The Third National Rice Development Strategy for Zambia - Data Collection and Analysis

Resilience
Empowerment
R E I C
Industrialization
Competitiveness

Procedural Manual

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List of Acronyms

AGRA	Alliance for a Green Revolution in Africa
AUDA-NEPAD	New Partnership for Africa's Development
CARD	Coalition for African Rice Development
CFS	Crop Forecasting Survey
FAO	Food and Agriculture Organisation
FBS	Food Balance Sheet
FBS	Food Balance Sheet
FGD	Focus Group Discussion
GM8	8th General Meeting
GRZ	Government of the Republic of Zambia
ha	Hectare
JICA	Japan International Cooperation Agency
KIIs	Key Informant Interviews
KIs	Key Informants
MoA	Ministry of Agriculture
MT	metric tonnes
NRDS	National Rice Development Strategies
PM	Procedural Manual
RICE	Resilience, Industrialization, Competitiveness and Empowerment
SSA	Sub-Saharan African
SSR	Self-Sufficiency Rate
TICAD IV	Tokyo International Conference on African Development
T-NRDS	Third NRDS

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1   Background

1.1   Role of Rice

According to the Food and Agriculture Organisation (FAO), rice is vital for the nutrition of much of the population of Asia, as well as Latin America and the Caribbean and Africa. It is central to the food security of over half of the world's population, not to mention the culture of many communities. Rice is, therefore, considered a 'strategic' commodity in many countries and is, consequently, subject to a wide range of government controls and interventions. (Food and Agriculture Organisation, 2002)

Specifically in Zambia, the Government recognises rice as one of the priority crops on the crop diversification agenda, aimed at contributing to increased production of a diverse range of agricultural commodities and products that can support households' income and food and nutrition security in a changing climate (Ministry of Agriculture and Livestock, 2014). It is anticipated that rice production will offer various cropping alternatives to farmers as opposed to relying on a single crop, namely maize (ibid). It is the third most important crop from maize and wheat and as such it is increasingly becoming an important food and cash crop in Zambia (Moono, 2015). This is evidenced by its inclusion in the National Food Balance Sheet (FBS). At producer level, it is a major source of income in four major producing provinces Northern, Muchinga, Western and Eastern. (Ministry of Agriculture, 2013 - 2022) Farmers consume 30 % to 35% of the rice, they produce, while the balance is traded through different channels though most of it is sold to private traders at the farm. (Salman, et al., 2022)

1.2   The CARD Initiative

Zambia is a member of the Coalition for African Rice Development (CARD), which is a consultative group of various donors (both bilateral and multilateral) and African/international institutions, supporting the development of the rice sector in thirty-two (32) Sub-Saharan African (SSA) countries. CARD was launched by the 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.

The CARD initiative aimed at doubling the rice production in SSA in ten years from fourteen (14) million metric tonnes (MMT) in 2008 to twenty-eight (28) MMT in 2018, thereby closing the demand-supply gap and contributing to food security as well as poverty reduction in the continent. To achieve this goal, the CARD Initiative tried to promote increased dialogue among partners interested in promoting rice sector development in SSA, leading to improved interventions, both in quantity (resources allocated) and quality (more coordination). 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. Therefore, the CARD entered its second phase in 2019, with a new target of further doubling rice production to fifty-six (56) MMT by 2030.

As a member of the CARD, the Government of the Republic of Zambia (GRZ) through the Ministry of Agriculture (MoA) has so far developed three (3) National Rice Development Strategies (NRDS), which are the implementation strategies of the CARD, namely; the First NRDS 2011 -2015, Second NRDS 2016-2020 and the Third NRDS 2022-2026 (T-NRDS). While the First and Second NRDS were developed to enhance the rice value chain, due to challenges that were identified in the sub-sector, production and productivity of rice remain low. Therefore, the T-NRDS, aims to accelerate the development of the sub-sector by driving the achievement of the objectives of increasing rice production and productivity to improve the share of locally produced rice on the market (Ministry of Agriculture, 2022a).

In the second phase, CARD focuses more on the Monitoring and Evaluation (M&E) of NRDS implementation. Thus, the CARD has developed an M&E framework (approved in the 8th General Meeting (GM8) of CARD in October 2021), applying the "RICE Approach" (Resilience, Industrialization, Competitiveness and Empowerment), a new strategic approach. The M&E framework has four (4) overall indicators, namely; production quantity, area harvested, yield, and self-sufficiency rate. Further, there are two (2) indicators for each of RICE components, totalling twelve (12) indicators.

While each CARD member country has its own NRDS M&E framework, all the member countries are requested to incorporate those twelve (12) common indicators in their M&E framework, so that CARD can monitor the progress of NRDS implementation in its member countries, using the same measures. In addition to the twelve (12) indicators, CARD also advises its members to monitor the price of rice segregated by the source; that is, imported rice or locally produced rice. Consequently, each CARD member country is to collect data and set the baseline figure for each indicator. At the same time, it is required to establish a simple methodology of data collection that makes it possible for NRDS Taskforce (TF) team to conduct M&E of their NRDS throughout the second phase of CARD up to 2030, using their own human and financial resources.

1.3 Purpose of the Manual

This procedural manual (PM) was developed after the completion of the baseline survey of the T-NRDS by documenting the process used during the survey for use in the annual reporting of the implementation of the T-NRDS.

Therefore, the purpose of this manual is to give a step-by-step guidance on how to ascertain each of the indicators under the CARD initiative.

2 Overview of the CARD M&E Indicators

This Chapter gives an overview of the indicators that are used to measure progress under the National Rice Development Strategy (NRDS) under the Coalition for African Rice Development (CARD) Monitoring and Evaluation (M&E) framework.

The first four (4) indicators are the overall indicators measuring the OUTPUT and OUTCOME level results. These indicators are; "Quantity of Paddy Production", "Total Area Harvested", "Yield per Unit Area" and "Self-Sufficiency Rate". The CARD M&E framework has applied the "Resilience, Industrialization, Competitiveness and Empowerment" (RICE) approach and under each of these four (4) components are two (2) indicators. These indicators are mainly at the INPUT and ACTIVITY levels. The additional eight (8) indicators are listed below;

1) **Resilience** ("Area under irrigation" and "Quantity of resilient variety seeds");
2) **Industrialisation** ("Level of milling sector upgrading" and "Level of mechanization in production");
3) **Competitiveness** ("Share of local rice in the market" and "Quantity of high-yielding variety seeds"); and,
4) **Empowerment** ("Smallholder farmers' accessibility to financial services" and "Smallholder farmers' accessibility to technical training or services")

Table 2-1 below is a summary of the CARD M&E framework indicators for the NRDS.

Table 2-1: NRDS M&E Indicators

CARD M&E Framework	Indicator	Definition (Unit)	Indicator Level
Overall	1. Quantity of paddy production	Paddy rice produced in a year (metric tonnes - MT)	Output Level
	2. Total area harvested	Rice-harvested area (hectares - ha)	Output Level
	3. Yield per unit area	Paddy rice harvested per hectare of land (MT/ha)	Output Level
	4. Self-sufficiency rate	The percentage of rice consumed that is locally produced (%)	Outcome Level
Resilience	1. Area under irrigation	Area under rice cultivation with supplementary irrigation that could mitigate the negative impacts of weather fluctuations on rice production (ha)	Activity Level
	2. Quantity of resilient variety seeds	Quantity of seeds of locally preferred varieties with resilient characteristics, locally produced and/or imported annually (MT)	Input Level
Industrialization	1. Level of industrial milling capacity	Ratio of installed capacity of medium and large mills among all functional mills (%)	Input Level

CARD M&E Framework	Indicator	Definition (Unit)	Indicator Level
	2. Level of mechanization in production	Number of machines available for ploughing and harvesting in rice producing areas (Number)	Input Level
Competitiveness	1. Share of local rice in the market	Share of locally produced rice in the total quantity of rice procured by major retail stores (%)	Output Level
	2. Quantity of high-yielding variety seeds	Quantity of seeds of locally preferred varieties with high-yielding attributes, locally produced and/or imported (MT)	Input Level
Empowerment	1. Smallholder farmers' accessibility to financial services	Ratio of smallholder farmers having access to financial services (%)	Input Level
	2. Smallholder farmers' accessibility to technical training or services	Ratio of farmers accessing necessary technical training and services in rice production areas (%)	Input Level

It is these twelve (12) indicators that Zambia needs to report on annually to the CARD Secretariate to ascertain the progress being made under the Third NRDS (T-NRDS). Appendix 1 gives the description of these indicators in full.

In addition to the twelve (12) CARD indicators, the M&E framework also collects the prices of rice differentiating between locally produced rice and imported rice.

In addition to the in-depth explanation of the indicators, the PM has also attached the data collection tools that were used during the baseline as Appendix 2.

3   **Determination of the Indicators**

This chapter looks at the main sources of data for the annual CARD reporting and if need be, the step-by-step calculation that results into an indicator. One of the objectives of the CARD reporting framework is to use as much secondary data as possible, this data should be reliable and produced at least annually to allow for the CARD annually reporting.

3.1   **Main Secondary Data Sources**

Most of the indicators are related to information collection from the Crop Forecasting Survey (CFS) and the Post-Harvest Survey (PHS), it is therefore imperative that the procedural manual (PM) gives a brief insight into the two (2) reports from the MoA.

3.1.1   *The Crop Forecasting Survey*

The Ministry of Agriculture (MoA) in collaboration with the Zambia Statistics Agency (ZamStats) conducts the Crop Forecasting Survey (CFS) every year covering the Small and Medium Scale farming households and large-scale farms. Crop forecasting is an estimate of the most likely production and yields of the crop based on crop conditions and weather forecast.

For an example of the methodology used, the 2021/2022 CFS captured the large-scale farms on a 100 percent enumeration basis while small and medium scale farmers were covered on a sample basis in 680 Enumeration Areas (EAs) drawn from an estimated 16,000 EAs which make up the agricultural sampling frame. At household level, 20 households are covered out of an average of 100-150 households per EA. (Ministry of Agriculture, 2022b)

For confidence in the survey, it should be noted that the Zambia Statistics Agency (ZamStats) was established in 2018 under the Statistics Act, 2018 as the sole designated entity responsible for the publication of official statistics. The Agency is also responsible for the development and coordination of an Integrated National Statistical System. The website is www.zamstats.gov.zm.

The CFS estimates the most likely production and yields of the crop based on crop conditions and weather forecast. It also provides information on farmland and use, crop production, fertiliser acquisition and application, seed type and source, expected crop sales, and the food security position. Therefore, in relation to this baseline survey, and the subsequent data collection by the NRDS, the CFS is a vital report.

3.1.2   *The Post-Harvest Survey*

The Post-Harvest Survey (PHS) is an assessment of the actual performance of the agricultural sector. The PHS gives definite data against the CFS which is more of a projection. However, the challenge with the PHS is that its frequency is not guaranteed. The infrequency is exhibited by the fact prior to the current compilation, the last PHS was for the season 2014/2015. Nonetheless, the 2021/2022 PHS results were published by ZamStats in their February 2023 monthly bulletin (Zambia Statistics Agency, 2023), and the baseline survey was able to use those figures in lieu of the CFS. The Baseline Survey was guided that for years where the PHS was available, it would supersede the CFS as was the case for the baseline year of 2022.

Other data can be sourced from the; Technical Services Branch (TSB) under the MoA, the MoA Extension Services, SCCI and ZRA as indicated in Appendix 3.

3.2 Overall 1. Quantity of Paddy Production

3.2.1 Indicator Data Source
The indicator for paddy production is already recorded as it is in both the CFS and the PHS. There is no need for further calculation. The CFS is produced annually by the MoA making it accessible to the TF for annual reporting.

3.2.2 Indicator Recommendation
The CFS is an estimate should only be used in the years where the PHS has not been conducted by the MoA and ZamStats.

3.3 Overall 2. Total Area Harvested

3.3.1 Indicator Data Source
The indicator for total area harvested is already recorded as it is in both the CFS and the PHS. There is no need for further calculation. The CFS is produced annually by the MoA making it accessible to the TF for annual reporting.

3.3.2 Indicator Recommendation
The CFS is an estimate should only be used in the years where the PHS has not been conducted by the MoA and ZamStats. Care should be taken to not use the "Area Planted" when measuring the CARD indicator but to use the "Area Harvested."

3.4 Overall 3. Yield Per Unit Area

3.4.1 Indicator Data Source
For analysis of this indicator, it was established that the CARD formula being used was;

$$Yield\ (MT/ha) = \frac{\text{Paddy Rice Harvested (MT)}}{\text{Area Harvested (ha)}}$$

Equation 3-1: Yield Rate

Therefore, the CFS/PHS data which provides information on the paddy rice harvested and the area harvested will suffice as a means for calculating the yield per unit area. The numerator is Overall Indicator 1 and the denominator is Overall Indicator 2.

3.4.2 Indicator Recommendation
The CFS is an estimate should only be used in the years where the PHS has not been conducted by the MoA and ZamStats.

3.5 Overall 4. Self-Sufficiency Rate

3.5.1 Indicator Data Source
According to the CARD, the self-sufficiency rate (SSR) at the initiative level will be calculated using the following formula;

$$Self\ Sufficiency\ Rate\ (\%) = \frac{\text{Milled Rice Produced (MT)}}{(\text{Milled Rice Produced (MT)} + \text{Milled Rice Imported (MT)} - \text{Milled Rice Exported (MT)})}$$

Where milled rice is not available, it can be calculated from paddy rice as below;

$$Milled\ Rice\ (MT) = Paddy\ Rice\ (MT) * 0.667$$

This is as guided by CARD on their website; https://riceforafrica.net (CARD, 2023)

3.5.2 *Indicator Recommendation*

Based on the above, the data sources for this indicator are PHS and CFS as reliable sources for rice produced and the import/export data from the ZRA. For ease of identification in the import/export data, the national codes for the rice are as follows; rice in the husk, paddy or rough (10061000), Husked (brown) rice (10062000) and Semi-milled or wholly milled rice (10063000). This analysis did not include broken rice (10064000).

3.6   Resilience 1. Area Under Irrigation

3.6.1 *Indicator Data Source*

The data source for this indicator are surveys. As was established by the T-NRDS baseline survey.

3.6.2 *Indicator Recommendation*

It is highly recommended that while the MoA is conducting its annual CFS and/or the PHS survey, this indicator is measured by including the query to the farmer of how much of their rice field is irrigated. With these Reponses, no further calculations will be required apart from the total size of the areas. This indicator is mainly for supplementary irrigation as is by its definition.

3.7   Resilience 2. Quantity of Resilient Variety Seeds

3.7.1 *Indicator Data Source*

The current data source are the certified seed growers from the SCCI.

3.7.2 *Indicator Challenge*

Regarding the indicator of how many tonnes of each seed variety was grown, this is currently calculated using the proxy data from the SCCI. This could not be determined from the farmers and MoA extension staff as it is not recorded at the time of planting. Mainly, the problem lies with farmers using recycled seed which over the years may even have been "contaminated" with other varieties.

3.7.3 *Indicator Recommendation*

The recommendation from the survey is that while the MoA is conducting the CFS and/or the PHS, the variety of seed planted, is also recorded.

3.8   Industrialization 1. Level of Industrial Milling Capacity

3.8.1 *Indicator Data Source*

The data source for the various capacities of milling in the areas was from inspection by the survey with the MoA Extension Services and the MoA Technical Services Branch (TSB).

Using CARD guidelines, this indicator is supposed to be measured as;

$$Level\ of\ Industrial\ Milling\ Capacity\ (\%) = \frac{Capcaity\ of\ Millers\ Milling\ Above\ 2\ MT/hr}{Total\ Capacity\ of\ Millers\ Sampled}$$

Care should be taken to ensure that the summation for both the numerator and denominator are not the number of mills, but the milling capacities. Using the data collected under the T-NRDS baseline of the eleven mills, the numerical equivalent would be;

$$Level\ of\ Industrial\ Milling\ Capacity\ (\%) = \frac{3.13 + 2.5 + 3.13}{3.13 + 0.25 + 1.13 + 0.63 + 2.5 + 3.13 + 0.42 + 0.63 + 0.63 + 0.38 + 0.31}$$

Equation 3-5: Level of Industrial Milling Capacity Calculated

This gives a ratio of 8.76 :13.14 resulting in a percentage of 66.7%.

3.8.2 *Indicator Recommendation*

For a national representation, it is suggested that while the MoA extension services are conducting visits in their areas of operation, this data can be collected from the rice milling firms in these areas. Alternatively, or supplementary, the surveys can get data from the Technical Services Branch (TSB) of the MoA. Summation of the data from these two (2) sources would give a national wide based indicator

3.9 Industrialization 2. Level of Mechanisation in Production

3.9.1 *Indicator Data Source*

The data source is the MoA Extension Services and the TSB.

3.9.2 *Indicator Challenge*

The T-NRDS baseline was challenged in that there was limited area covered in relation to the whole country.

3.9.3 *Indicator Recommendation*

For annual CARD reporting, it is suggested that while the MoA extension services and the TSB are conducting visits in their areas of operation, the level of mechanisation through the rice growing stages (planting, harvesting and even threshing) can be recorded. Another solution would be the CFS and/or the PHS adding these parameters for monitoring as the surveys are being carried out. This would ensure annual and reliable data collection. The CFS can capture level of mechanisation at land preparation, planting and weeding stages of rice production while the PHS can capture data from harvesting to threshing stages.

Further, it was agreed with the TF and the CARD that the equipment need not be specific to rice only, but any rice-applicable equipment that is being used for other crops as well.

3.10 Competitiveness 1. Share of Local Rice in the Market

3.10.1 *Indicator Data Source*

According to the CARD indicators, the share of local rice in the market should be established by the sales data obtained from the major retail stores in Zambia compared to rice produced as indicated below;

$$Share\ of\ Local\ Rice\ in\ the\ Market\ (\%) = \frac{Locally\ Produced\ Rice\ Sold\ in\ the\ Retail\ Stores\ (MT)}{All\ Rice\ Sold\ in\ Retail\ Stores\ (MT)}$$

Equation 3-6: Share of Local Rice in the Market

3.10.2 *Indicator Challenge*

The T-NRDS baseline made several attempts to obtain this data from the retail stores but it proved challenging. This might be the case for follow up annual reporting.

3.10.3 *Indicator Recommendation*

It is recommended that the MoA request the rice sales data from the retail stores to provide a more authoritative request. This will give an accurate value of the indicator as it also shows preference.

The baseline and the MoA attempted to obtain sales data from the retail stores, however, by the time of the conclusion of the baseline, this data was not available. With approval from the CARD, the baseline calculated this indicator by assessing the samples found in the stores visited and calculating the percentage of local rice brands compared the total rice brands in the stores.

Using observational data, a table of different rice brands and packages on the shelves in the sampled stores was compiled and then the following formula was applied;

$$Share\ of\ Local\ Rice\ in\ the\ Market\ (\%) = \frac{\text{Unique Number of Locally Produced Rice Brands and Package Sizes on the Shelves}}{\text{Total Unique Number of All Rice Brands and Package Sizes on the Shelves}}$$

Equation 3-7: Share of Local Rice in the Market (Baseline Alternative)

3.11 Competitiveness 2. Quantity of High-Yielding Variety Seeds

3.11.1 *Indicator Data Source*

The current data source are the certified seed growers from the SCCI.

3.11.2 *Indicator Recommendation*

The recommendation from the survey is that while the MoA is conducting the CFS, the variety of seed planted, is also recorded.

3.12 Empowerment 1. Smallholder Farmers' Accessibility to Financial Services

3.12.1 *Indicator Data Source*

This data can be obtained from the farmers directly and the MoA extension who can record this data. This would simply be, how many farmers had access to financial services for their rice production.

3.12.2 *Indicator Recommendation*

It is therefore recommended for continuous and reliable data collection for this indicator that the MoA extension services starts to record the aspects of financial accessibility to the small-scale farmers as regards their rice production.

3.13 Empowerment 2. Smallholder Farmers' Accessibility to Technical Training and Services

3.13.1 Indicator Data Source

This data is obtained from the farmers directly and the MoA extension record this data. This data is; how many farmers had access to technical services and training for their rice production.

3.13.2 Indicator Recommendation

It is therefore recommended for continuous and reliable data collection for this indicator that the MoA extension services starts to record the aspects of technical training and services accessibility to the small-scale farmers.

3.14 Findings - Retail Prices of Rice in Zambia

3.14.1 Indicator Data Source

This data is found from retail stores. The T-NRDS just sought permission from the stores to take pictures and recorded the prices of different sizes and brands of rice.

The data is then segregated into locally produced rice and imported rice then further broken down into package sizes for effective comparison.

An example is the result of the T-NRDS is as below;

Table 3-1: Average Prices of Rice Per Package Size

Weight (kg)	Imported (ZMW)	Local (ZMW)	Imported (US $)[1]	Local (US $)
0.5	ZMW 38.28	ZMW 16.00	$1.91	$0.80
1	ZMW 56.66	ZMW 28.42	$2.83	$1.42
2	ZMW 70.67	ZMW 58.49	$3.53	$2.92
2.5	ZMW 88.03	ZMW 72.60	$4.40	$3.63
5	ZMW 136.48	ZMW 132.77	$6.82	$6.63
10	ZMW 303.32	ZMW 241.99	$15.15	$12.09

The conversion from Zambian Kwacha (ZMW) to United States Dollars ($) makes it easy for the comparison between different countries under the CARD initiative. The rate is the average mid-rate of the day(s) of collection of the data, as obtained from the Bank of Zambia (BOZ) website; https://www.boz.zm

4 Conclusion

It should be noted that the twelve (12) indicators under the CARD initiative are not exhaustive and each member country can develop more indicators for further guidance of the implementation of their NRDS.

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[1] [1] The conversion rate was US $ 1 = ZMW 20.0229 as indicated by the Bank of Zambia average mid-rate on Friday, 03rd March 2023. (Bank of Zambia, 2023)

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6   Appendix 1: CARD Indicators

6.1   Overall Indicators and Targets

The CARD M&E framework as four (4) overall indicators and they are each briefly explained below.

6.1.1   Overall 1. Quantity of paddy production

Quantity of paddy production is the sum of paddy produced in a given year in different ecologies. The CARD has set the target of fifty-six (56) million metric tonnes (MMT) produced by the year 2030 by all Sub-Saharan African (SSA) countries. This will be measured from the twenty-eight (28) MMT from 2018. According to the CARD;

> *CARD Phase2 just started in 2019, with a renewed target of further doubling of rice production in SSA, from 28 million to 56 million MT for the next 12 years (by 2030). (CARD, 2022a)*

In the case of Zambia, according to the CARD, the Phase 2 baseline figure was 43,063 MT and this meant to be doubled to 86,126 MT by the year 2030. (CARD, 2022b).

According to the T-NRDS, the target is to increase the rice production in Zambia up to 44,376 MT (paddy rice) by 2026. (Ministry of Agriculture, 2022a, p. 12). This is against the backdrop of the production figures falling to 34,630 MT in 2020. (CARD, 2022b)

6.1.2   Overall 2. Total Area Harvested

Total area harvested is the sum of rice-harvested area from all rice-growing ecologies. According to the CARD M&E framework, the 2030 target for the SSA countries is 18.7 million hectares (Mha), this is from a 2020 achievement of 16.6 Mha.

For Zambia, the 2020 area was 24,756 hectares (ha), a drop from the Phase 2 baseline figure of 30,297 ha. The CARD 2030 target has been set at 41,507 ha. The MoA has a 2026 target of increasing this to 38,375 ha under the -NRDS.

6.1.3   Overall 3. Yield Per Unit Area

This indicator is basically the average quantity (in weight) of paddy grains harvested per hectare of land. For the SSA, from the 2020 value of 1.98 metric tonnes per hectare (MT/ha), the 2030 target is set for 3.00 MT/ha.

The Zambian case is that in 2020, this was measured to be 1.40 MT/ha with the CARD 2030 target being 2.07 MT/ha. Through the T-NRDS, the MoA aims for this to be 1.35 MT/ha by the year 2026.

6.1.4   Overall 4. Self-Sufficiency Rate

This indicator measures the; quantity of milled rice produced / (quantity of milled rice produced + quantity of milled rice imported– quantity of milled rice exported). This is;

$$x = \frac{a}{(a + b - c)}$$

Where;

x = Self-Sufficiency Rate (in percentage)

a = milled rice

b = imported rice

c = exported rice

The CARD M&E framework does not set a target for the SSA countries but encourages member countries to set their own targets.

6.2 R.I.C.E. Indicators

In Phase 2 of the CARD, the new approach called R.I.C.E. is adopted and hence measuring progress on the four aspects of; Resilience, Industrialization, Competitiveness and Empowerment, becomes imperative. Therefore, the following indicators, two for each component, are considered as important indicators for the rice sector development in each member country under the CARD initiative. These indicators make it possible to follow the changes in the entire rice value chain in the process of NRDS implementation, while the overall indicators mentioned in the previous section follow the changes in the OUTPUT and/or OUTCOME. With the RICE indicators, we can understand how we are approaching the set targets, that is the required INPUTS and/or ACTIVITIES.

The target figures for RICE indicators are to be set by each country. For each RICE indicator, the figures at the regional and initiative levels are derived by totalling the figures of corresponding member countries, as shown in the table above.

6.2.1 Resilience 1. Area under irrigation

Definition: Area under rice cultivation with supplementary irrigation that could mitigate the negative impacts of weather fluctuations on rice production (ha)

The area of rice field under irrigation is the sum of rice fields with water control. This data can be obtained in reports from agricultural statistics departments at the national level. Data can be collected at the end of rice production season(s). Where double cropping is practiced under irrigation, areas for both seasons should be counted.

6.2.2 Resilience 2. Quantity of resilient variety seeds

Definition: Quantity of seeds of locally preferred varieties with resilient characteristics, locally produced and/or imported annually (ton)

This indicator is a proxy to the area under cultivation of resilient varieties. It aims 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.

6.2.3 Industrialization 1. Level of industrial milling capacity

Definition: Ratio of installed capacity of medium and large mills among all functional mills (%)

This indicator is to assess the level of industrialization by following the level of upgrading the milling sector. It is to be 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, can be considered as a major drive for industrialization of the whole rice value chain.

6.2.4   Industrialization 2. Level of mechanization in production

Definition: Number of machines available for ploughing and harvesting (in rice producing areas) (unit)

This indicator is to assess 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. Tractors can be used for other crops as well. Therefore, we limit the areas to be questioned to what the country regards rice producing areas. By doing so, we can more accurately count tractors meant for rice, not for other crops.

6.2.5   Competitiveness 1. Share of local rice in the market

Definition: Share of locally produced rice in the total quantity of rice procured by major retail stores (%)

This indicator is to assess the competitiveness of local rice compared to imported rice. It will be measured using the share of local rice in the total quantity of rice procured by pre-selected major retail stores. The assumption is that a supermarket store captures the best the value of both the local and imported rice to consumers. The data will be obtained through a survey at the major retail stores (especially pre-selected supermarkets).

6.2.6   Competitiveness 2. Quantity of high-yielding variety seeds

Definition: Quantity of seeds of locally preferred varieties with high-yielding attributes, locally produced and/or imported (ton)

The previous indicator "Competitiveness 1" which measures the ratio of local rice and imported rice to roughly see local rice's competitiveness, covers multiple aspects of consumer preference over rice such as taste, aroma, colour, price and so forth. On the other hand, this "Competitiveness 2" 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 and also it entails increase in importation which might have an effect on self-sufficiency.

We therefore follow the level of availability of seeds of high-yielding varieties (HYV). Higher yield lowers the unit costs of production, which in turn can increase local supply and market share of local rice. This may also hold the potential to reduce retail prices and thereby increase the market competitiveness of the local rice. The more high-yielding varieties are adopted, the greater the competitiveness of local rice over the imported rice.

6.2.7   Empowerment 1. Smallholder farmers' accessibility to financial services

Definition: Ratio of smallholder farmers having access to financial services (%)

This indicator is to measure the capacity of smallholder rice farmers over investing in their farming operations, evaluated by the degree of their access to financial services that can support and upgrade their rice production system.

6.2.8   Empowerment 2. Smallholder farmers' accessibility to technical training and services

Definition: Ratio of farmers accessing necessary technical training and services in rice production areas (%)

This indicator is to assess the level of extension service accessible to rice farmers. Availability of irrigated fields and better inputs like seeds can help produce more paddy if they are guided by appropriate technological backstopping which is normally provided by the public

extension system. This indicator should try to capture not only the extension services by the public but also by private sectors. The data is to be collected from rice producing areas.

7 Appendix 2: Data Collection Tools

7.1 Key Informant Interviews

A. IDENTIFICATION

Name of Institution: .... Date: DD/MM/YYYY
Name of KI: ………...…………………………… KI Contact Number ....
District……………………………………………Town…………………………………………………….
Questionnaire ID: …………………………… Enumerator's name: …………………………

B. OVERALL

1.	Gender of respondent	1. Male 2. Female
2.	What is your position?	
3.	How long have you served in this capacity?	
4.	Do you have paddy rice farmers in this district?	
5.	How many MTs of paddy rice do they produce on average per year?	
6.	What is the districts average total area harvested for paddy rice?	
7.	What are some of the determining factors for the MTs of the paddy rice they produce?	
8.	What are the main paddy rice producing areas in the district?	

C. RESILIENCE

9.	What are the main sources of water for paddy rice production in the district?	1. Rain-fed Lowland (Flood plans) 2. Rain-fed Upland (Including seasonal dambos) 3. Irrigated Lowland
10.	What seed varieties do the paddy rice farmers use in this district?	1. Rain-fed lowland rice varieties 2. Upland rice varieties 3. Lowland rice varieties
11.	a) What are some of the main varieties of seeds used by paddy rice farmers in the district? b) Why would you say they use those particular varieties?	
12.	Are the seed varieties they use climate-resilient?	1. YES 2. NO

13.	In the face of climate change would you say paddy rice farmers in the district are prepared for weather fluctuations? Explain your answer	1. YES 2. NO
14.	Would you say the seed varieties used by the paddy rice farmers are high yielding? Please explain why	1. YES 2. NO
15.	a) Have the rice farmers ever experienced pest outbreaks in the district? b) If YES, are they able to handle pest outbreaks? c) If YES, what measures have you put in place in order to enable the rice farmers to handle the pest outbreaks?	1. YES 2. NO 1. YES 2. NO

D. INDUSTRIALIZATION

16.	a) Do paddy rice farmers in this district have machinery for the production of rice? If YES, what machinery do they have and what do they use it for? (Ploughing and harvesting)	1. YES 2. NO
17.	a) Do some of the paddy rice farmers own rice hammer mills? b) If YES, how would you categorize the rice hammer mills they own (small, medium or large scale)? c) If NO, are there rice hammer mills or milling companies within the proximity of the paddy rice farmers? If YES please indicate names of milling companies)	1. YES 2. NO
18.	Do the paddy rice farmers in the district own tractors that they use for rice production?	1. YES 2. NO

E. COMPETITIVENESS

19.	Who do the paddy rice farmers sell/supply their rice to?	1. Marketeers 2. Major retail stores 3. Milling companies 4. Government (e.g. FRA, DMMU)

20.	Compared to imported rice would you say the price of local rice is priced at a reasonable amount? Explain your answer	1. YES 2. NO

F. EMPOWERMENT

21.	a) Would you say paddy rice farmers in this district have access to financial services that can support and upgrade their rice production system? b) If YES from who? c) What form of financial services?	1. YES 2. NO
22.	a) Do the paddy rice farmers in this district receive financial services through input support? b) If YES who provides these inputs and what inputs are they given?	1. YES 2. NO
23.	a) Do the paddy rice farmers in this district have access to technical training and services towards their production of rice? b) If YES who provides these trainings?	1. YES 2. NO
	c) Have the paddy rice farmers been trained on how to practice climate smart farming techniques towards rice production?	1. YES 2. NO
	d) If YES who trained them	

End of Interview
Thank you for participating.

7.2 Farmers

A. IDENTIFICATION

Name of District: ………………………………… Name of Town: ....

Questionnaire ID: …………… Date: DD/MM/YYYY Enumerator's name: ……………………

B. OVERALL

1.	Gender of respondent	1) Male 2) Female
2.	How long have you been farming rice?	1) Less than a year 2) 1 – 5 years 3) 6 – 10 years 4) > 10 years
3.	How many MTs of paddy rice do you produce on average per year?	
4.	What is your average total area harvested for paddy rice?	
5.	What are some of the determining factors for the MTs of the paddy rice you produce?	

C. RESILIENCE

6.	What source of water do you use when it comes to rice production?	1. Rain-fed Lowland (Flood plains) 2. Rain-fed Upland (Including seasonal dumbos) 3. Irrigated Lowland
7.	What seed varieties do you use?	1. Rain-fed lowland rice varieties 2. Upland varieties 3. Lowland varieties
8.	a) What brand of seeds do you use? b) Why do you use that particular brand?	
9.	Are the seed varieties you use climate-resilient?	1. YES 2. NO
10.	In the face of climate change would you say you are prepared for the weather fluctuations? Explain your answer	1. YES 2. NO
11.	a) Have you ever experienced pest outbreaks? b) If YES, are you able to handle pest outbreaks? c) If YES what measures have you put in place in order to be able to handle pest outbreaks?	1. YES 2. NO 1. YES 2. NO

D. INDUSTRIALIZATION

12.	a) Do you have machinery that you use for the production of rice? b) If YES, what machinery do you have and what do you use it for? (Ploughing and harvesting)	1. YES 2. NO
13.	a) Do you have a rice hammer mill?	1. YES 2. NO

	b) What is its capacity of tons/hour?	
	c) If NO, are there rice hammer mills or milling companies within your proximity? If YES please indicate names of milling companies	

E. COMPETITIVENESS

14.	Who do you sell/supply your rice to?	1. Marketeers 2. Major retail stores 3. Milling companies 4. Government (e.g. FRA, DMMU)
15.	Compared to imported rice would you say the price of local rice is priced at a reasonable amount? Explain your answer	1. YES 2. NO
16.	Are the seed varieties you use high yielding? Please explain why	1. YES 2. NO
17.	Quantity of high-yielding variety seeds	

F. EMPOWERMENT

18.	a) Would you say you have access to financial services that can support and upgrade your rice production system? b) If YES from who? c) What form of financial services?	1. YES 2. NO
19.	a) Do you receive financial services through input support? b) If YES who provides these inputs and what inputs are you given?	1. YES 2. NO
20.	a) Do you have access to technical training and services towards your production of rice? b) If YES who provides these trainings? c) What did you learn from these trainings? d) Have you been trained on how to practice climate smart farming techniques towards rice production? e) If YES who trained you	1. YES 2. NO 1. YES 2. NO

End of Interview
Thank you for participating.

7.3 Milling Companies

A. IDENTIFICATION

Name of District: …………………………………… Name of Town: ....

Questionnaire ID: …………… Date: DD/MM/YYYY Enumerator's name:
…………………………

B. OVERALL

1.	Gender of respondent	1) Male 2) Female
2.	What is the milling capacity (MT / hour)	
3.	Purpose of the milling	1. Milling for resale by miller 2. Milling for others
4.	Who do you buy the paddy rice from?	1. Small scale farmers 2. Large scale farmers 3. Food Reserve Agency 4. Government (e.g. ZARI)
5.	Who does the aggregation of the paddy rice?	1. Miller 2. Farmers 3. Food Reserve Agency
6.	Who do you sell/supply your rice to?	1. Marketeers 2. Major retail stores 3. Milling companies 4. Government (e.g. FRA, DMMU) 5. Farmers In Need of Milling
7.	Compared to imported rice would you say the price of local rice is priced at a reasonable amount? Explain your answer	1. YES 2. NO

End of Interview
Thank you for participating.

7.3 Milling Companies

7.4 Agricultural Research Institutes

A. IDENTIFICATION

Name of Institution: .... Date: DD/MM/YYYY

Name of KI: ………....……………………… KI Contact Number ....

District……………………………………Town……………………………………………

Questionnaire ID: …………………………… Enumerator's name: …………………………

B. OVERALL

1.	Gender of respondent	1. Male 2. Female
2.	What is your position?	
3.	How long have you served in this capacity?	

C. RESILIENCE

4.	What are the main sources of water for paddy rice production in the district?	1. Rain-fed Lowland (Flood plans) 2. Rain-fed Upland (Including seasonal dambos) 3. Irrigated Lowland
5.	What seed varieties do the paddy rice farmers use in this district?	1. Rain-fed lowland rice varieties 2. Upland rice varieties 3. Lowland rice varieties
6.	a) What are some of the main brands of seeds used by paddy rice farmers in the district? b) Why would you say they use those particular brands?	
7.	Are the seed varieties they use climate-resilient?	1. YES 2. NO
8.	In the face of climate change would you say paddy rice farmers in the district are prepared for weather fluctuations? Explain your answer	1. YES 2. NO
9.	Would you say the seed varieties used by the paddy rice farmers are high yielding? Please explain why	1. YES 2. NO
10.	a) Have the rice farmers ever experienced pest outbreaks in the district? b) If YES, are they able to handle pest outbreaks? c) If YES, what measures have you put in place in order to enable the rice farmers to handle the pest outbreaks?	1. YES 2. NO 1. YES 2. NO

D. INDUSTRIALIZATION

11.	a) Do paddy rice farmers in this district have machinery for the production of rice? If YES, what machinery do they have and what do they use it for? (Ploughing and harvesting)	1. YES 2. NO
12.	a) Do some of the paddy rice farmers own rice hammer mills? b) If YES, how would you categorize the rice hammer mills they own (small, medium or large scale)? c) If NO, are there rice hammer mills or milling companies within the proximity of the paddy rice farmers? If YES please indicate names of milling companies)	1. YES 2. NO
13.	Do the paddy rice farmers in the district own tractors that they use for rice production?	1. YES 2. NO

E. EMPOWERMENT

14.	a) Do the paddy rice farmers in this district have access to technical training and services towards their production of rice? b) If YES who provides these trainings? c) Have the paddy rice farmers been trained on how to practice climate smart farming techniques towards rice production? d) If YES who trained them	1. YES 2. NO 1. YES 2. NO

End of Interview
Thank you for participating.

8 Appendix 3: Baseline Data Collection Matrix

The main data sources of the baseline survey are tabulated below indicating which indicator information is available in the data source and the organisation to obtain the data from. As per Zambian communication norm, request for this data will have to be made to the controlling officer of each of the organisations.

Table 8-1: Data Collection Matrix

CARD M&E Framework	Indicator	Main Data Source	Organisation (Officer)
Overall	1. Quantity of paddy production	CFS / PHS	MoA (Permanent Secretary)
	2. Total area harvested	CFS / PHS	MoA (Permanent Secretary)
	3. Yield per unit area	CFS / PHS	MoA (Permanent Secretary)
	4. Self-sufficiency rate	CFS / PHS Rice Import/Export Data	MoA (Permanent Secretary) Zambia Revenue Authority (Commissioner General)
Resilience	1. Area under irrigation	CFS / PHS	MoA (Permanent Secretary)
	2. Quantity of resilient variety seeds	SCCI Database	SCCI (Director)
Industrialization	1. Level of Industrial Milling Capacity	MoA Extension Services MoA Technical Services Branch	MoA (Permanent Secretary)
	2. Level of mechanization in production	MoA Extension Services MoA Technical Services Branch	MoA (Permanent Secretary)
Competitiveness	1. Share of local rice in the market	Retails Stores	Store Managers
	2. Quantity of high-yielding variety seeds	SCCI Database	SCCI (Director)
Empowerment	1. Smallholder farmers' accessibility to financial services	MoA Extension Services	MoA (Permanent Secretary)
	2. Smallholder farmers' accessibility to technical training or services	MoA Extension Services	MoA (Permanent Secretary)

For the collection of rice prices from the retail stores, these can be obtained from the stores as per Indicator C1, from the store managers.