Ahero, West Kano and SISO	Data compiled from seed production reports from NIA -Ahero Station.
IR 2793-80-1 Quantity Adopted (tons)	140	135	140.5	145.8	73		
BASMATI 370 Quantity Locally Produced (tons)	-	-	-	-	-		
BASMATI 370 Quantity Adopted (tons)	1.5	4.5	1.5	2.5	5.0		

Source: Compiled by Consultant (April 2022)

Narration: The main source of certified rice seed of **IR 2793-80-1** in Kisumu County is NIA-Ahero Research Station. The research station obtains the parent seed from KEPHIS and multiplies the seed to distribute to rice farmers in the county.   Seed for Basmati 370 is sourced from NIA Mwea Station.

Remarks/ Decision:
- The study recommends **2021** as a base year for the following quantity of resilient variety seeds locally produced (tons) and quantity adopted (tons) respectively (82.2 and 160.2) (see Table 30).
- The main source of data and information will be NIA Ahero quarterly seed reports.

Quantity of Resilient Variety Seeds Imported (tons)

Table 31: Quantity of Resilient Variety Seeds Imported and Adopted – Kisumu County

Variety	2017	2018	2019	2020	2021	Geographic coverage	Method of data collection
ARIZE TEJ GOLD Quantity Adopted (tons)	1	0.5	1.5	0.5	0.3	Ahero, West Kano and SISO	Data compiled from seed production reports from NIA -Ahero Station.
AT-054 Quantity Adopted (tons)	0	0	0	0	3.5		

Source: Compiled by Consultant (April 2022)

Narration: Arize Tej Gold developed by Bayer Crop Science and AT054 developed by Afritec Seed Limited are reported to be imported varieties grown in Kisumu County. The small quantities of seed planted/adopted of these varieties are tracked by NIA

agronomists during the field visits and are reported in seed reports. Imported Hybrid varieties, viz. AT 054 and Arize Tej Gold were introduced and adopted under contract farming in the recent years. Arize Tej Gold are bought from local agrovets whereas AT 054 variety seeds are bought by farmers from Afritec's outlets in Kisumu County (see Table 31).

Remarks/Decision:
- The study recommends **2021** as a base year. The base data for the quantity adopted is 3.8 tons
- The main source of data and information will be NIA Ahero seed reports.

Industrialization

Level of Milling Sector Upgrading

This section presents data and information on millers having capacity of at least 2.0 tons/hour in Kisumu County. The study undertaken by Njuguna and Oyange (2018)[32] provided systematic secondary data and information which was augmented by primary data on the mills in the county. The study team made physical visits to the Western Kenya Rice Mills (NIA-managed) and Lake Basin Development Company (LBDC) mills. Table 32 summarises the findings on this indicator.

Table 32: Mills in Kirinyaga County by Capacity

Name of Miller	Name/type of Milling Machine	Year Installed	No. of Mills	Status	Installed Capacity (tons/hour)	Capacity Utilization (tons/hour) and %							
						2018		2019		2020		2021	
						(tons/hr)	(%)	(tons/hr)	(%)	(tons/hr)	(%)	(tons/hr)	(%)
LBDC	SCHULE	1993	1	Non-functional	3.5	1.1	31%	1.1	31%	1.1	31%	1.1	31% 33
Western Kenya Rice Mills (NIA)	BALLARINI SOCCAMA	Early 1990's	1	Functional	3.5	2.5	71%	1.5	43%	0.5	14%	0.5	14%
Kisumu Private mills34	Not specified	Not specified	5	Functional	2.5 tons each (12.5combined)	12.5	100%	-	-	-	-	-	-

Source: Compiled by consultant (May, 2022)

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[32] Ndirangu, S. N., & Oyange, W. (2019). Analysis of Millers in Kenya's Rice Value Chain. *IOSR Journal of Agriculture and Veterinary Science, 12*(1), 38-47. doi:10.9790/2380-1201033847

[33] The milling machine stopped operations in October 2021

34 Located in Ahero, Nyangande, Rabuor (private) Katito(CBO)

Narration: The number of rice mills installed in Kisumu County since 1993 and with milling capacity of at least 2.5tons/hour is 7. All the mills are functional except the LBDC mill which stopped operations in 2021 due to obsolesce, and is being replaced by a new mill. The latter will have a milling capacity of 7.5 tons/hour. The functional installed capacity of at least 2.5t/hour is 19.5 as at 2018.

Remarks/Decisions:
- The study recommends a ratio of **19.5tons/hour** to**19.5tons/hour (19.5:19.5)** as the total installed capacity to all functional capacity of rice mills as at **2018** in Kisumu County.
- Adapt the methodology used by Njuguna and Oyange (2018)[35].

Level of Mechanization in Production and Harvesting

Based on key informant interviews at NIA-Ahero, the machinery for rice production and harvesting in Kisumu County are owned and operated by cooperative societies as well as individual private owners. Table 33 presents the number of tractors and combine harvesters disaggregated by institutional and individual private ownership.

Table 33: Number of tractors available at production and harvesting stages -Kisumu County

Type/ Name of Tractors	2017		2018		2019		2020		2021	
	Total No.	No. in Use	Total No.	No. in Use	Total No.	No. in Use	Total No.	No. in Use	Total No.	No. in Use
Ahero Multi-Purpose Cooperative Society- New Holland[36] : (12 -80HP; 1-60HP)	13	9	13	9	13	9	13	9	13	0
West Kano Framers Cooperative Society (12 -80HP; 1-60HP)	13	12	13	12	13	12	13	12	13	0
Privately Owned: 80 HP	12	12	10	10	8	8	12	12	17	17
Total tractors	38	33	36	21	34	29	38	33	43	17
Type/ Name of Combine Harvesters	Total No.	No. in Use	Total No.	No. in Use	Total No.	No. in Use	Total No.	No. in Use	Total No.	No. in Use
Privately Owned: Mercy Ferguson 120HP	0	0	0	0	1	1	4	4	9	9
Privately Owned: Sajah 120Hp	0	0	0	0	0	0	0	0	1	1
Total combine harvesters	0	0	0	0	1	1	4	4	10	10

Source: **Compiled by Consultant (April 2022)**

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[35] This involves secondary and primary data sources through structured questionnaires, key informants, and physical visits and updating the most recent data.

[36] Donated to the Cooperative by JICA/GoK through 2KR project

Narration: The total number of tractors respectively owned by cooperatives and private owners were 26 and12 tractors as at 2017. However, by 2021 all the tractors owned by the cooperatives were not operational due to poor management. The privately owned tractors have moved between Kisumu and Kirinyaga County based on availability of work. The combine harvesters are predominantly owned by private individuals in Kisumu County. The use of combine harvesters was introduced in 2019 and since then, there has been a gradual increase of combine harvesters from 1 to 10.

Remarks/Decisions:
- The baseline number of functional tractors and combine harvesters as at **2022** is **43** and **10** respectively. These mainly include only privately owned tractors and combine harvesters **as at 2021.**
- There is no systematic data collection on mechanization in Kisumu County. Thus, the study recommends adaptation of the methodology used by CaDPERP to report data on tractors and combine harvesters in 2021/22.

Competitiveness
Share of local rice in the market
The data and information on marketing of rice produced in Kisumu County under both NIA-managed and community managed irrigation schemes is not documented and tracked. The study was informed that a large portion of rice produced from the county is sold to buyers from Uganda through Kenyan middlemen. A small proportion of paddy is milled through local private millers and public millers such as Western Kenya Rice Mills and LBDC. However, the relevant data and information are not available.

4.1.2 Share of imported rice in the market
The study sought to establish the share of imported rice in the county through supermarkets. The discussion with the management of Quickmart supermarket referred the study team to their head office in Nairobi for any data on quantities of rice stocked and sold over time.

Decision/Remarks:
- The recommended base year is **2018,** and the baseline value for share of locally produced rice in the market is **0tons** (2018). Similarly, the baseline value for share of imported rice in the market is **0 tons** (2018)
- The study followed the recommendation by the management of Quickmart and made an attempt to collect data on this indicator from the headquarters of three supermarkets in Nairobi (viz. Quickmart, Naivas and Carrefour).

Quantity of High Yielding Variety Seeds Preferred

Quantity of High Yielding Variety Seeds Preferred - Locally Produced & Imported
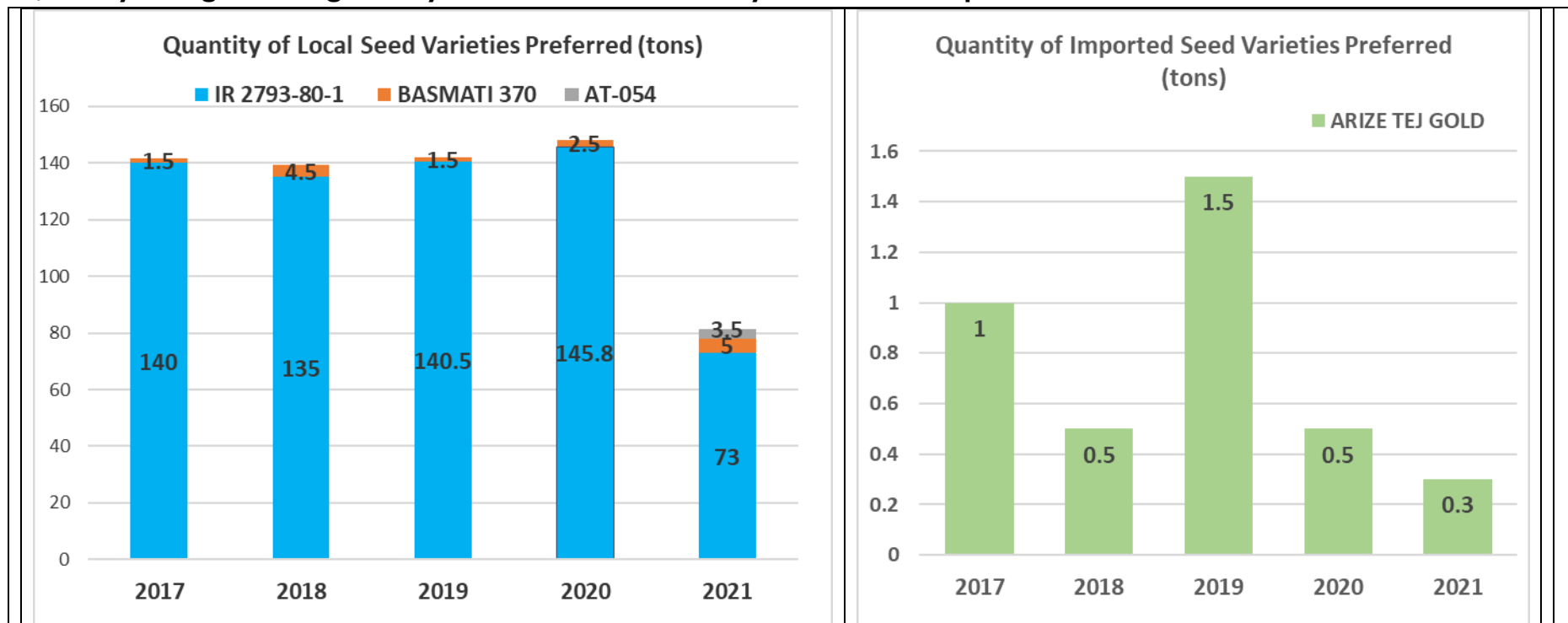
Figure 2: Quantity of Local and Imported Seed Varieties Preferred
Source: Compiled by Consultant (April 2022)

Narration: According to NIA website[37] and key informant interviews, IR 2793-80-1 is the predominant local variety grown in Kisumu County. The variety is grown by 90% of farmers in the county due to its ready market in the larger East African countries, majorly Uganda. Basmati 370 sourced from Mwea accounts for only 5% of the total rice grown in Kisumu County. The imported Hybrid varieties, viz. AT 054 and Arize Tej Gold were introduced and adopted under contract farming in the recent years. These hybrid varieties only accounts for 5% of the total varieties grown. Although Arize Tej Gold was introduced in 2017, AT054 which was introduced in 2021 is the most preferred hybrid imported variety.

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[37] https://www.irrigation.go.ke/projects/ahero-irrigation-scheme/

- The study recommends **2021** as the base year, and the base values of quantity of high yielding variety seeds preferred - **locally produced** and adopted respectively: **IR 2793-80-1 (82.16 tons and 73 tons)**. The baseline values on the quantities of high yielding variety seeds preferred that are imported and adopted: **AT054 (0 tons and 3.5tons)** (See Figure 1).
- The main source of data and information will be NIA seed reports.

Empowerment

Smallholder farmers' accessibility to financial services

Table 34 presents the farmers access to financial services disaggregated by groups and individuals. The data provided only captures number of farmers accessing finances from the NIA managed schemes.

Table 34: Number of farmers accessing finances as groups and as individuals -Kisumu County

Source of Finance	2017		2018		2019		2020		2021	
	No. of Groups	No. Indiv.	No. of Groups	No. Indiv.	No. of Groups	No. Indiv.	No. of Groups	No. Indiv.	No. of Groups	No. Indiv.
Agricultural Finance Corporation (AFC)	0	0	0	0	15	300	29	580	30	600
Alluvial Trade & Investment Company	0	0	0	0	0	0	0	0	4	427
Digi Farm	0	0	0	0	0	0	0	0	8	122

Source: Compiled by Consultant (April 2022)

Narration: Agricultural Finance Corporation (AFC) is the main source of credit for rice farming in Kisumu County since 2019. Farmers access loans primarily as individuals but also as groups[38]. These loans are mainly used for land preparation and harvesting. Registration as a member of Ahero Irrigation Scheme (NIA-managed) is a mandatory requirement for accessing AFC loans. The number of individual farmers and groups accessing loans from AFC has respectively doubled from 15 and 300 (2019) to 30 and 300 (2021). Alluvial and Digi Farm started their operations as private lenders in Kisumu County in 2021 and have provided loans to 427 and 122 individuals, as well as 4 and 8 groups respectively.

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[38] Each group has an average membership of 15 farmers

- The study recommends **2021** as the base year, the number of individual farmers accessing financial services is **1,149** whereas the number of groups accessing financial services is **42**.
- NIA is recommended as the main source of data.

Smallholder farmers' accessibility to technical training or services

Table 35: Number of farmers accessing technical training or services -Kisumu County

Type/ purpose of Extension Services Accessed	2017		2018		2019		2020		2021	
	No. of Groups	No. Indiv.	No. of Groups	No. Indiv.	No. of Groups	No. Indiv.	No. of Groups	No. Indiv.	No. of Groups	No. Indiv.
NIA Extension Providers	86	1645	86	1645	86	1645	86	1645	86	1645
SCAO - County staff	5	100	5	100	5	100	5	100	5	100
Private Extension Providers	86	1645	86	1645	86	1645	86	1645	86	1645

Source: Compiled by Consultant (April 2022)

Table 36: Extension Service Providers-Kisumu County

Extension provider	Area		Total
	West Kano	**Ahero**	
NIA Agronomists and Field staff[39]	3	7	10
SCAO	1	1	2
Private extension providers[40]	10	15	25
Total	14	23	37

Source: Compiled by Consultant (April 2022)

Narration:

Based on key informant interviews, farmers accessed technical training or services in Kisumu County as groups and individuals through NIA extension providers, SCAO and private extension providers. The number of farmers accessing these services remained the same for each of these extension channels. The total number of extension providers is 37 which comprises NIA extension providers (10), SCAO (2) and private extension providers (25). The total number groups and individuals accessing technical and extension services is **177** and **3,390** respectively. NIA Extension providers and SCAOs offer general extension services on land

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[39] Comprises water management teams
[40] Agrodealers and other collaborators

preparation, sowing and harvesting whereas the private extension providers offer specific information on crop nutrition, pest and disease control, and safe use of chemicals.

Remarks/Decision:
- The study recommends **2021** as the base year, the number of individual farmers accessing technical training or services is **3,390** whereas the number of groups accessing technical training or services is **177**.
- NIA is recommended as the main source of data.

Share of Local Rice in the Market in Nairobi

As mentioned in section 4 (competitiveness), supermarkets in Kirinyaga County rarely sold locally produced rice. As well, in Kisumu County, the management of Quickmart Supermarket referred the study team to its head office in Nairobi for data on quantities of rice stocked and sold over time. Thus, the study team visited three supermarkets in Nairobi (viz. Carrefour, Naivas, Quickmart) in the period between 23rd and 27th May 2022, to seek data and information on the share of local rice in the market. Figure 1 and table 37 summarise the study findings on the share of local rice in the supermarkets only based on brands displayed on the shelves –and not on quantities procured and sold in the past six years (2016-2021).

Share of Local Rice in the Supermarkets (Carrefour, Naivas & Quickmart) n=70

Local	25
Pure imported	2
Imported & repackaged	38
Blended	5
Total	70
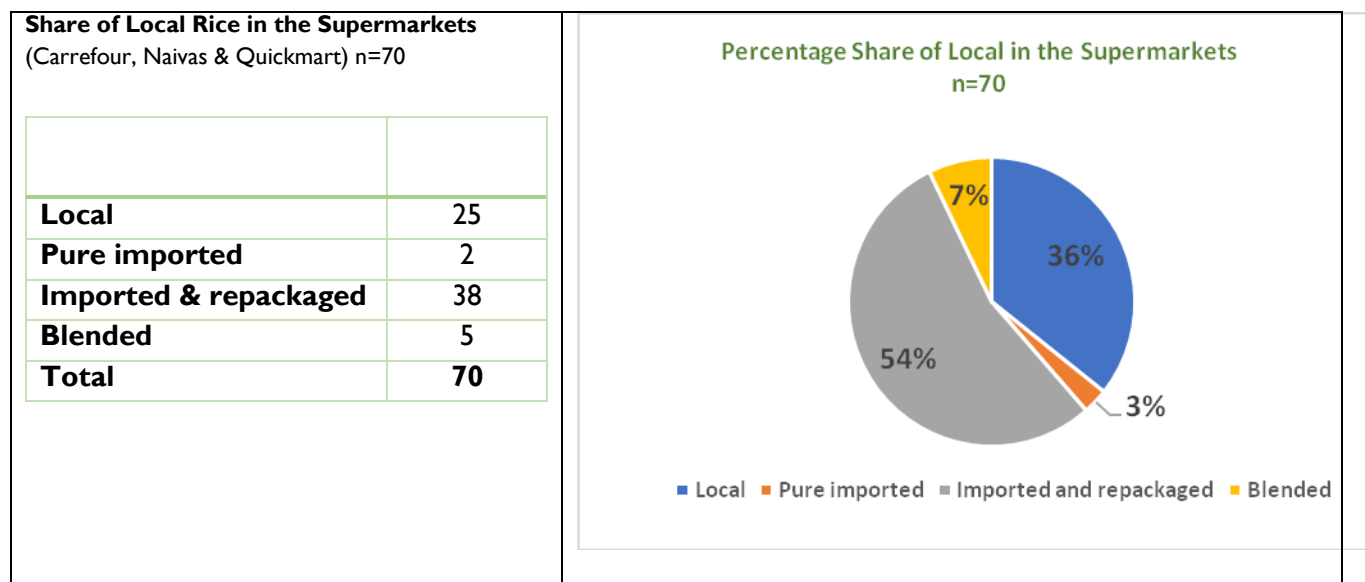
Figure 3: Rice brand analysis
Source: Compiled by Consultant (27th May 2022)

Table 37: Share of Local Rice in the Supermarkets by Brand

Type of Brands	Carrefour		Naivas		Quickmart	
	(n)	(%)	(n)	(%)	(n)	(%)
Local	19	40%	10	45%	15	45%
Pure imported	2	4%	0	0%	0	0%
Imported and repackaged	23	48%	20	52%	17	52%
Blended	4	8%	3	3%	1	3%
Total	48	100%	33	100%	33	100%

Source: Compiled by Consultant (28th May 2022)

Narration:

The study found out that the supermarkets carried 70 brands of rice. Based on a key informant interview, these brands can be placed into four categories namely: imported and repackaged (54%), local (36%), blended (7%) and purely imported (3%) (See Figure3). Table 37 shows that the share of local brands account for 40-45% while imported and repackaged brands account for 48-52% across the three supermarkets.

Decision/Remarks:

- The study recommends 2022 as base year. The share of **local brands** account for **40-45%** while imported and repackaged brands account for **48-52%** across the three supermarkets (viz. Carrefour ,Naivas and Quickmart)
- There is a need for NRDS focal point to establish data collection protocol with the supermarket management on quantities procured and sold at given prices over time.

5. SYNTHESIS AND RECOMMENDATIONS

This section summarizes a synthesis of findings on CARD M&E Indicators, methods data collation on each indicator from the desk review and primary data collection in Kirinyaga, Kisumu and Nairobi Counties. The synthesis also helps TF to understand decisions of the study team to collect primary data from purposely selected primary data sources in the target counties and propose key sources for systematic data for monitoring NRDS 2 R.I.C.E indicators.

5.1 Summary overall indicators

The overall indicators assessed the total annual rice production level by examining the total paddy produced in terms of the area harvested and the yield. Table 37 summarises baseline indicators based on data reporting by MoALFC in NRDS 2. However, the study team computed the value for Self Sufficiency Rate (in %) from secondary data reported by MoALFC in NRDS 2 and Trade Map. The main sources of secondary data for the overall indicators will be MOALFC for production data and MTIED for data on imports and exports.

Table 38: Summary of baseline data on overall indicators

Indicator	Source of data	Year published	Author	Baseline indicator	Base year	Method of data collection
Total Quantity of Paddy Production (tons)	NRDS 2	2020	MoALF&C	166,099	2018	Data reporting by MoALFC In NRDS 2
Total Area Harvested (Ha)	NRDS 2	2020	MoALF&C	50,751	2018	Data reporting by MoALFC In NRDS 2
Yield under irrigation (t/ha)	NRDS 2	2020	MoALF&C	4.2	2018	Data reporting by MoALFC In NRDS 2
Yield Rain-fed lowland (t/ha)	NRDS 2	2020	MoALF&C	2.1	2018	Data reporting by MoALFC In NRDS 2
Yield Rain-fed upland (t/ha)	NRDS 2	2020	MoALF&C	1.4	2918	Data reporting by MoALFC In NRDS 2
Self Sufficiency Rate (%)	NRDS 2		MoAFC	17	2018	Data reporting by MoALFC in NRDS 2 and Trade Map

Source: Consultant's compilation (2022)

5.2 Secondary Data

Table 39 summarizes secondary data and information on two R.I.C.E indicators, namely; Resilience (the area under Irrigation in hectares) and Industrialization (the ratio of total installed capacity to total functional capacity of mills)

Table 39: Summary of baseline data on R.I.C.E. indicators

Indicator	Source of data	Indicator Description	Baseline indicator	Base Year	Method of data collection
Area under Irrigation (Ha)	MoALFC	NRDS 2	40,120	2018	Secondary data reporting by MoAFC
The ratio of total installed capacity to total functional capacity of mills	CaDPERP	Mills	58.5:194	2018	Adapt the methodology used by Njuguna and Oyange (2018)[41] Primary data required to provide up-to-date statistics

Source: Consultant's compilation (2022)

There were no systematic secondary data on the rest of the R.I.C.E. indicates. Thus, the study team sought primary data and information from Kirinyaga, Kisumu and Nairobi Counties to establish the respective base values and base years for each indicator.

5.3 Primary Data

5.3.1. **Kirinyaga County**

Table 40 summarizes data and information on R.I.C.E. indicators in Kirinyaga County. Apart from a study on Analysis of Millers in Kenya's Rice Value Chain undertaken by Njuguna and Oyange (2018) and data from internal project data collection on tractors and combine harvesters compiled by CaDPERP, there is no systemic data on the rest of R.I.C.E. indicators in the County.

Table 40: Summary of baseline data on R.I.C.E. indicators in Kirinyaga County

Indicator	Source of data	Indicator Description	Baseline indicator	Base Year	Method of data collection
Area under Irrigation (Ha)	NIA-Mwea	NIA-Managed	12,146	2018	NIA annual reports augmented by KIIs
Quantity of Resilient Variety Seeds Locally Produced and adopted (tons)	NIA/ MIAD	Basmati 370	458.4	2021	Data reporting by NIA /MIAD seed reports and MRGM
	NIA/ MIAD	Basmati 217	58.4	2021	Data reporting by NIA /MIAD seed reports
	NIA/ MIAD	IR 2793	25.5	2021	Data reporting by NIA /MIAD seed reports
	NIA/ MIAD	ITA 310	6.0	2021	Data reporting by NIA /MIAD seed reports
	NIA/ MIAD	Komboka	356	2021	Data reporting by NIA /MIAD seed reports and MRGM

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[41] This involves secondary and primary data sources through structured questionnaires, key informants, and physical visits and updating the most recent data.

	NIA/ MIAD	Nerica 1	1.2	2021	Data reporting by NIA /MIAD seed reports
	NIA/ MIAD	Nerica 4	0.7	2021	Data reporting by NIA /MIAD seed reports
	NIA/ MIAD	Nerica 10	0.3	2021	Data reporting by NIA /MIAD seed reports
	NIA/ MIAD	Nerica 11	0.5	2021	Data reporting by NIA /MIAD seed reports
	NIA/ MIAD	BW 196	12.3	2021	Data reporting by NIA /MIAD seed reports
The ratio of functional capacity of mills to the total installed capacity to total (%)	CaDPERP	Mills	71 30.5:43	2018	Adapt the methodology used by Njuguna and Oyange (2018)[42]
Mechanization in production and harvesting	CaDPERP	Tractors	72	2022	Formalize data reporting by CaDPERP in 2021/22
	CadPERP	Combine	62	2022	Formalise data reporting by CaDPERP in 2021/22
SHFs farmers accessibility to financial services	MRGM	Number of farmers	2,741	2021	Data reporting by MRGM
	MRGM	Total loans per year (Kes Million)	55	2021	Data reporting by MRGM
SHFs accessibility to training and technical services	MIAD	Number of farmers	6,230	2021	Data reporting by MIAD

Source: Consultant's compilation (2022)

NIA/ MIAD and MRGM were the key sources of primary data for most of the R.I.C.E. indicators in Kirinyaga County. Thus, the study team recommends these sources as the main sources of data and information. Regarding 'Share of Local Rice in the Market' in the competitiveness indicator, rice millers undertake marketing arrangement that is unique to the county. For instance, millers provide free storage of paddy before and after milling, offer milling services at a cost and a space for Marketing milled rice. This study recommends that the share of local rice in the market from a miller-trader perspective be tracked and lessons drawn for millers in Kisumu County and elsewhere in the country.

5.3.2 Kisumu County

Table 41 summarizes data and information on R.I.C.E indicators in Kisumu County. Like Kirinyaga County, the established systematic data collection in Kisumu County is captured by a study on Analysis of Millers in Kenya's Rice Value Chain undertaken by Njuguna and Oyange (2018) and the internal project data collection on tractors and combine harvesters compiled by CaDPERP.

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[42] This involves secondary and primary data sources through structured questionnaires, key informants, and physical visits and updating the most recent data.

Table 41: Summary of baseline data on R.I.C.E. indicators in Kisumu County

Indicator	Source of data	Indicator Description	Baseline indicator	Base Year	Method of data collection
Area under Irrigation (Ha)	CDA-Kisumu	Total area	5.970	2018	Data collected and filled by the County Crops Officer
Quantity of Resilient Variety Seeds	NIA-Aheo	IR 2793-80-1	83.2	2021	Data reporting by NIA –Ahero Station
	NIA-Ahero	Basmati 370	0	2021	Data reporting by NIA –Ahero Station
	NIA-Ahero	ARIZE TEJ GOLD	0	2021	Data reporting by NIA –Ahero Station
	NIA-Ahero	AT-054	0	2021	Data reporting by NIA –Ahero Station
The ratio of total installed capacity to total functional capacity of mills (%)	CaDPERP	Mills	100 19.5:19.5	2018	Adapt the methodology used by Njuguna and Oyange (2018)[43]
Mechanization in production and harvesting	CaDPERP	Tractors	17	2021	Formalise data reporting by CaDPERP in 2021/22
	CadPREP	Combine	10	2021	Formalise data reporting by CaDPERP in 2021/22
Quantity of High Yielding Variety Seeds Preferred - Locally Produced	NIA-Ahero	IR 2793-80-1	73	2021	Data reporting by NIA –Ahero Station
	NIA-Ahero	AT054	3.5	2021	Data reporting by NIA –Ahero Station
	NIA-Ahero	Basmati 370	5	2021	Data reporting by NIA –Ahero Station
	NIA-Ahero	Arize Tej Gold	0.3	2021	Data reporting by NIA –Ahero Station
SHFs farmers accessibility to financial services	NIA-Ahero	Number of farmers	1,149	2022	Data reporting by NIA –Ahero Station
	NIA-Ahero	Total loans per year (Kes Million)	-	2022	Data reporting by NIA –Ahero Station
SHFs accessibility to training and technical services	NIA-Ahero	Number of farmers	3,390	2021	Data reporting by NIA –Ahero Station

Source: Consultant's compilation (2022)

NIA-Ahero and the County Directorate of Agriculture (CDA) were the key sources of primary data for most of the R.I.C.E. indicators in Kisumu County. Thus, the study team recommends these sources as the main sources of data and information RICE Indicators. Regarding 'Quantity of High Yielding Variety Seeds Preferred – Imported' in the competitiveness indicator, There were two hybrid varieties which account for only 5% for the total rice seed grown in Kisumu County: Arize Tej Gold was introduced in 2017, and AT054 which was introduced in 2021. AT054 is the most preferred hybrid imported variety.

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[43] This involves secondary and primary data sources through structured questionnaires, key informants, and physical visits and updating the most recent data.

5.4 Share of Local Rice in the Market in Nairobi

Table 42: Summarise the baseline values of the share of local rice in supermarkets in Nairobi County (viz. Quickmart, Naivas and Carrefour). The study established that these supermarkets carried 70 brands of rice –which were placed into four categories and accounted for the following shares in the market: imported and repackaged (54%), local (36%), blended (7%) and purely imported (3%). The values of local brands (36%), and imported and repackaged (54% correspond to the computed Self Sufficiency Rate (36%), and Import dependency rate (64%) for the year 2020 in Table 10.

Table 42: Summary of baseline data on the share of local rice in the market in Nairobi

Indicator	Source of data	Indicator Description	Baseline indicator	Base Year	Method of data collection
Share of Local Rice in the Market in Nairobi (%)	Supermarkets	Local brands	40-45%	2022	Data collected from supermarkets in Nairobi
	Supermarkets	Imported and repackaged brands	48-52%	2022	Data collected from supermarkets in Nairobi

Source: Consultant's compilation (2022)

The study recommends 2022 as base year, base values of 40-45% and 48-52% for the share of **local brands** and imported and repackaged brands respectively. There is a need for NRDS focal point to establish data collection protocol with the supermarket management on this indicator.

5.5 Single baseline figures and recommended methods of data collection

	Indicator	Baseline figure	Base year	Rationale for the baseline figure	Recommended method to use by NRDS TF
1	Quantity of paddy Production (tons)	166,099	2018	The study adopted the figure reported by the MoALFC in NRDS 2 (Table 5).	MoALFC normally collects and compiles indicator data through County field officers. It also conducts validation visits to the counties to establish the reliability of the data. For the next year, the study is recommending NRDS TF to conduct their routine data collection and use the data for 2023, since this study could not find any better alternative data collection method.
2	Total Area Harvested (ha)	50,751	2018	The study adopted figure reported by the MoALFC in NRDS 2 (Table 6) in preference to KNBS because MoALFC in the NRDS 2 reports the total area under harvest including both NIA-managed and community managed schemes. This is unlike KNBS which only reports on NIA-managed schemes.	The same as above.

3	Yield (t/ha)	3.3	2018	The study adopted the production figures reported by MoALFC in NRDS 2. Table 7 presents yield for each type of rice growing areas, separating the yield from irrigated area, lowland rain-fed and upland rain-fed areas. However, to obtain a single baseline figure for the indicator, the researchers used the formula (**section 2.2.1.3**): Yield = Quantity of paddy production / Total area harvested **=166,099 / 50,751= 3.3t/ha**	The same as above.
4	Self Sufficiency Ratio (%)	17	2018	The study computed the ratio using the formula: **SSR = (Qty of rice production x 100 / (Qty of rice Production + Qty of imported rice – Qty of exported rice)).** The study adopted data of imports and exports reported by MTIED for milled rice. According to NRDS Phase 2, MoALFC uses 65% of paddy production (indicator 1) to convert into milled rice. Adopting the SSR formula and the data reported in tables 8 and 9, the self-sufficiency ratio is calculated.	For the next year, the study is recommending NRDS TF to calculate the SSR by using the following steps**: Step 1**: NRDS TF to use the same formula--by adopting the production data to be reported by the MoALFC in Indicator 1. **Step 2:** NRDS TF to convert the data of quantity of paddy production to quantity of milled rice by taking 65% of paddy production in indicator 1. **Step 3:** NRDS TF to source quantity of imported and exported rice from the data reported by MTIED on Trade Map to be accessed here since this study could not find any better alternative data collection method. According to MTIED link, MTIED collects the data of the rice transactions in the international market, using the data of rice passing through the formal customs at the boarders.
5	Area under Irrigation (ha)	40,120	2018	The study adopted the figure of area under irrigation reported by MoALFC in NRDS 2 since MoALFC reports data on both the NIA-managed and community-managed irrigated area (Table 10). However, data reported from these sources may not cover expanded area under NIA-managed and community-managed irrigation schemes in the country. Kirinyaga County, the current irrigated area under rice production is 30,000 acres (12,146ha). This includes 20,000 acres (8,097ha) originally gazetted under NIB in 1954 and 10,000 acres (4,049ha) new additional area. In	For the next year, the study is recommending NRDS TF to to adopt the data reported by the MoALFC by conducting their routine data collection and use the data for 2023 from existing NIA-managed and non-NIA-managed irrigation schemes. NRDS TF to use the same routine methods to collect additional primary data on expanded area and unreported area under both NIA-managed and community-managed irrigation schemes mainly in Kirinyaga and Kisumu Counties. This study concurs with views

				Kisumu County, there was increase in the total area under harvested rice from 5,750ha in 2017 to 6,300ha in 2021. Also, the area under community- managed schemes increased from 3,970ha in 2017 to 4,840ha in 2021.	expressed by a key informant at CDA's office in Kirinyaga County, that there is a need for MoALFC to conduct a census of new areas under production in order to establish reliable data.
6	Quantity of resilient variety seeds (tons)	1001.5	2021	The baseline figure for **base year 2021** represents the sum of the quantity of resilient variety seeds produced in Kirinyaga **(919.3t in table 18)** and Kisumu **(82.2t in table 26)**. The study collected primary data during field visits and key informants in Ahero and Mwea. Secondary sources could not provide reliable data in terms of the quantity of seeds produced. The data reported in the base year 2021 in Kirinyaga County -by KALRO (274.7t), NIA-Mwea (316.6t), MRGM (328t); and Kisumu County - by NIA-Ahero (82.2t).	For the next year, NRDS TF to collect data from KALRO, NIA and MRGM on the quantity of seed distributed to farmers through key informants and seed reports they compile quarterly and annually. NRDS TF to also collect information from KEPHIS on the list of certified resilient seed varieties both locally produced and imported. But according to KEPHIS, the data on resilient variety of seed listed and adopted will be found through the following authorized institutions and seed companies; (i) MRGM, (ii) NIA-Mwea & Ahero, (iii) KALRO-Mwea, (iv) Kenya Seed Company, (v) Bayer Crop Science, and (vi) Afritech. The study collected data from these actors –which form the main sources of future data collection by NRDS TF.
7	Level of milling sector upgrading (ratio)	58.5:194 (30%)	2018	The secondary data were drawn from a study undertaken by Njuguna and Oyange (2019). This was supplemented by primary data collection from physical visits to six millers in Kirinyaga County including Mwea Rice Mills (MRM), Mwea Rice Growers Multi-purpose, Tai Rice Millers Limited, Nice Millers, Tana Group Rice Millers and Golden Grain Rice Millers (See Table 19); two mills in Kisumu County namely, LBDC and Western Kenya Rice Mills (Table 27) (NIA). The study determined the proportion of the functional capacity of the medium and large mills (with capacity of at **least 2,0t/hour**) out of the total installed capacity. Based on **data in table 11 and annex 6 (**Njuguna et al.,, 2019), there are **18** medium and large mills with operating capacity of **58.5 tons/hour** out of the total **281 mills** with a total installed	NRDS TF to adopt the methodology used by Njuguna and Oyange (2019) to collect indicator data for subsequent years. The Njuguna and Oyange study used both secondary and primary data sources through structured questionnaires, key informants, and physical visits, updating the most recent data as at October 2010. For the next year, NRDS TF to collect data through key informants, and physical visits starting with 8 mills the study visited in Kirinyaga and Kisumu Counties The data collection tool and contact lists of possible KIs are provided.

				capacity of **194** tons/hour. The rate of milling sector upgrading = **58.5/164.5 x 100 = 36%.**	
8	Level of mechanization in production and harvesting	Tractors =115 Combine harvesters =72	2022	The study collected primary from MRGM and NIA-Mwea for the institutions and a key informant interview with Wilson Oyange of CaDPERP for the privately-owned tractors and combine harvesters. In Kisumu, all the tractors owned by the cooperatives were not operational, The combine harvesters are predominantly owned by private individuals in Kisumu County. The study used primary data collected in Kirinyaga and Kisumu Counties. The baseline figures for the base **year 2022** included the number of functional tractors in Kirinyaga County (**72 from table 20**) and in Kisumu County (**43 from table 20**), and numbers of combine harvesters from Kirinyaga (**62**) **and Kisumu (10) from table 28.**	Apart from internal project data compiled by CaDPERP in Irrigation schemes in Kenya, there is no systematic data collection on tractors. For next year, NRDS TF to collect data on the level of mechanization from MRGM, NIA-MIAD, KALRO and other individual private owners who were captured in the baseline study. NRDS TF to collect additional data through liaising with CaDPERP especially for the privately owed-machinery. Possible contacts of KIs to be provided by Dr. Oyange of CaDPERP.
9	Share of local rice in the market (%)	36	2022	The study conducted a market survey of **3** the major supermarket outlets in Nairobi. This was limited to observation of rice brands on the shelves because the management of supermarkets were reluctant to provide data on procurement and price of their rice brands. The study observed 70 brands of rice on shelves –and sought the guidance of a key informant to categorize the brands. Only **36%** of the sold rice is locally produced; **54%** is imported and repackaged, **3%** is sold as imported and **7%** blended (mix of local rice and imported rice in **the base year of 2022**) (see **Figure 1 and Table 32**). However, the proportion of blending could not be reliably estimated, hence not included as part of the locally produced rice.	For next year, NRDS TF to collect primary data from major retail outlets in Nairobi City. The study is recommending NRDS TF to strengthen a link with the three supermarkets (i.e., Naivas, Quickmart and Carrefour) to facilitate data collection on the quantity of milled rice brands procured and sold by supermarkets in Nairobi City.
10	Quantity of preferred high-yielding variety seeds (ton)	695	2020	The baseline figure of the **base year 2021** represents the sum of the quantity of resilient variety seeds produced in Kirinyaga County (**613.1.1t in table 22**) and Kisumu County (**81.8t in figure 2)**. The study collected primary data during field visits and key informants in Ahero and Mwea. Secondary	For the next year, NRDS TF to collect data from KALRO, NIA-Mwea and MRGM and NIA-Ahero on the quantity of preferred high-yielding seed through key informants and seed reports compiled quarterly and annually. NRDS TF to also collect data from seed companies: Kenya

				sources could not provide reliable data in terms of the quantity of seeds produced. The data reported in the base **year 2021** in Kirinyaga County by NIA-Mwea (285.1t), MRGM (328t) and Kisumu County-- by NIA-Ahero (**81.5t**). Thus, a total of **695t.**	Seed Company, Bayer Bayer Crop Science, and Afritech.
11	Smallholder farmers accessibility to financial services (Number)	3890	2021	The number represents the sum of farmers accessing financial services for rice production in Kirinyaga County (**2741** from table 23) and Kisumu County (**1149** from table 29) in base year **2021**. The study collected primary data during field visits and key informants in Mwea and Ahero. The data collection from a key informant at MRGM in Kirinyaga County for base year 2021 are: MRGM (1,463) farmers (or 78% of its 3,500 active members) accessed financial services, According to a key informant at NIA-Ahero, farmers accessed financial services through: AFC (600), Alluvial Trade & Investment Company (427), and Digi Farm (122).	For the next year, NRDS TF to collect primary data from MRGM in Kirinyaga County; while in Kisumu County: AFC, Alluvial Trade & Investment Company, and Dig Farm --through key informants. Although NIA-Ahero provided data on the number of smallholder farmers accessing financial services through various service providers, the study is recommending NRDS TF to contact these providers and – especially the new private financial service providers. The study has provided the general tool for data collection.
12	Smallholder farmers accessibility to technical training and services (Number)	9620	2021	The number represents the sum of farmers accessing technical training and services in Kirinyaga (**6,230** from table 24) and Kisumu (**3,390** from table 30). The study collected primary data during field visits and key informants in Mwea and Ahero. The data from key informants in Kirinyaga County for base year 2021 are: KALRO (3,500), Tana Group Millers (700), NIA-MIAD (1,030), MRGM (1000); in Kisumu County, NIA Extension Providers (1645), SCAO - County staff (100), Private Extension Providers (1645).	For the next year, NRDS TF to collect primary data from KALRO, NIA-Mwea, MRGM, and Tana Group Millers in Kirinyaga County, and NIA-Ahero, SCAO, Private Extension Providers in Kisumu County. Although NIA-Ahero provided data on the number of smallholder farmers accessing technical training and services through various service providers, the study is recommending NRDS TF to contact the mentioned institutions and the new private service providers. The study has provided the general tool for data collection.

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ANNEXES

**There are several authors that appears in text but not listed here. Eg. Ndirangu and
Oyange; Omanga; Crops Officer, Kisumu County etc.**

1. Overall Indicators
Annex 1: Data Summary of Quantity of Paddy Production

1.1 Quantity of paddy production					
	2016	**2017**	**2018**	**2019**	**2020**
Mwea	71,450	53,788	81,610	109,766	128,748
Ahero	5,891	7,032	4,169	7,687	8,709
West Kano	4,204	3,704	4,107	8,548	5,175
Bunyala	4,102	3,295	3,394	3,344	3,168
Southwest Kano	6,441	5,842	6,700	7,424	7,314
North Kano	-	-	1,743	2,758	3,251
Bura	-	-	430	982	1,568
Tana	-	-	-	816	1,089
Lower Kinja	-	-	-	4,354	5,080
Other irrigated areas	-	-	44,733	55601	116423
Paddy produced under irrigation	**92,088**	**73,662**	**146,887**	**201,281**	**280,524**

Source: **KNBS, 2021**

Annex 2: Data Summary on Total Area Harvested

1.2 Total Area Harvested					
Total Area Harvested (ha)	**2016**	**2017**	**2018**	**2019**	**2020**
NIA Irrigation schemes	14586	21949	27383	32324	31591
Other irrigated areas	-	-	12737	19471	36847
Total area under irrigation	**14586**	**21949**	**40120**	**51795**	**68438**
Rainfed Lowland area	-	-	6400	7800	9200
Rainfed Upland area	-	-	4231	4462	4692
Total Rainfed area	**0**	**0**	**10631**	**12262**	**13892**
Total area harvested	**14586**	**21949**	**50751**	**64057**	**82330**

Source: **KNBS, 2021**

Annex 3: Data Summary on Yield

1.3 Yield per unit area				
Yield (t/ha)		**2018**	**2019**	**2020**
Yield in area under irrigation	Expected	3.66	3.89	4.10
	Reported	4.20	4.6	5
Yield in lowland rainfed areas	Expected	2.05	2.10	2.15
	Reported	2.1	2.1	2.2
Yield in upland rainfed areas	Expected	1.44	1.48	1.52
	Reported	1.4	1.5	1.5

Source:

2.1 Resilience

Annex 4: Certified Resilient High Yielding Variety Rice Seeds

No.	Variety name/code	Year of release	Owner(s)	Maintainer and seed source	Optimal production altitude range (Masl)	Duration to maturity (months /days)	Grain yield (t ha⁻¹)	Special attributes
1	Basmati	KARI	KARI-Kibos	ND (Data not available)	ND	ND		• ND
2	Sindano	KARI	KARI-Kibos	ND	ND	ND		• ND
3	NERICA 1	2009	KARI	KARI (Mwea & Kibos)	15-1700	90-100	2.5-5.5	• Aromatic • Blast tolerant • Long grains
4	NERICA 4	2009	KARI	KARI (Mwea & Kibos)	15-1700	90-112	3.2-6.5	• Blast tolerant • Long grains
5	NERICA 10	2009	KARI	KARI (Mwea & Kibos)	15-1700	86-93	3.5-6.7	• Early, Long grains • Blast tolerant
6	NERICA 11	2009	KARI	KARI (Mwea & Kibos)	15-1700	90-105	3-5	• High ratooning ability • Long grains • Tolerant to blast & drought
7	Dourado Precose	2009	KARI	KARI (Mwea & Kibos)	15-1700	95-115	2.3-5.5	• Beardless

No.	Variety name/code	Year of release	Owner(s)	Maintainer and seed source	Optimal production altitude range (Masl)	Duration to maturity (months /days)	Grain yield (t ha^{-1})	Special attributes
8	Trenasse	2010	Africe seed company	Africe seed company-Malindi	0-1700	3.5-4	6.0-8.1	• Early maturing • High ratooning • Excellent threshability & milling quality • Non-aromatic, semi dwarf, long grain • Intermediate amylose content • Cooks dry & non sticky • Intermediate gelatinization temperature • Resistant to blast, brown spot and stemborer
9	SC 213	2010	Afritec seed com-pany	Afritec seed Company Malindi	0-1700	4-4.5	6.2-9.6	• Long grain, high tillering ability, resistant to lodging • Non-aromatic, good milling quality • Intermediate amylose content • Cook dry & non sticky, good threshing ability • Resistant to blast & stemborer
10	NIBAM 10	2010	National Irrigation Board (NIB)	NIB / MIAD	15 - 1700	90 - 100	3.5 – 6.0	• Aromatic • Tolerant to rice yellow mottle virus (rymv) • Long slender grains, awned • No anthocyanin, high ratooning ability
11	NIBAM 11	2010	National Irrigation Board (NIB)	NIB / MIAD	15 - 1700	95 - 112	3.2 – 6.5	• Aromatic • Tolerant to rice yellow mottle virus (rymv) • Long slender grains, awned

No.	Variety name/code	Year of release	Owner(s)	Maintainer and seed source	Optimal production altitude range (Masl)	Duration to maturity (months /days)	Grain yield (t ha^{-1})	Special attributes
12	NIBAM 108	2010	National Irrigation Board (NIB)	NIB / MIAD	15 - 1700	135 - 145	6 - 10	• No anthocyanin, high ratooning ability • Medium maturing, non-aromatic • Long grains, tolerant to blast, awnless
13	NIBAM 109	2010	National Irrigation Board (NIB)	NIB / MIAD	15 - 1700	135 - 150	8 - 12	• No anthocyanin, high tillering capacity • Late maturing, non-aromatic • Short thick grains, tolerant to blast • Awnless, no anthocyanin
14	NIBAM 110	2010	National Irrigation Board (NIB)	NIB / MIAD	15 - 1700	110 - 120	3.0 – 5.0	• Very high tillering capacity • Medium early maturing • Tolerant to rice blast & rymv • Non-aromatic, long slender grain
15	TXD306	2013	ARI-KATRIN	ARI - KATRIN	Irrigated and rain-fed low-land ecosystems	2.5-3.0	4.5-6.0	• Awnless, no anthocyanin • Aromatic paddy rice • Good eating & cooking qualities • Good milling quality • Moderate tolerant to some YMV and blast diseases strain

2.2 Industrialization

Annex 5: **Detailed data of the level of mechanization in rice production is presented in the table.**

Value chain	Activity	Farm scale and % level			Average
		Small-scale	Medium scale	Large scale	
Irrigated rice	Ploughing	66.7	66.7	-	67.0
	Rotavation/ harrowing	70.3	91.7	-	81.0
	Levelling	70.3	83.3	-	77.0
	Planting	0.0	0.0	-	0.0
	Weeding	0.0	0.0	-	0.0
	Harvesting	48.6	60.9	-	55.0
	Threshing	58.3	83.3	-	71.0
	Transport	91.9	95.8	-	94.0
	Average	**42.0**	**52.0**	-	**47.0**
Upland rice	Ploughing	80.3	-	-	80.3
	Harrowing	51.9	-	-	51.9
	Planting	4.9	-	-	4.9
	Weeding	1.6	-	-	1.6
	Harvesting	10.6	-	-	10.6
	Threshing	15.5	-	-	15.5
	Transport	4.5	-	-	4.5
	Average	**13**	-	-	**13**

Summary of level of mechanization in the rice value chains

Source: Wawire et al. (2016)

Annex 6: Mills in Kenya by Location and Capacity

	Mill	Location	Details on lines/mills	Capacity (tons/hour)		Year installed and other details
				Total capacity	Current operating mills capacity	
	Large and Medium Mills					
I	Mwea Rice Millers (MRM)	Mwea	5 lines of 2.5 2 lines of 5t/hr	22.5	5	1968 (3 lines of 2.5t/hr-not operational), 1972 (2 lines of 5t/hr-not operational because of high capacity), 2014(2 lines each 2.5t/hr 1 line of 2.5 not operational
2	Mwea Rice Growers Multipurpose Coop (MRGM)	Mwea	1 line of 1.5 1 line of 2.5 t/hr	4	2.5	Latest line-2012 Line of 1.5 not operational
3	Nice	Mwea	1 line	2.5	2.5	2012
4	Euros	Mwea	1 line	2.5	2.5	2010
5	Top grade	Mwea	1 line	2.5	2.5	2016
6	Boma	Mwea	1 line	2.5	2.5	2015
7	TAI	Mwea	1 line	2.5	2.5	2016
8	Global	Mwea	1 line	2.5	2.5	2011
9	Bephero	Mwea	1 line	1	1	2011
10	Tana	Mwea	1 line	3	3	2016
11	Dozer	Mwea	1 line	1	1	2018
12	Capwell	Thika	1 line	2.5	2.5	Before 2008
13	TARDA	Garsen	2 lines of 7.5t/hr and 1t/hr	8.5	0	Latest line (7.5t.hr)-1996 Old line-1t/hr-before 1996. Lack of paddy to operate the mills
14	LBDC	Kisumu	2 lines of 1.5t/hr each	3	1.5	One line not operational Early 1990's
15	Western Kenya	Ahero	1	3	3	Early 1990's
16	NCPB	Sagana	1	2.5	2.5	2014
	Total Large and Medium Mills	**25**		**66.0**	**37.0**	

		Single Pass Mills				
1		Busia	4 mills	2	2	Magombe, Teso North/South
2		Siaya	2 mills	1	1	At Anyiko- JICA donated mills- operational
3		Kirinyaga	228 mills	114	114	All private
4		Lamu	4 mills	2	0	All Government issued, lack of paddy
5		Taveta	3 mills	1.5	0.5	All government issued, only 1 functional
		Kwale	9 mills	4.5	2.5	4 issued by Government and not working
7		Kaloleni	1 mill	0.5	0	Government issued, not working
11		Kisumu	5 mills	2.5	2.5	Ahero, Nyangande, Rabuor (private) Katito (CBO) All operational
		TOTAL	**256**	**128***	**122.5**	
		TOTAL		**194.0**	**159.5**	

Source: Ndirangu & Oyange (2019)

CARD MONITORING AND EVALUATION INDICATORS SURVEY

TOPIC GUIDE (MARCH – JUNE 2022)

Date of Interview	
Name of Institution	
Physical Location	
Name of Respondent	
Designation	
Mobile Number	
Email Address	
County	
Paddy Producing Area	

1.0 OVERALL INDICATORS

Key data source: The MoALFC has data on rice production which feeds into FAOSTAT
SSR data will be gathered from (Ministry of Trade, Industry and Enterprise Development, Kenya Revenue Authority)

1.0 OVERALL INDICATORS									
	Indicator	**Indicator Description**	**Years (Data Available)**					**Base Year (TBD)**	**Source of Data**
			2017	**2018**	**2019**	**2020**	**2021**		
1.1	**Quantity of Paddy Produced Locally**	What is the Total Quantity of Rice Produced in the last production year? *(tons)*							
		(i) Rainfed Lowland *(tons)*							
		(ii) Rainfed Upland *(tons)*							
		(iii) Under Irrigation *(tons*							
1.2	**Total Area Harvested**	(i) Rainfed Area *(Hectares)*							
		(ii) Area Under Irrigation *(Hectares)*							
		Total area harvested (Rainfed +Irrigation)							
1.3	**Yield Per Unit Area**	Average quantity of paddy grains harvested per hectare *(tons/hectare)* (*Qty of paddy produced/Area Harvested*)							
1.4	**Self-Sufficiency Rate (SSR)**	Total Quantity of Rice Produced Locally (tons)							
		Total Quantity of Rice Imported (tons)							
		Total Quantity of Rice Exported(tons)							
		SSR = (Rice Production x 100 / (Rice Production + Rice Imports – Rice Exports)).							

General Remarks

2.0 RESILIENCE

2.1 Area under irrigation

Target Respondents:

NIA, County Director of Agriculture (CDA), County Department of Irrigation, Mgt of out-grower groups)

Indicator	Indicator Description	Years (Data Available)					Base Year (TBD)	Source of Data
		2017	2018	2019	2020	2021		
Area under irrigation	Area harvested under irrigation *(Hectares)*							
	(i) Area harvested under main irrigation schemes							
	(ii) Area harvested under out-grower groups							
	(iii) Small and Micro Irrigation							
	Total Area Harvested under irrigation (Irrigation Schemes + Out-growers)							

General Remarks

2.2 Quantity of Resilient Variety Seeds

Quantity of seeds of locally preferred varieties with resilient characteristics (*Locally produced/Imported*)

Target Respondents:

(KEPHIS, KALRO, County Director of Agriculture, Mgt of Out-grower Groups)

Years (Data Available)		Name of Resilient Variety Seeds Produced Locally *(List Variety of seed)*					Base Year (TBD)	Source of Data
		1.	2.	3.	4.	5		
2017	Quantity Produced (tons)							
	Quantity adopted (tons)							
2018	Quantity Produced (tons)							
	Quantity Adopted (tons)							
2019	Quantity Produced (tons)							
	Quantity Adopted (tons)							
2020	Quantity Produced (tons)							
	Quantity Adopted (tons)							
2021	Quantity Produced (tons)							
	Quantity Adopted (tons)							
	Total							

General Remarks--

Years (Data Available)		Name of Resilient Variety Seeds Imported *(List Variety of seed)*					Base Year (TBD)	Source of Data
		1.	2.	3.	4.	5		
2017	Quantity Imported (tons)							
	Quantity Adopted (tons)							
2018	Quantity Imported (tons)							
	Quantity Adopted (tons)							
2019	Quantity Imported (tons)							
	Quantity Adopted (tons)							
2020	Quantity Imported (tons)							
	Quantity Adopted (tons)							
2021	Quantity Imported (tons)							
	Quantity Adopted (tons)							
	Total							

General Remarks

3.0 INDUSTRIALIZATION

3.1 Level of milling sector upgrading

Total Installed capacity of small-scale, medium- and large-scale mills (*2 tons/hour or larger*) *(tons/hour)*

Target Respondents: *Millers, County Director of Cooperatives, County Chamber of Commerce*

Years (Data Available)		Type/ Name of Milling Machine Installed					Base Year (TBD)	Source of Data
	Location of Mill							
2017	Total Capacity Installed (tons/hour)							
	Total Capacity Utilized (tons/hour)							
2018	Total Capacity Installed (tons/hour)							
	Total Capacity Utilized (tons/hour)							
2019	Total Capacity Installed (tons/hour)							
	Total Capacity Utilized (tons/hour)							
2020	Total Capacity Installed (tons/hour)							
	Total Capacity Utilized (tons/hour)							
2021	Total Capacity Installed (tons/hour)							
	Total Capacity Utilized (tons/hour)							
	Total							

General Remarks

3.2 Level of mechanization in production and Harvesting

73

Number of machinery available at production and harvesting stages (*Tractors and harvesters)*

Target Respondents: Rice Cooperatives, MOALFC- Mechanization Dept., Machine stakeholders

Years (Data Available)		Type/ Name of Machines in Production (Tractors)					Base Year (TBD)	Source of Data
	Size of Tractors (Horsepower)							
2017	Total Number of Tractors							
	Total Number of Tractors in Use							
2018	Total Number of Tractors							
	Total Number of Tractors in Use							
2019	Total Number of Tractors							
	Total Number of Tractors in Use							
2020	Total Number of Tractors							
	Total Number of Tractors in Use							
2021	Total Number of Tractors							
	Total Number of Tractors in Use							
	Total							

General Remarks

Years (Data Available)		Type/ Name of Combine Harvesters					Base Year (TBD)	Source of Data
	Size of Combine Harvesters (Horsepower)							
2017	Total Number of Combine Harvesters							
	Total Number of Harvesters in Use							
2018	Total Number of Combine Harvesters							
	Total Number of Harvesters in Use							
2019	Total Number of Combine Harvesters							
	Total Number of Harvesters in Use							
2020	Total Number of Combine Harvesters							
	Total Number of Harvesters in Use							
2021	Total Number of Combine Harvesters							
	Total Number of Harvesters in Use							
	Total							

General Remarks

MARKET SURVEY

4.0 COMPETITIVENESS

4.1 Share of local rice in the market
(Share of locally produced rice in the total quantity of rice procured by major retail stores. (Local vs Imported))

Target respondents:

Supermarkets, rice wholesalers, Blending Rice Millers

Date	
Name of Outlet	
Type of Outlet (Wholesaler/Supermarket/ Millers)	
Location (County/ Town/Branch)	
Name of Respondent	
Designation	
Mobile Number	

Quantity Locally Produced Rice in the Market

Years (Data Available)		Name of Local Rice Brand Procured					Base Year (TBD)	Source of Data
2017	Quantity **Locally** Produced Brands Procured (tons)							
	Quantity Sold (tons)							
2018	Quantity **Locally** Produced Brands Procured (tons)							
	Quantity Sold (tons)							
2019	Quantity **Locally** Produced Brands Procured (tons)							
	Quantity Sold (tons)							
2020	Quantity **Locally** Produced Brands Procured (tons)							
	Quantity Sold (tons)							
2021	Quantity **Locally** Produced Brands Procured (tons)							
	Quantity Sold (tons)							
	Total							

General Remarks

Quantity Imported Rice in the Market

Years (Data Available)		Name of Imported Rice Brand Procured					Base Year (TBD)	Source of Data
2017	Quantity **Imported** Brands Procured (tons)							

	Quantity Sold (tons)							
2018	Quantity **Imported** Brands Procured (tons)							
	Quantity Sold (tons)							
2019	Quantity **Imported** Brands Procured (tons)							
	Quantity Sold (tons)							
2020	Quantity **Imported** Brands Procured (tons)							
	Quantity Sold (tons)							
2021	Quantity **Imported** Brands Procured (tons)							
	Quantity Sold (tons)							
	Total							

General Remarks

4.2 **Quantity of high-yielding variety seeds**
Quantity of seeds of locally preferred varieties with high-yielding attributes, locally produced and/or imported
Target Respondents: *KEPHIS, KALRO, County Director of Agriculture (CDA)*

4.2.1 Quantity of high-yielding variety seeds – Locally Produced

Years (Data Available)		High-yielding Preferred Variety of Seeds (List variety of seed)					Base Year (TBD)	Source of Data
2017	Quantity **Locally** Produced Preferred seed (tons)							
	Quantity Used (tons)							
2018	Quantity **Locally** Produced Preferred seed (tons)							
	Quantity Used (tons)							
2019	Quantity **Locally** Produced							

78

	Preferred seed (tons)							
	Quantity Used (tons)							
2020	Quantity **Locally** Produced Preferred seed (tons)							
	Quantity Used (tons)							
2021	Quantity **Locally** Produced Preferred seed (tons)							
	Quantity Used (tons)							
	Total							

General Remarks

4.2.2 Quantity of high-yielding variety seeds – Imported

Years (Data Available)		High-yielding Preferred Variety of Seeds (List variety of seed)					Base Year (TBD)	Source of Data
2017	Quantity **Imported** Preferred seed (tons)							
	Quantity Used (tons)							
2018	Quantity **Imported** Preferred seed (tons)							
	Quantity Used (tons)							
2019	Quantity **Imported** Preferred seed (tons)							
	Quantity Used (tons)							
2020	Quantity **Imported** Preferred seed (tons)							
	Quantity Used (tons)							
2021	Quantity **Imported** Preferred seed (tons)							
	Quantity Used (tons)							
	Total							

General Remarks

5.0 EMPOWERMENT

5.1 Smallholder farmers' accessibility to financial services

The ratio of smallholder farmers having access to financial services for land preparation, seed, fertilisers, agrochemicals, spraying service teams, harvesters, threshers, and other farm inputs.

Target Respondents:
Rice Cooperatives (e.g., MRGM), Individual scheme leaders, local financial institutions

(*Check out for Financial Reports of the institution*)

Date	
Location (County/ Town/Branch)	
Name of Respondent	
Designation	
Mobile Number	

5.1.1 Farmers Accessing Financial Services by Source

Years (Data Available)		Name of Financial Institution					Base Year (TBD)	Source of Data
	Type/ purpose of financial services accessed ➔							
2017	Total Number of Farmer groups Accessing Financial Services							
	Total Number of Individual Accessing Financial Services							
2018	Total Number of Farmer groups Accessing Financial Services							
	Total Number of Individual Accessing Financial Services							
2019	Total Number of Farmer groups Accessing Financial Services							
	Total Number of Individual Accessing Financial Services							
2020	Total Number of Farmer groups Accessing Financial Services							
	Total Number of Individual Accessing Financial Services							

Years (Data Available)		Name of Financial Institution					Base Year (TBD)	Source of Data
2021	Total Number of Farmer groups Accessing Financial Services							
	Total Number of Individual Accessing Financial Services							
	Total							

General Remarks

5.2 Smallholder farmers' accessibility to technical training or services

The ratio of farmers accessing necessary technical training and extension services in rice production areas.

Target Respondents:
County Director of Agriculture (CDA), KALRO, Cooperatives (e.g., MRGM, MIAD)

(*Check out for Financial Reports of the institution*)

Date	
Location (County/ Town/Branch)	
Name of Respondent	
Designation	
Mobile Number	

5.1.1 Farmers Accessing Financial Services by Source

Years (Data Available)		Name of Public and Private Extension Service Providers					Base Year (TBD)	Source of Data
	Type/ purpose of Extension Services Accessed							
2017	Total Number of Farmer groups Accessing Extension Services							

Years (Data Available)		Name of Public and Private Extension Service Providers					Base Year (TBD)	Source of Data
	Total Number of Individual Accessing Extension Services							
2018	Total Number of Farmer groups Accessing Extension Services							
	Total Number of Individual Accessing Extension Services							
2019	Total Number of Farmer groups Accessing Extension Services							
	Total Number of Individual Accessing Extension Services							
2020	Total Number of Farmer groups Accessing Extension Services							
	Total Number of Individual Accessing Extension Services							
2021	Total Number of Farmer groups Accessing Extension Services							
	Total Number of Individual Accessing Extension Services							
	Total							

General Remarks

Mwea Rice Mills Established in 1969

Farmer delivering paddy to Mwea Rice Mill for Milling (May, 2022)

Trader weighing milled rice at MRM

MRGM Coop. Society mills and sells different grades of rice