THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF
AGRICULTURE

Japan International
Cooperation Agency

NATIONAL RICE DEVELOPMENT STRATEGY PHASE II

(NRDS II)
2019-2030






JULY, 2019

FOREWORD

Tanzania's commitment to address the food and nutrition security issues is well reflected in the Long Term Perspective Plan, National Five Year Development Plan, National Agriculture Policy 2013, Tanzania Agriculture Food Security Investment Plan, and Agricultural Sector Development Plan Phase Two. These national and sectoral development frameworks envisage the agriculture sector growth of up to 7.6 % by year 2020. In view of the foregoing, the Government's commitment is to transform the agriculture from the current subsistence farming towards commercialization and modernization. This will be attained through crop intensification, diversification, technological advancement and development of supporting production and marketing infrastructures.

The transformation requires integrated and collective efforts to improve institutions and policies as well as technical know-how involved in production and marketing of agricultural produces. In response to these trends, the Government of Tanzania is implementing Sustainable Development Goals (SDGs) globally agreed targets of addressing poverty, hunger, employment and economic growth by the year 2030.

The second phase of National Rice Development Strategy (NRDS II) has been prepared through a participatory approach involving various rice development actors along the rice value chains. I hope that the twelve years implementation of this strategy will sustain rice self-sufficiency, contribute to the regional self-sufficiency, enable rice market leadership, and inject competitiveness through significant improvements in terms of quality, quantity and value of the rice produced in Tanzania.

In this respect, it gives me great pleasure to present the NRDS II to all stakeholders in rice development. The implementation of NRDS II will involve all stakeholders from public, private, development partners, farmers, financial institutions and non-state actors.

I would like to urge all the stakeholders to bring their collective strengths to pursue the rice initiative transformation agenda which, without doubt, will contribute significantly to the country's development targets. It is necessary therefore that the NRDS II interventions are shared and supported by all stakeholders in the rice development and each one of us in our different capacities to implement the NRDS II in order to achieve the goals we have set for industrial development.

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Permanent Secretary
Ministry of Agriculture

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Lastly but not least, great appreciation is directed to all who contributed and supported the formulation exercise in various ways.

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List of abbreviations

AGRA:	Alliance for Green Revolution in Africa
ASA:	Agriculture Seed Agency
ASDP:	Agricultural Sector Development Programme
ASDS:	Agriculture Sector Development Strategy
ASLMs:	Agriculture Sector Lead Ministries
AU:	African Union
BRiTEN:	Building Rural Incomes Through Entrepreneurship
CAADP:	Comprehensive Africa Agriculture Development Programme
CAMARTEC:	Centre for Agriculture Mechanization and Rural Technology
CAP-F:	Country Agribusiness Partership Framework
CARD:	Coalition for African Rice Development
CET:	Common External Tariff
CORDEMA:	Client Oriented Research and Development Management Approach
DADP:	District Agricultural Development Plan
DAP:	Di Ammonium Phosphate
DIDF:	District Irrigation Development Fund
EAC:	East Africa Community
ESA:	Eastern and Southern Africa
FYDP:	Five Year Development Plan
GAP:	Good Agriculture Practices
GDP:	Growth Domestic Product
GF:	Guarantee Fund
IPM:	Intergrated Pest Management
IOs:	Irrigators' Organizations
IWRM:	Integrated Water Resource Management

KATC:	Kilimanjaro Agricultural Training Centre
KPL:	Kilombero Plantation Limited
LGA:	Local Government Authorities
LTPP:	Long Term Perspective Plan
MAFC:	Ministry of Agriculture Food Security and Cooperatives
MATI:	Ministry of Agriculture Training Institute
MOA:	Ministry of Agriculture
MoFP:	Ministry of Finance and Planning
MT:	Metric Tonne
NAP:	National Agriculture Policy
NBS:	National Bureau of Statistics
NGO:	Non Government Organization
NIDF:	National Irrigation Development Fund
NIRC:	National Irrigation Commission
NPGRC:	National Plant Genetic Resource Centre
NRDS:	National Rice Development Strategy
PHL:	Post Harvest Loss
PHM:	Post Harvest Management
PSs:	Permanent Secretary
QDS:	Quality Declared Seeds
R & D:	Research and Development
RYMV:	Rice Yellow Mottle Virus
SADC:	Southern Africa Development Community
SDGs:	Sustainable Development Goals
SRI:	System of Rice Intensification

SSA:	Sub Sahara Africa
TADB:	Tanzania Agricultural Development Bank
TAFSIP:	Tanzania Agriculture Food Security Investment Plan
TAMS:	Tanzania Agriculture Mechanization Strategy
TARI:	Tanzania Agriculture Reaserch Institute
TFRA:	Tanzania Fertilizer Regulatory Authority
TMX:	Tanzania Mercantile Exchange
TOSCI:	Tanzania Official Seed Certification Institute
TPRI:	Tropical Pesticide Research Institute
USA:	United State of America
USD:	United State Dollar
VCAs:	Value Chain Actors
VIEM:	Value chain Intervention Element Matrix
WRS:	Warehouse Receipt System

CHAPTER ONE

1.1. Introduction

Agriculture continues to support the livelihoods of the majority of Tanzanians, although it remains underdeveloped and generally vulnerable to the whims of nature. The agriculture sector provides about 67% of employment, accounts for about 23% of the GDP, 30% of exports and 65% of inputs to the industrial sector (MoFP, 2016). For several decades, rice has been one of the important crops that contributed immensely to Tanzania's food and nutrition security, socio-economic development, and country's foreign exchange earnings. Rice is the second most important food grain crop after maize, produced in 64 districts and widely consumed in the country. The rice industry directly influences the livelihoods of over two million people. About 30% of the rice produced in the country is consumed by farmer/producer households, whereas the remainder is sold in the domestic and regional markets, with consumption being the highest in larger urban areas (Wilson and Lewis, 2015).

An estimated 2.2 million MT of rice is produced annually, making Tanzania the biggest rice producing country in the region. The rice sub-sector has long been identified by the Government of Tanzania as a strategic priority for agricultural development due to its potential for improving food security and income for large numbers of rural households with landholding sizes ranging from 0.5 to 3 ha. In Africa, the rate of increase in demand for rice is the fastest in the world because of population growth (4% per annum). The raising income levels and urbanization have lead to shifts in consumer preferences in favor of rice over other crops. The consumption has been increasing by more than 34% since 2002 compared with 8% in Asia and 10% as the world average; with the continent accounting for more than 29% of global imports. In Eastern and Southern Africa (ESA), rice is considered both as a food and cash crop owing to its importance; however, the paddy productivity in ESA countries is below 2 tons per hectare.

There are plenty of opportunities for rice development to flourish in Tanzania. There are abundant water resources for irrigation (ground water, rivers and lakes) and suitable land (21 million ha) for rice cultivation. There is a potential for increases in national and regional demand due to population growth, urbanization and increase in income. Seed production ventures and accredited seed certification systems (conventional and community based) exist to ensure that paddy farmers have access to quality seeds of improved rice varieties. Political will of the government, donor commitment and suitable policy environment (e.g. exemption of taxes and subsidy on agricultural inputs) do also favor rice production in the country.

1.2. Global, Regional and National Context of Forecast of Rice Production, Imports and Exports

Rice is produced in over hundred countries throughout the World. It is estimated that more than 715 million tons of paddy is produced annually equivalent to 480 million tons of milled rice. Asian countries account for 90% of the world's total rice production. China and India account for 50% of the rice produced in the World. Other major producing countries include Brazil, USA, Egypt, Nigeria and Madagascar account for 5 percent of rice produced globally. Global rice consumption has been increasing in the 2018/2019 crop-year, about 490.27 MT of rice was consumed worldwide, up from 437.18 million MT in the 2008/2009 crop year.

Rice has emerged as a significant crop in SSA, the single most important source of dietary energy in West Africa, and the third most important crop across SSA. Local demand is growing at a rate exceeding 6% per year, with some countries like Kenya and Ethiopia reaching over 12%, faster than any other food staple in the region. This increase is mostly attributed to population growth 4%, improved income, and urbanization. Average annual per capita rice consumption is estimated at 40 kg in SSA, with the highest reported in Madagascar 140 kg. In Tanzania, per capita consumption of rice is estimated to be 25 kg.

Reasonable production gains were witnessed in the last decade, attributed to both area expansion and increase in yield in some countries. However, the gap between local/regional production and demand is progressively widening, causing the region to import about 15 million tons of milled rice in 2018, and posing serious food security challenges. Rice is now being recognized as a strategic crop and a major component of food security and income for the region.

Regional rice production meets only about 55% of demand, with the rest being met through imports, costing the region USD 5–6 billion annually, placing a considerable burden on the already struggling economies. In Tanzania, rain-fed areas, which constitute over 70% of rice areas, are not sufficiently exploited, and the country has plans to expand its irrigated areas. The regional gap in demand for rice could significantly be narrowed with the largest untapped land and water resources and the enormous potential for increasing yields in Tanzania to at least match that being attained in Asia. In the long run, Tanzania can potentially produce sufficient quality rice to meet the SSA/regional demands, and with potential for export to the whole continent.

1.3. National and Regional Trends of Rice Production and Consumption

About 71, 9 and 20 percent of rice cultivation in Tanzania takes place under rain fed lowland, lowland irrigated and upland conditions, respectively. Available

information indicates that more than 70 percent of rice production in the country originates from six leading rice producing regions: Shinyanga, Tabora, Mwanza, Mbeya, Rukwa and Morogoro. Other regions include Songwe, Katavi, Arusha, Kilimanjaro, Kigoma, Manyara, Iringa, Mara and Tanga. Over the past two decades from 1995 to 2014, the area under rice and production at national level increased by 57 and 76 percent respectively. Increase in production has gradually reduced the need for imports and rice self-sufficiency has been attained in the recent years (Table 1).

Average paddy yields across ecosystems have varied widely during the same period (between 1.25 and 2.5 tons per hectare) without a clear increasing or declining trend (http://ricepedia.org/tanzania). Average paddy yields also significantly vary among the rice growing regions. For example, the average paddy yields in 2016/17 cropping season for Morogoro and Mbeya (the two major growing regions) were 4.0 and 2.2 t/ ha respectively (NBS, 2018). Around 90% of Tanzania's rice production takes place under smallholder (small-scale) system. The sizes of rice farms range from 0.5 to 3 ha, with an average farm size of 1.3 ha (MAFC, 2015). Among the cereal crops, rice alongside maize has been selected as one of the strategic commodities for government investment in both Agricultural Sector Development Programs ASDP I (2006/07-2012/13) and ASDP II (2017/18–2027/28). The criteria used to select the priority commodities were contributions to the value of agricultural production, national food security and food import bill and export revenues.

Table 1: Trend of Rice Production and Consumption

Year	Area Harvested (Ha)	Yield (t/ha)	Production (MT)	Requirement (MT)	Self-sufficiency ratio (%)
2011/2012	900,275	1.3	1,170,358	818,699	143
2012/2013	1,005,622	1.3	1,307,308	840,487	156
2013/2014	840,563	2.0	1,681,125	886,962	190
2014/2015	1,139,358	1.7	1,936,909	926,096	209
2015/2016	1,238,372	1.8	2,229,071	976,925	228
2016/2017	758,861	2.1	1,593,609	924,435	172
2017/2018	1,109,814	2.0	2,219,628	990,044	224

Source: MOA reports-Tanzania

CHAPTER TWO

2.0 REVIEW OF THE NATIONAL RICE SUB SECTOR

2.1 Status of the Sector in National Policies

Tanzania's commitment to address the food and nutrition security issues is well reflected in the Long Term Perspective Plan (LTPP), National Five Year Development Plan (FYDP) 2016/17-2021/2022, National Agriculture Policy 2013 (NAP 2013), Tanzania Agriculture, Food Security Investment Plan (TAFSIP), Agricultural Sector Development Programme Phase Two (ASDP II 2017/18-2027/2028). These national and sectoral development frameworks envisage the agriculture sector growth of up to 7.6 % by the year 2020. Thus, the Government's commitment is to bring about the green revolution that entails the transformation of agriculture from subsistence farming towards commercialization and modernization through crop intensification, diversification, technological advancement and infrastructural development.

Policies, plans and strategies of the government are centered on prominently transforming challenges in the agriculture sector that focuses on increasingly market-based agricultural systems that take into account current and future demand trends for food, raw materials and labour. The transformation requires integrated and collective actions to read institutions capacity and policies as well as technical know-how involved in production and marketing of agricultural produce. In response to these trends, the government of Tanzania is implementing Sustainable Development Goals (SDGs) globally agreed targets of addressing poverty, hunger, employment and economic growth by the year 2030. Similarly, the Government is committed to implement the African Union's (AU) Comprehensive Africa Agriculture Development Programme (CAADP). CAADP pillars are centered in extending the area under sustainable land management, increasing food supply, reducing hunger, improving rural infrastructure, agriculture, research and technology dissemination.

Currently the Ministry of Agriculture in collaboration with Agricultural Sector Lead Ministries (ASLMs) is implementing the Agricultural Sector Development Programme Phase Two (ASDPII). The implementation of the programme responds the National Agriculture Policy (NAP 2013) and Agricultural Sector Development Strategy (ASDS). The target is to create enabling and conducive environment for improving productivity and profitability of the agricultural sector as the basis for ensuring household income, food and nutrition security, and rural poverty

reduction. Also, to provide opportunities for up scaling, increasing incomes and creating jobs to value chain actors through expansion of forward and backward linkages in the economy.

Thus, the focus of ASDP II entails transforming subsistence smallholder into sustainable commercial farmers by enhancing and activating sector drivers through increasing productivity of targeted commodities including rice. This will be achieved through implementation of the four major components that support sustainable water and land use, enhanced agricultural productivity and profitability, commercialization and value addition and sectoral linkage and coordination. Therefore, National Rice Development Strategy phase II (NRDS II) is in line with both national policies and international commitments that Tanzania has ratified aimed at improving the livelihood of the majority of rural communities through enhancing household incomes from paddy farming, food and nutrition security.

2.2 Consumer Preferences and Demand Projection

Rice consumers in Tanzania are very keen on the grain size, colour, flavour and aroma. Majority of the consumers prefer long slender, translucent, intermediate amylose content and aromatic to semi-aromatic. The two popularly preferred Tanzania rice in domestic and regional markets includes Supa and TXD 306 (SARO 5). The common grades of rice available in the local markets are premium, grade one and standard.

Premium prices are usually given to aromatic rice type e.g. Kyela brand and other rice brand of premium or grade one when sold in attractive package. The demand projection for rice is envisaged to increase as a result of urbanization, change in consumption pattern, increased in diversified use of rice-based products and economic growth. Current national rice consumption is estimated at 1.8 MT and is projected to reach 2.6 MT by 2025 and 3.5 MT by 2030.

2.3 Typology and Number of Rice Farmers, Processors and Traders

a) Majority of rice farmers (females, males and youth) are smallholders who produce rice for home consumption and sell the surplus directly to traders. Also, other forms of marketing like contract and auction can be used through Warehouse Receipt System and Tanzania Mercantile Exchange (TMX) when fully operational. Although most of the farmers do cultivate over a farm size that ranges from 0.5 to 3 hectares, there are large scale commercial farms such as Kilombero Plantation Limited-KPL in Morogoro region and Kapunga Rice Plantation Project, Mbarali Rice

Farm and Madibira Rice Farm in Mbeya region.

b) Processors (millers) are located in most of the production areas and range from medium to large scale ones. Medium scale processors are located in urban centres near production areas and owned by male and female entrepreneurs. Some processing machines can produce white stone–free rice of premium (unbroken), standards (half broken) and regular (three quarters broken) grades. Large scale processors include: Kapunga and Mbarali rice farms in Mbeya region, KPL in Morogoro and Madibira rice farm in Mbeya region. These processors process their farm produce and paddy from other farmers in the vicinity.

c) Traders in paddy and milled rice are scattered throughout the country. Both females and males are involved in this trade. Paddy trade is concentrated in production areas, while trade in milled rice is usually done at wholesale and retail levels in production and distant markets. Price for milled rice is relatively higher than that for paddy of same quantity irrespective of whole sale or retail market. Physical mixing of aromatic and non-aromatic rice is often practiced by some traders in order to get good price. Rice sold at retail shops and open markets is usually put into jute bags. Export trade of milled rice is commonly sold to neighboring countries. Produce cess charged by District Councils to both paddy and milled rice have been reduced from five to two percent. In general, there is a potential for expanding both internal and external markets.

2.4 Gender Dimensions of Rice Production, Processing and Trading

In Tanzania majority of the rice farmers are women and make a significant contribution to food production, while men are more involved in processing and marketing. Women form 80% of the agricultural labour force in the rural areas. They play a major role in rice production in the country. They are highly involved in all aspects of rice value chain particularly planting, weeding, bird scaring, harvesting, processing and trading. It has been observed that men are mostly involved in the land preparation.

Both men and women are engaged in rice harvesting and threshing. Generally, women in agriculture experience the following:

i. Performing non-mechanized backbreaking farming operations such as transplanting, weeding, and threshing poses significant health risks for women in addition to inherent household responsibilities; and

ii. Difficulty in accessing the key factors of production – land, water, credit, capital and appropriate technologies. It is far easier for men to access these inputs. Therefore, the introduction of labour saving technologies will take into consideration of gender issues to ensure that gender sensitive technologies are introduced so that women and the youth are not left out.

2.5 Comparative Advantage of Domestic Production (farm, processing and retail level in urban and growth centres).

The comparative advantages of domestic production of rice are the following:

- Locally produced rice is of acceptable type and is in greater demand in the region, due to its inherent qualities;

- Excess rice can be easily exported to the neighboring markets in the region through the large and diverse road network, and earn foreign exchange and contribute to foreign currency;

- Production costs can be further reduced by utilization of cost effective production technologies such as System of Rice Intensification (SRI) and installation of milling and processing facilities closer to the production areas. Thus, the price of locally produced rice can be equal or cheaper than the price of imported rice from Asia and elsewhere; and

- Assist small businesses, enterprises and communities to create sustainable jobs in production, processing and marketing of rice as well as in the development of supporting industries e.g. Repair and maintenance of machineries used in production and processing.

CHAPTER THREE

3.0 CHALLENGES AND OPPORTUNITIES FACING RICE SUB SECTOR IN TANZANIA

3.1 Key Challenges and Opportunities

A number of challenges have been identified that act as limiting factors to the rice development in Tanzania. These include limited availability and accessibility to improved seed varieties, low use of fertilizers and pesticides, inadequate promotion of time and labour saving technologies including mechanization inputs, insufficient development of irrigation infrastructures and water conservation technologies, sparse development of human resources, weak marketing structures and inadequate access of financial services.

3.1.1. Seeds

Challenges

- The poor availability of improved and quality rice seed varieties that are resilient to drought, cold weather, major insect pests and diseases are major challenges facing the rice sub-sector in the country. Yet there are hundreds of local/ traditional rice varieties grown by farmers in the rain-fed lowland, irrigated low land and upland ecosystems
- Funding for plant breeding for the development of suitable varieties is not adequate
- Coordination of activities implemented by seed industry development partners are insufficient
- The adoption of improved seed varieties which are high yielding is low thus leaving farmers poor by being stuck with low yielding aromatic varieties

Opportunities

- Availability of R & D system capable of developing new rice varieties
- Presence of Agricultural Seed Agency (ASA) and private seed companies for multiplication, distribution and marketing of improved seed varieties in the country.
- Presence of accredited seed quality control system, Tanzania Official Seed Certification Institute (TOSCI) that can assure the availability of quality registered seeds
- Presence of agro-dealers in rural areas that can help in seed distribution

- Rich availability of local germplasm that can serve as source of variations in developing rice varieties for different purposes
- Great demand of rice quality seed of improved varieties in the region

3.1.2 Fertilizers

Challenges

- The use and access of fertilizers (about 15% of rice farmers in Tanzania use fertilizers) is low because of high prices, inadequate knowledge on fertilizer use, untimely availability of fertilizer, inadequate of agro dealers in rice growing areas and low purchasing power among farmers
- Limited development, supply and utilization of blended (soil and crop specific) fertilizers
- Limited awareness by farmers on the benefits of adequate and proper management of soil fertility

Opportunities

- The Government's willingness to support availability and affordability of fertilizer to farmers through its programs and projects
- Presence of R & D system that can develop fertilizer recommendations
- High potential for local manufacturing and blending of fertilizers
- A good number of cement companies that could establish operations in the mining, processing and distribution of lime
- Transportation and communication network within the country
- Presence of regulatory authorities e.g. Tanzania Fertilizer Regulatory Authority (TFRA)

3.1.3 Pesticides

Challenges

- Awareness on Integrated Pest Management (IPM) practices is still low
- Knowledge and skills on diagnosis, pesticide use are not adequate among farmers and extension workers
- Presence of counterfeit pesticides in the market

Opportunities

- Readiness of farmers to use pesticides
- Presence of regulatory authorities, e.g. Tropical Pesticide Research Institute (TPRI) that can assure appropriate and safe use of pesticides

3.1.4 Irrigation infrastructures and water conservation technologies

Availability of water is a prerequisite for increased rice production. Most of the rice production in the country depends on rainfall and other climatic factors. Annual variation in the amount and distribution makes rain-fed rice production susceptible to various manifestations of the climatic changes, including the flooding and/or drought, often within the same season. Drought risk impedes investment, causing stagnation of production at subsistence level.

Challenges

- Inadequate development of potential areas for irrigation
- Irrigation infrastructures are not appropriately utilized
- Inadequate research in irrigation and drainage
- Limited mapping and development of ground water resources
- Most of the smallholder lands under irrigation is not leveled
- Pre feasibility and feasibility studies for potential areas for irrigation are not well established.
- Inadequate drive and support for the adoption of most modern technologies

Opportunities

- Availability of water resources
- Gover**r**nment's willingness to invest in irrigation development
- Presence of National Irrigation Commission (NIRC)
- Presence of Irrigation Master Plan
- Increased global availability of modern irrigation technologies such as solar powered pumping that if adopted could revolutionize irrigation in Tanzania

3.1.5 Promotion of time and labour saving technologies, including Mechanization inputs

In Tanzania, about 95% of the farm operations in paddy production are done manually. Planting (both during direct sowing/broadcasting, seeding and transplanting of seedlings), weeding, harvesting, threshing and cleaning of paddy are mainly done by hand. The labour input in puddling is high, requiring between 300 and 350 man hours/ha. Similarly, manual transplanting and weeding are labour intensive, and each such operation requires between 200 and 300 man hours /ha.

Challenges

Despite its importance**,** the development of mechanization in the country has been slow as it is held back by several factors. These include;

- Agricultural financing from financial institutions are still limited
- The number of skilled operators and mechanics for agricultural machinery is not sufficient
- Inadequate after sale services
- Service centres/ service providers with full machinery packages are inadequate and under-equipped
- Linkages between technology development agencies, manufacturers, distributors and farmers are still low
- Limited development of private sector and commercially operated machinery hire services
- Funds for Research and Development on agricultural mechanization technologies is limited
- Review and updating of Tanzania Agricultural Mechanization Strategy (TAMS) to address the current needs is still pending
- Introduction of time and labour saving technologies (including mechanization) with respective to small farm sizes

Opportunities

- Development of policy instruments such as TAMS to address various technological and mechanization inputs
- Private sector involvement in supply chains of labour saving technologies and agricultural machineries is well positioned
- Private sector involvement in after sales and mechanization service delivery is possible
- Presence of the Center for Agricultural Mechanization and Rural Technology (CAMARTEC) for quality assurance, fabrication of Agricultural machineries and dissemination of appropriate labour saving technologies

3.1.6 Marketing and access to financial resources

Challenges

- Limited market information
- Price fluctuations
- Irregular and unreliable supply of paddy due to fluctuation in production
- Limited access to micro-finance institutions for saving and credit services
- Farmers have no strong marketing groups, associations or cooperatives
- Low use of appropriate pre and post-harvest technologies
- Limited access to loans from financial institutions due to lack of collaterals

Opportunities

- The increase importance of rice as a staple food in rural and urban areas opens opportunities for rice marketing
- Availability of improved rice varieties with economic potentials
- Improved transport and communication networks
- Presence of Tanzania Agricultural Development Bank (TADB), Agricultural Input Trust Fund (AGITF) and other commercial Banks like NMB and CRDB

3.2 Trans-Boundary and Regional Issues

Tanzania is a member of East Africa Community (EAC) and Southern Africa Development Community (SADC). Both these regional economic blocs/ communities (REC) allow duty-free trading of rice produced within the region. EAC has set a Common External Tariff (CET) of 75% on the rice imported from outside the region. Tanzania produces enough rice with huge potential for exporting the surplus to other markets within EAC, SADC and other Eastern Africa countries such as Djibouti, Eritrea, Rwanda, Kenya, Uganda, Somalia and Ethiopia. However, export quantities of the Tanzania rice have decreased for the past four years despite an increasing trend of domestic production. This has been attributed to the abuse of EAC's rules of origin (RoO) by adulterating Tanzania rice with imported rice from Pakistan[1]. This has prompted Uganda and Rwanda to impose a 75% duty on Tanzania rice. Deliberate efforts have since been taken by Tanzania government to address such tariff and non-tariff barriers on rice, leading to a resolution of the issue with Uganda and Rwanda in May 2017. Despite these events, the demand for Tanzania rice in Uganda, Rwanda and other regional markets is steadily growing[2]; and thus, creating greater opportunities for scaling up the trading of the locally produced rice.

3.3 Humans and Institutional Capacities

3.3.1 Human capacities

The number of trained personnel working on rice has increased over the years. The rice sub sector has about 740 professional staff (9 PhD, 150 MSc. and 599 BSc.). More researchers will be required, especially at PhD Level which require further training and facilities. The transfer of technology is of fundamental importance to the future of the rice industry. Trainings have been conducted through donor funded projects and private companies specifically in Rice production, Post harvesting technologies,

1 USAID (2018) EAC Common market implementation: Implementation of trade policy instruments on rice trade in the EAC – The experience of United Republic of Tanzania

2 AGRA (2018) Competitiveness of rice industry in Rwanda and Senegal (unpublished)

Agricultural machineries, Gender in rice farming, Water management, Good Agricultural Practices, Marketing and Operation and Maintenance of irrigation schemes. However, there are only 8,323 Agricultural Extension Officers, while the established demand in 2019 was 20,100. The up-scaling of Extension Officers are crucial in providing extension services for rice and other crops. Public and private partners need to continue to implement programmes aimed at training and allocating extension staff to all wards, villages and irrigation schemes. These staff need to be facilitated with working tools and opportunities for training to improve their skills.

3.3.2 Institutional capacities

Training institutes and centres of the MoA are actively involved in the participatory extension of improved rice technologies and management of small-scale irrigation schemes through training of farmers and extension staff. These institutes and centres include: Kilimanjaro Agricultural Training Centre (KATC) in Moshi, MATI Ukiriguru in Mwanza, MATI Igurusi in Mbeya, MATI Ilonga in Morogoro, MATI Mtwara, MATI Tumbi and Mkindo Farmers Training Centre in Morogoro and the National irrigation Commission. Whereas the Mkindo Farmers Training Centre offers short term training to farmers, KATC Moshi and the five MATIs offer long term training programmes in Agricultural Production at diploma and certificate levels, which last for two years. MATI Igurusi also offers two specialized diploma courses in 'Irrigation' and 'Land Use Planning'. Upon successful completion of the two-year training, the graduates are employed as front line extension staff by the local Government Authorities (LGAs).

TANRICE II (2012-2018), a project implemented by JICA and MoA, is aimed at dissemination of rice farming technologies nationwide in partnership with seven (7) agricultural training institutes. TANRICE II used training approach for disseminating the appropriate irrigated and rain-fed rice cultivation technologies. In addition, the project also promoted rice value chain by developing appropriate subject-matter training courses. All these activities were for increasing rice production in the country. The outcomes of the project were;

- Standard training course or modified standard training course, including the pilot courses in 81 irrigation schemes were conducted
- Dissemination of effective technologies for rain-fed lowland rice cultivation such as; Bund making, Leveling, Straight row transplanting, Straight row direct planting (dibbling & drilling), Application of fertilizer and Improved variety
- Subject-matter training courses (Irrigation scheme management, Gender, Marketing, Agricultural Machinery and Post harvesting technologies) in 129 irrigation schemes were conducted

As a result of the project interventions, the paddy yield under irrigated rice ecosystem has increased from 3.2 to 4.5 t/ha, and that in rain-fed lowland from 1.4 to 2.1 t/ha and rain-fed upland rice (NERICA) from 0.5 to 1.2 t/ha.

3.4 Potential of Local Rice Production in Rural Poverty Reduction, Food Security and Economic Growth

Rice has become an increasingly important cash crop in rice producing areas. This is due to the fact that

- The national and regional demands are high
- The price trends are relatively stable in the food market.
- It is relatively less affected by storage pests as compared to other cereal grains such as maize, sorghum, millet, and wheat, commonly used in food security measures;
- The rice sub-sector has long been identified by the Government of Tanzania as a strategic priority for agricultural development due to its potential for improving food security and income for large numbers of rural households with landholding sizes ranging from 0.5 to 3 ha
- Seed production ventures and seed certification systems (conventional and community based) exist to ensure that paddy farmers have access to quality seeds of improved rice varieties.
- Increase in local production gradually reduced the need for imports

3.5 Land Tenure

Tanzania is endowed with an area of 94.5 million hectares of land, out of which 44 million hectares are classified as suitable for agriculture. It is estimated that about 21 million hectares are suitable for rice growing. In 2018, the area under rice production reached 1.1 million hectares. The land belongs to the Government. Land ownership is under the respective villages/districts and governed by the Village Act No.5 of 1999, which recognizes customary rights. Thus, the village governments under the Local Government Authority are the ones responsible for allocation of the land for various uses. The Government has recently reviewed the land tenure system whereby there is land equity in land ownership for men, women and youth.

3.6 Water Sources for Irrigation

Tanzania is endowed with enormous potential water resources constituting of rivers, lakes, and groundwater for irrigation and other uses. In view of the existing scenarios of water and land, the irrigation potential in the country is estimated at 29.4 million hectares with varying degrees of potential. There are 2.3 million hectares

of high development potential, 4.8 million hectares of the medium potential and 22.3 million hectares of low potential. Among achievements made under ASDP I include the rehabilitation, improvement and construction of a number of irrigation schemes, this resulted in an increase in irrigated area from 264,338 hectares (2005/06) to 475,052 hectares in the year 2019.

3.7 Seed Production Ventures

Seed of improved rice varieties is increasingly being accessed by smallholder rice farmers in Tanzania. Liberalization of the seed sub- sector has enabled the emergence of private seed companies, which are already taking up production and sale of certified seeds such as SARO 5 (TXD 306). The early generation seed classes (pre-basic and basic seeds) are being multiplied and marketed by both the public and private seed producers. Agricultural Seed Agency (ASA) plays a major role in multiplying the basic seeds of all the improved rice varieties. In 2017/18, ASA produced and marketed about 987 MT of improved rice seeds. These efforts are being supported by Development Partners such as Alliance for a Green Revolution in Africa (AGRA) and Bill and Melinda Gates Foundation. Breeder (pre-basic) seeds are multiplied at TARI, Ifakara and Dakawa. In addition to certified seeds, Quality Declared Seeds (QDS) are produced from the certified seeds by registered farmer-seed producers in groups or individually and sold to ASA, agro-dealers and farmers in same locality. Among the rice-specific action areas identified for implementation under ASDP II are improving access to and use of high quality seeds through engaging the private sector and farmer organizations in seed supply chains and strengthening the national and local agricultural input supply systems to improve access to quality crop inputs (seeds, fertilizer, agrochemicals and tools).

3.8 Existence of Seed Certification Systems

Tanzania has set up procedures and regulations to ensure that the seeds reaching the farmer is of prescribed quality. On this basis, Tanzania Official Seed Certification Institute (TOSCI) of the MoA which is accredited by OECD and ISTA has the power and responsibilities to enforce the Seed Act, 2003 and regulations on seed certification. Since the rice seed regulations and standards are harmonized with that of the EAC and SADC regions; the rice seeds produced in Tanzania by both public and private seed companies, are traded across the region.

3.9 Research, Technology Dissemination and Capacity Building

Research technology development and dissemination is practiced through Client Oriented Research and Development Management Approach (CORDEMA). This approach builds a greater farmer influence and accountability into the choice of research programmes as well as improved management and monitoring of research. The linkage between researchers, extension and farmers is provided through

Technology Information Transfer at TARI Centers, with enhanced communication capability. Its core functions include assembly, assimilation and dissemination of relevant agricultural technologies from TARI centres.

(a) Genetic resources conservation and use

Collection and conservation of germplasm have been limited to a few crops due to poor finances and poor linkages. For this reason, the germplasm collection and conservation for rice has been undertaken by the respective research centres working on rice under the Tanzania Agricultural Research Institute (TARI) in collaboration with interested international research institutions. A wide range of germplasm of about 420 genotypes has been collected from within the country and from IRRI, IITA and Africa Rice. The materials are periodically rejuvenated, field evaluated, characterized and conserved at TARI Ifakara and TARI Dakawa. Genotypes with desirable traits are incorporated through rice breeding programs. More collection missions are needed to be conducted and concerted efforts need to be put in place by the rice research programme in collaboration with National Plant Genetic Resource Centre (NPGRC) to collect, characterize and conserve germplasm for future mining of novel genes against biotic and abiotic stresses. In this regard, more funds are needed for collection and conservation and to build capacity in terms of infrastructure facilities for both the rice research programme and the NPGR. In this endeavor; TARI Ifakara which is the coordinating Institution for rice research, will need to render close collaboration with the NPGR to ensure that the same germplasm resources are conserved at the NPGRC.

Participatory breeding methods and advanced biotechnology tools need to be deployed in accordance to the national bio-safety framework for selecting and developing high yielding varieties with desirable consumer/market qualities. These qualities include post-harvest and production attributes such as milling percentage, resistance to lodging, early maturity, and resistance to major biotic and abiotic factors. Developed and released varieties are registered with the Registrar of Plant Breeders Rights at MoA. .

(b) Soil health and soil fertility management

Research on soil fertility has been done to establish optimal rates of inorganic fertilizers for lowland rice in some areas. Recommendations on the use of both the organic and inorganic fertilizers need to be established particularly in intensive rice producing areas. More work in revising fertilizers recommendations is required in view of the increased prices of fertilizers and new brands of fertilizers being introduced into the market. General packages for control of soil erosions

are available and need to be adapted to conditions of the ecosystem. Mineral imbalances in rice growing areas have led to Iron, Sulphide, Boron, Manganese and Aluminium toxicity. Integrated soil fertility and soil–water management options will thus be emphasized for sustainable natural resources.

(c) Crop management and protection options

Rice production is affected by a wide range of pests and diseases. The severity depends on location, season, variety, farming system, and weather. Rice Yellow Mottle Virus (RYMV), which is indigenous in Africa, is a major scourge of lowland rice and can sometimes lead to a total crop failure. Rice blast caused by *Pyricularia oryzae* is also another serious disease in lowland rice. Pests are another biotic stresses that cause huge losses in rice production. Yield losses ranging from 30 to 100 percent have been recorded. Most damage to rice is caused by stem borers (*Chillo spp.*), African rice gall midge (*Orseolia oryzivora*), rodents and birds. Integrated pest management options developed or verified in the country need to be efficiently disseminated to farmers. Also, other available improved crop management options for irrigated lowlands, rain-fed lowlands and rain-fed upland ecosystems will be repackaged and disseminated, where necessary.

(d) Advisory services-extension, NGOs and agri-business

The Local Government Authorities (LGAs) have a primary responsibility for ensuring that the extension services are adequately provided to smallholder farmers. A majority of extension service provision for smallholders is controlled by central or local government. However, some Non-Governmental Organizations (NGOs) are able to source funds independently. A number of extension methodologies that have demonstrated good prospects of success are currently being used by various programmes/projects in parts of the country. In view of this, further productivity enhancement will require an efficient extension service which would facilitate increased transfer of appropriate technologies as well as application of other research results. In the recent years, Agri-business organizations have also been increasingly contributing to the delivery of agricultural services and technologies.

CHAPTER FOUR

4.0 VISION, SCOPE AND STRATEGIC OBJECTIVES

4.1 Vision:

A vibrant rice industry through productivity and markets, providing employment along its value chain in the region.

4.2 Goal:

It is envisaged that Tanzania will sustain rice self-sufficiency, contribute to the regional[3] self-sufficiency, be a rice market leader, and be well positioned to become more competitive through significant improvements in terms of quality, quantity and value of the locally produced rice. Hence, the goal of the second phase of the NRDS is to sustain national self-sufficiency in rice production, contribute to the regional self-sufficiency, and become a market leader in the region. To attain this goal, the following strategic objectives are set;

4.3 Strategic Objectives

SO1. Improve Climate resilience by developing market-oriented varieties and promoting other production technologies and policy tools that could mitigate the climatic vagaries

SO2. Enhance Regional market competitiveness of locally produced rice over the imported Asian and other regional rice varieties by reducing the costs of production and improving the quality and regulatory mechanisms.

SO3. Sustainably orient Tanzanian rice farming system, especially smallholdings toward national and regional rice markets through improved production and marketing mechanisms

SO4. Expand rice cultivable area under irrigated, rain-fed lowland and upland ecosystems through new establishments and rehabilitation of existing irrigation infrastructures and management capacities

While these objectives will be realized by taking a value chain approach; the following will serve as key strategic pillars.

3 The regional markets include the East Africa region (Burundi, Rwanda, Kenya, South Sudan, Eritrea, Mauritius, Uganda; and Somalia, Djibouti, Comoro and Ethiopia) and SADC (Angola, Botswana, Comoros, DRC, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Zambia and Zimbabwe).

4.4 Strategic Pillars

This strategy is based on implementation of ASDP II that is focusing on bringing about the transformation of subsistence production of rice to commercial farming. This will be attained through: (i) increase in area under production; (ii) productivity increase; (iii) value addition and reduction in post harvest losses from 30% to 10% by 2030; and (iv) marketing and establishment of viable agribusiness ventures. Therefore, the strategic interventions under the implementation of NRDS II have been aligned with the overarching ASDP II through the following four strategic pillars and the key intervention elements;

4.4.1 Double the area under rice cultivation from 1.1 million Ha (2018) to 2.2 million Ha by 2030)

The doubling of the area will involve the following key intervention elements: -

i. Expanding the area under rice cultivation in all rice ecosystems ie. Upland rain fed, lowland rain-fed and irrigation rice ecosystems. The area under irrigation ecosystems will be expanded by new construction, rehabilitation of irrigation infrastructures and development of targeted 25 dams for water harvesting (National Irrigation Development strategy -Draft);

ii. Improvement in land tenure/policies, awareness and enforcement of land laws and regulations

iii. Easy title issuance procedures to facilitate farmers to use land titles to access loans

iv. Enhancing gender equity in land ownership

v. Facilitation of village land use plans to address land conflicts and Water management,

vi. Engagement of the private sector to promote the use of Mechanization in all rice farming operations.

vii. Training of artisans and mechanics of operating and maintaining farm machineries at village level.

4.4.2 Double the on-farm rice productivity from 2 t/ha to 4 t/ha by 2030

i. Promotion of the utilization of farm mechanization (tractor, planter, combine harvester and rotary weeders) to facilitate timely rice farming operations.

ii. Improving access, distribution and proper use of inputs, (improved seeds, fertilizers and pesticides) to smallholder rice farmers, by enhancing marketing skills and regulatory compliance to private local agro input suppliers.

iii. Promotion of climate resilient varieties and adoption of climate-flexible production practices, irrigation infrastructure development, and promotion of crop insurance.

iv. Increasing number of extension officers and enhancing regular in-service training for extension officers to promote new technologies.

v. Creating awareness and promotion of Good Agriculture Practices (GAP), including the use of improved technologies for quality paddy production.

vi. Promoting private sector participation in the extension services delivery.

vii. Strengthening research-training-extension-farmer linkages.

viii. Increasing investments in research and development, including recruiting of researchers and research capacity building (technically and financially) to enhance the development of new technologies.

ix. Increasing farmers' access to information through improved knowledge management and information sharing systems.

x. Promoting soil testing and the use of soil test kits to guide optimal/ appropriate application of fertilizers.

xi. Formalizing farm ownership and its usage as collateral to access finance for investment in technologies that could increase productivity.

xii. Facilitating Establishment and capacity strengthening of Farmers Cooperatives/ Associations to facilitate smallholder farmers' access to financial services

4.4.3 Value addition and Reduce the post harvest losses from 30% to 10% by 2030

i. Rising the awareness of smallholder farmers on Post-Harvest Loss (PHL) management and enhancing the compliance of production and storage standards to reduce post –harvest losses

ii. Promoting the availability, accessibility, affordability and adoption of tested technologies[4] and processes to reduce rice post-harvest losses

iii. Enhancing the quality of locally produced paddy and rice grains through improved management practices during harvesting, drying and storage of rice grains

iv. Identification of post-harvest technology manufacturers/ dealers, service providers and facilitation of linkages between service providers and small holder farmers to enhance access to PHL reducing technologies

4 Promote technologies for timely harvesting, proper drying and improved quality of rice

v. Improved capacity and skills of extension service providers on rice PHL, management and technologies

vi. Promotion of research and innovations of new and appropriate technologies for value addition and methods to reduce rice losses and enhance the value

vii. Rising the standard of milling operations and thereby improving the quality and competitiveness of the locally produced milled rice

viii. Strengthening institutional capacity, coordination, partnerships and stakeholders' participation in PHM and processing

ix. Developing a standard methodology for data collection and estimating rice Post-Harvest Losses

x. Creating a favorable environment for promoting PHM financing

xi. Improving hygiene and quality of storage facilities and equipments

4.4.4 Agribusiness and markets

i. Increasing public and private sector engagement and investments in rice processing, branding and marketing

ii. Improving access to better markets and trade

iii. Promoting private sector investments on affordable post-harvest technologies and value addition including by products such as that of broken rice[5] to reduce post-harvest losses

5 Broken rice can be used for making snacks, beer, vinegar, milk, pet food industry, animal feeding, aquaculture. Also broken rice can be used to make starch which is used as laundry and in foods, cosmetics and textile manufacture.

4.5 Targets

The mid-term (2025) and long-term (2030) targets for the NRDS II (2018 to 2030) are indicated in the table 2.

Table 2: NRDS II Targets and Projections

Items	2018/19	2025 (mid- term)	2030
Area under cultivation (million ha)	**1.1**	**1.43 (30%)**	**2.2**
Output (milled rice; t/ha)	**2**	**3 (50%)**	**4**
Yield paddy – before milling t/ha	**3.08**	**4.3**	**6.15**
Post harvest losses	**30%**	**20%**	**10%**
Harvest (milled rice, million tons)	**2.2**	**4.29**	**8.8**
National consumption (milled rice)*	**1.8**	**2.6**	**3.5**
Estimated growth in Consumption based on current trend 2010/11-2017/18=1.8-1=0.8/6=0.133millionTons per year			
Surplus* (million tons)	**0.4**	**1.7**	**5.3**
Seeds			
Adoption rate (% of farmers)	**15%**	**25%**	**40%**
Average Seed rate used kgs /ha	**80**	**80**	**80**
Requirement of breeders seed (Kg)	**56**	**122**	**300**
Requirement of Pre- basic seed (t)	**2.82**	**6.10**	**15.02**
Requirement of basic seed (t)	**176**	**381**	**939**
Users' formal seed volume (t)			**70,400**
(Formal a) certified seed (t)	**900**	**19,000**	38,000
(Formal b) QDS (t)	500	16,200	32,400
Formal seed* include certified and QDS)			
Fertilizer			
Adoption rate (% of rice farmers)	n/a	38%	**75%**
Rate of fertilizer recommended NPK			**100-20-20**
Nitrogen fertilizers (t)	n/a	82,500	**165,000**
Phosphorous (t)	n/a	16,500	**33,000**

CHAPTER FIVE

5.0 STRATEGIES

NRDS II will be implemented through a value chain approach that would coherently help achieve the set goal and strategic objectives. The various rice value chain segments (seeds, fertilizer, irrigation, mechanization, postharvest handling, processing and marketing) will be addressed through intervention elements (policy tools, research and development, extension services, institutional coordination, and gender equity). A matrix of the value chain and the intervention elements (value chain intervention element matrix; VIEM) is presented in tables 3a-3g.

5.1 Improving Accessibility of Improved Variety and Seed Systems

NRDS II envisages promotion of both the formal- and informal seed systems; whereby the public production and distribution systems will be improved through building human- and technical capacities. The private based rice seed production and supply will be enhanced by establishing public-private partnerships in developing infrastructures and by enabling regulatory- and financial environments for the production and marketing of quality rice seeds. QDS production systems will be improved through training and improved coordination and planning at grass root levels by local administrative institutions. Farmers who are presently engaged in using informally produced seeds will be pursued to adopt a formal seed system through awareness creation, and thereby demand for quality rice seeds will be raised. The major strategic interventions under the seed will include: -

- Sensitization of farmers on the use certified seeds and the benefits of higher productivity
- Enabling policies that will enable the institutions responsible for seed multiplication to open services to farmers in their vicinity
- Increased production and promotion of the use of certified seeds
- Regular inspection of seed production
- Improved business environment of seed producers
- Capacity building to Irrigators' Organizations (IOs) on QDS farmers
- Promotion of improved local varieties

Table 3 (a): Value chain intervention element matrix (VIEM – Seed): Proposed interventions under the rice seed value chain

Policy	R&D	Extension	Finance	Quality	Institutional organization	Women and Youth
Create business enabling environment for private sectors to invest more in seed production, marketing and distribution	Develop varieties that are: resilient to drought, diseases, heat, salinity, high yielding and good grain quality. Develop rice suitability map	Create awareness /promote use of improved varieties. Capacity building e.g. in seed inspection of QDS. Capacitate media involved in agricultural information.	Subsidize price of seeds. Empowerment of private seed companies. Finance ASA and R & D to increase their seed production and distribution capacity	Use of seed labels from authorized institutions and electronic labels. Regular inspections. Regular training of seed inspectors. Strengthening capacity of seed quality controlling authority.	Create enabling environments for public and private seed companies. To encourage more collaboration with international organizations (JICA, IRRI, AfricaRice)	Involving youth in agricultural training institutes in rice seed production

Policy	R&D	Extension	Finance	Quality	Institutional organization	Women and Youth
	Enhance R & D institution to develop improved varieties and production of early generation seeds. Capacitating R & D in hybrid seed production. Capacity building.	Facilitate extensionists with transport facilities and working gears. Strengthening coordination and collaboration between public and private extension service providers.			To strengthen seed certification system	

5.2 Fertilizer Marketing and Distribution

The increased use of modern inputs is a pre-requisite for sustaining national rice self-sufficiency and further increasing the supply of Tanzania rice in regional markets. Fertilizers are mostly imported by the private sectors. The distribution of fertilizers is done by the importers and stockists/agro-dealers.

The government has projected that the imported volumes of fertilizers in the 2018/2019 financial year to reach between 430,000 and 450,000 tonnes. Common fertilizers used particularly in rice fields include both organic to inorganic fertilizers. Organic fertilizers include farmyard manure and compost which are found locally and not very widely used. Inorganic fertilizers such as Di- Ammonium Phosphate (DAP) and Urea are widely used.

The strategy would focus on:-

- Strengthening the capacity of agro-dealers in accessing the input credits and agribusiness skills.
- Ensuring proper use of inputs to sustain national rice self-sufficiency
- Increased investments in fertilizer and agrochemicals industries
- Development of soil maps for fertilizer recommendations
- Engagement of R & D institutes in conducting more evaluation and appropriation of agro-inputs
- Strengthening coordination and collaboration between public and private extension service providers
- Subsidizing the price of agro-inputs
- Supporting farmers to access credits
- Capacity building to farmers and extension service providers to access fertilizer distribution
- Strengthening fertilizer certification and vigilance to eliminate counterfeit fertilizers
- Formulation of primary societies and linking them to financial institutions for improving the accessibility and affordability of fertilizer to farmers

Table 3 (b): Value chain intervention element matrix (VIEM – Fertilizers & Agrochemicals): Proposed interventions under the Fertilizers & Agrochemicals value chain

Policy	R&D	Extension	Finance	Quality	Institutional organization	Women and Youth
Subsidizing costs. Bulk procurement approach. Investment in fertilizers and agrochemicals industries	Develop soil maps for fertilizer recommendations. R & D to engage into invention of agrochemicals. R & D institutes to do more evaluation of agro-inputs for appropriate recommendations. Capacity building	Create awareness/ promote use of agrochemicals Regular training of extensionists on agrochemicals Capacity building. Facilitate extensionists with transport facilities and working gears. Strengthening coordination and collaboration between public and private extension service providers.	Subsidize price of agro-inputs -Support farmers to access credits	Use of seed labels from authorized institutions and electronic labels	Regular inspections by authorized institutions	Support women and youth to access credits

5.3 Irrigation and Investment in Water Control Technologies

Under ASDP II (2017/18-2027/28), the Government is implementing a comprehensive irrigation development through component 1: Sustainable Water and Land use Management. Two funds have been established to cater for irrigation development investments in the country:

(i) District Irrigation Development Fund (DIDF) and (ii) National Irrigation Development Fund (NIDF). The DIDF complements funding for small scale irrigation schemes identified by farmers through District Agricultural Development Plans (DADP). Irrigated agriculture in Tanzania is dominated by smallholder traditional systems producing mainly rice and vegetables. In such irrigation schemes, irrigation efficiency is quite low, estimated at 14-20 percent. The National Irrigation Development Strategy (Draft) is to conduct prefeasibility and feasibility studies in 80 unimproved Rain water harvesting schemes, improve 75 traditional irrigation systems, construct 10 new small holder schemes, rehabilitation/construction of 25 Dams, build capacity of 15,000 farmers and 700 technicians on Operation and Maintenance and develop 5 schemes through Public Private Partnership. The Government has thus embarked on medium and long-term strategies for improving production and productivity of irrigated crops.

It is proposed that the NRDS II supports implementation of activities aimed at enhancing crop productivity and profitability to the smallholder irrigation farmers through proper utilization of water and other resources in existing and new irrigation schemes. Implementation of these activities is expected to: (i) increase crop productivity, farmer incomes and reduce susceptibility to drought and occurrence of floods through rehabilitation of irrigation infrastructures and construction of storage dams; (ii) expand area under irrigation for smallholder, medium and large scale farming; (iii) increase irrigation efficiencies of selected smallholder traditional irrigation schemes and newly developed irrigation systems as well as support comprehensive river basin management by improving the management of demand for irrigation water. Thus, the irrigation and investment in water control technologies would focus on the following areas:

- rehabilitation work in the traditional and improved irrigation schemes;
- construction of new irrigation schemes;
- construction of rain-water harvesting and storage structures; and
- capacity building on Operation and Maintenance

Table 3 (c): Value chain intervention element matrix (VIEM – Water Management): Proposed interventions under Irrigation and Water Management

Policy	R&D	Extension	Finance	Quality	Institutional organization	Women and Youth
Encourage private sector participation in irrigation infrastructure development and management	Promote new water harvesting techniques. To device new technologies for water use efficiency. Capacity building	Facilitate irrigation research and development. To promote new water harvesting techniques. Strengthen IOs in water resource management. Promote and disseminate new technologies for water use efficiency. Capacity building of NIRC. Facilitate extensionists with transport facilities and working gears	Provide sufficient funds for constructions and/or rehabilitations of irrigation infrastructures. Link IOs with financial institutions to access funds for O & M.	Conservation and management of water sources to ensure irrigation water quality. Enforcement of laws and regulations on water use management.	Capacity building. Encourage more collaboration with international organizations in developing irrigation scheme infrastructure.	Empowerment of women and youth to have equal access to water use management

Policy	R&D	Extension	Finance	Quality	Institutional organization	Women and Youth
		Strengthening coordination and collaboration between public and private extension service providers. Facilitate irrigation schemes by provision of extension officer and technician in each scheme.				

Table 3 (d): Value chain intervention element matrix (VIEM – Promotion of time and labour saving technologies including Mechanization): Proposed interventions under promotion of time and labour saving technologies including Mechanization

Policy	R&D	Extension	Finance	Quality	Institutional organization	Women and Youth
Create enabling environment for private sector engagement in agro-mechanization. Strengthen Private Public partnership and Private Private Partnership on agro-industries development. Review TAMS.	Strengthen R & D institutions dealing with agro-machineries technologies. To build capacity of R & D staff in research institutions. Develop simple and affordable tools and machines. Establish platform and networking for the R & D and local artisans/ manufactures of ago-machineries.	Disseminate and promote use of agro-machineries technologies. Rehabilitate and retooling farmers training centers. Capacity building of local mechanics on agricultural machineries. Establish platform for linkages and networking of local agro-mech technicians and agro-machinery owners	Link farmers with financing /credit institutions Link local agro-machineries fabricators with credit institutions	Enforce laws and regulations on quality of both imported and locally fabricated agro-machineries. Strengthen Ago-machineries quality control institutions e.g. CARMATEC.	Train agromechanics and farmers on use and maintenance of agro-machineries. Establish agro-mech platforms. Encourage private sector to establish hiring centers. Strengthen Agro-mech training centers in human capacity and facilities.	Promote proper use of agro-machineries for labour serving to attract youth and women involvement in agriculture. Involvement of youth and women in providing mechanization services

		Capacity building of agric agro-mechanics. Develop machineries dealer platform and link them with farmers to ensure availability of after sale services. Facilitate extensionists with transport facilities and working gears. Strengthening coordination and collaboration between public and private extension service providers				

Table 3 (e): Value chain intervention element matrix (VIEM – Land Management): Proposed interventions under Crop and Land Management

Policy	R&D	Extension	Finance	Quality	Institutional organization	Women and Youth
Awareness and enforcement of land laws, regulations . Easy title issuance procedures to be used to access loans. Enhance gender equity in land ownership.	Strengthen research-training-extension-farmer linkages; Increase investment in research and development including recruiting of researchers and capacity building (technically and financially). Enhance on-farm and substation client oriented research	Promote and strengthening private sector participation in extension services delivery. Increase access to information through improved information sharing systems and mechanism. Soil test kits. Increase number of extension officers. In-service training for extension officers to promote new technologies	Formalize farm ownership to be used as collateral to access loans. Capacity building to Farmers. Cooperative intelligence to support small holder farmers to access financial services. Create awareness and promote farmers to use crop insurance	Government to institute reduced interest rate which is favorable to farmers. Promote and create awareness on GAP including use of improved technology for quality paddy production. Empower famers on use of improve crop management for quality. Capacity building to farmers to grow uniform variety	Strengthen coordination of different institutions and organizations supporting farmers for sustainable solutions	Enhance gender equity in land ownership Promote labour saving technologies for reduced drudgery for women and youth.

Policy	R&D	Extension	Finance	Quality	Institutional organization	Women and Youth
Facilitate villages land use plan to address land conflicts		Enhance value addition at village levels				

5.4 Post-Harvest Management, Value Addition and Marketing

5.4.1 Post-harvest Management

The causes of harvest and post-harvest losses in rice are mainly due to lack of technical know-how and capital to invest in proper technologies. The strategy will address post-harvest loss by targeting interventions throughout the post-harvest value chain. For effective and sustainable interventions while sufficiently contributing to national food and nutrition security, the strategy will promote;

- research and innovations on new and appropriate technologies and methods to reduce rice losses
- availability, accessibility, affordability, and adoption of tested technologies and processes to reduce rice post-harvest losses
- standardization of methodology for estimating losses
- building the capacity of extension service providers on postharvest management and technologies parallel to that promoting private sector to invest in affordable postharvest technologies
- favorable environment for promoting post-harvest technologies financing to service providers
- coordination of partners and stakeholders in the implementation of strategic interventions

5.4.2 Value addition (processing)

The strategy will put special emphasis on rice processing with a view of enhancing rice profitability by adding value to what they produce and commercial utilization of rice products and by-products. Rice-based products include rice flour, rice starch, parboiled rice, cakes, baked breads and crackers, breakfast cereals. Currently practice, rice bran and husks are thrown away or disposed as low value fuel or animal feed. The strategy will promote: -

- Investments in technology, research and development of rice based products and by-products based on their potentiality of local and export markets
- High value products such as fertilizer bran oil for cooking, waxes for cosmetic products, particle boards, bedding materials and animal feeds

Table 3 (f): Value chain intervention element matrix (VIEM – Grain Quality Management): Proposed interventions under Post-harvest Processing and Value addition

Policy	R&D	Extension	Finance	Quality	Institutional organization	Women and Youth
New registration to ensure compliance with standards and adoption to minimize post-harvest losses. To harmonize the function of accredited standards regulatory authorities to reduce post-harvest losses and promote value addition.	Promote research and innovations of new and appropriate technologies and methods to reduce rice losses. Promote availability, accessibility, affordability and adoption of tested technologies and processes to reduce rice post-harvest losses. Develop a standard methodology for collecting data and estimating rice post-harvest losses.	Capacity building to extension service providers on rice PHM and PHT	Create a favorable environment for promoting PHM financing Promote and strengthening private sector to invest on affordable post-harvest technologies Provide incentives to post harvest infrastructure investments	Capacity building on harvest handling at household and at storage facility. Promote branding and traceability	Strengthen institutional capacity, coordination, partnerships and stakeholders' participation of PHM and processing to enhance integrated interventions	Capacity building for youth and women to be involved in rice byproducts and value addition

5.4.3 Marketing

To strengthen efficiency in the functionality of market systems, the strategy will improve the formalization and structuring of rice market systems, while strengthening the efficiency and effectiveness of available market related support services. Facilitation will be done to increase investments and strengthen market intelligence as well as strengthening market information system and mechanism that is easily accessible to all value chain actors especially farmers, through extension service providers. The private sector will be supported and capacitated to invest in medium scale milling machines for quality milling while strengthening backward and forward linkages among the rice value chain actors. Farmers will be capacitated through extension services to produce as per market requirements, including the commercial benefits of uniformity of grain quality. The strategy will improve and ease standards, certification procedures and promote strong branding and quality packaging of rice-based products and by-products. The strategy will: -

- Promote warehouse receipt systems that ensure producers get a better price of their produce, earn more and have reliable sources of food and income;
- Establish strong, self-supporting producer groups in which members support each other to produce, process, package and market their rice;
- Build producer's knowledge, skills, and confidence to improve their bargaining power;
- Establish wider links in the rice trade so as to be able to compete in regional and world market
- Promote efficient operationalization of Warehouse Receipt System (WRS) and Tanzania Mercantile Exchange (TMX)

Table 3 (g): Value chain intervention element matrix (VIEM – Marketing and trade): Proposed interventions under rice marketing segment of the value chain

Policy	R&D	Extension	Finance	Quality	Institutional organization	Women and Youth
Improve efficiency and effectiveness of available market related support services. Predictable policies based on data. Formalization and structuring of rice marketing systems Constantly monitor quality and branding in rice marketing. Enforce constantly monitoring trade policies of partner countries. Institute procedures which encourage formal boarder trade (porous border is an issue)	Investment and strengthen market intelligence . Improving data collection and use of market information.	Strengthening access to market information through improved information systems and mechanism.	Promote short term working capital to value chain actors. Strengthening backward and forward linkages between value chain actors (eg contract farming/millers)	Support and strengthen private sector capacity investment in high tech milling machine. Capacity building to farmers and processors on quality management. Capacity building on commercial benefit of uniform variety (One farm should have same variety for quality stocks	Strengthen coordination and sectoral linkages to strengthen marketing system. (Many ministries are involved in marketing)	Capacity building to women and youth participation in marketing. Capacity building to youth and women to be involved in rice byproducts

5.4.4 Access to credit/agricultural finance

Public and private sector agricultural financing in Tanzania is low due to non-availability of long-term financing for investment in the sector. Lending to agriculture by financial institutions has drastically declined because of economic liberalization and privatization. Tanzanian agriculture is characterized by smallholder producers whose production is often considered risky and expensive to lend. Furthermore, agriculture's low profitability does not allow farmers and agribusiness to earn adequate returns for sustaining livelihoods and re-investing in the sector. Besides, financial management capacity of the rice producers is limited. In view of this, the strategy will: -

- Facilitate farmers to form farmers groups and associations to strengthen their bargaining power and accessibility to credits.
- Promote contract farming scheme as one way of alleviating the lack of formal farm credit among the smallholder farmers as well as providing access to the extension services, farm inputs and product markets.
- Scale up agricultural inputs guarantee pilot scheme arrangement to the rice producing areas and facilitate timely availability of agro-inputs to farmers.

These interventions are expected to encourage rural-based agro- dealers to carefully screen their customers and extend credit to them and further extend the benefits of the Guarantee Fund (GF), beyond the primary recipients. In this way, the capacity of agro-dealers to access credit that can help meet the incremental working capital requirements for acquisition and distribution of inputs can be ensured.

CHAPTER SIX

6.0 PRIORITY AREAS, INVESTMENT AND IMPLEMENTATION

6.1 Priority Areas

Amongst the various proposed interventions above, special focus will be laid on the following five priority areas for public and private investments in rice value chain: -

6.1.1 Irrigation

Current paddy cultivated areas under irrigation is 475,052 ha while potential area is 29.4 million ha. The focus is to invest in expansion of area under irrigation; rehabilitation of existing irrigation schemes; research and development on improving efficiency in water use and management and strengthening irrigators' organizations.

6.1.2 Marketing

The focus will be on expanding the rice market beyond the domestic market into regional markets. This involves sustaining domestic supply and exporting the surplus to regional markets. This will be achieved through improvement of both domestic and regional policies on enhancing the competitiveness of Tanzania rice in the regional market through improvements in rice grain quality standards and regulations, business enabling environment; finance, and investments in market intelligence, post-harvest handling and storage practices, processing, value addition, branding and strengthening of business linkages.

6.1.3 Time and labour saving technologies, including Mechanization

Labour saving technologies are crucial in expanding areas under cultivation and in increasing the on-farm productivity. The focus is to expand the use of machineries in rice production through increased participation of the private sector; support in research and development of simple and affordable tools and machines and after-sales services.

6.1.4 Farm Inputs and services

Expansion of production and productivity requires increased use of inputs such as improved seeds, quality fertilizer and access to supporting services such as extension and finance. The focus is to improve the capacities of rice breeding for climate resilience, multiplication and distribution of varieties which are market preferred and resilient to climate changes; strengthening seed certification system; improved

access and use of fertilizer and other agrochemicals; improved extension services through building capacity of public and private service providers; and enhancing financial institutions to finance value chain actors.

6.2 Investments Financing

6.2.1. Public-Private Partnerships

The backbone of the NRDS II implementation is public-private partnerships in achieving the strategic goal. Public investments are required to trigger private investments in newer rice production areas (such as the irrigation schemes) where the entire value chain needs to be built. However, it is important that the public investments in strategic infrastructures and technologies for irrigation and water management; mechanization; value addition, processing and marketing; inputs and service distribution require strategic partnerships with the private sector. Such public-private partnerships are expected to transform the rice farmers livelihoods through increased income and improved socio-economic well being of farmers and other value chain actors; increased volume of rice trade, increased employment opportunities and increased sub-sector contribution in government revenues. The NRDS II seeks to attract more public and private investment in the following infrastructures, technologies and service delivery to achieve the desired change in the subsector: -

a) Irrigation and water management
b) Post-harvest handling and storage
c) Labour saving technologies, including mechanization (machines, spare parts and affordable simple labour saving equipments)
d) Processing
e) Value addition to rice and by products
f) Branding
g) Transport
h) Farm Input supply
i) Trade facilitation (e.g through commodity exchange market)
j) Training and Extension services
k) Financial services
l) Agribusiness Development (Micro, small, medium and large enterprises)

The public investments will largely be sourced through ASDP, the medium-term national investment plans under the CAADP framework, annual national budgetary sources and development partners whose country strategy are in line with the socio-economic developmental aspirations of the NRDS II. These public investments are expected to contribute to the envisaged private investments (Section 6.2.2) and their partnerships, and effectively engage the stakeholders so as to advance the development of the rice value chain.

6.2.2. Private Investments

NRDS II provides ample scopes for the private investors to participate in rice value chain production, processing and marketing. While the commercial on-farm production of quality premium rice that is meant for exports, shall be led by large scale private farming; the domestic supply chain of inputs for both the subsistent and the market-oriented smallholder rice farming shall be heavily driven by micro-, small-, medium- and macro enterprises. The handling and processing of paddy, packaging and branding of the locally produced rice and by-products (straw, bran and husk) present huge investment opportunities. The regional supply chain of Tanzania rice and the requirement of the associated logistics will also need to be absorbed by the private investors.

The investment requirements of the NRDS II will be integrated with other initiatives that aim at mobilization of private investments such as Country Agribusiness Partnership – Framework (CAP-F) under AU-NEPAD's Grow Africa. In this context, interests in partnering and investing in rice value chain (seeds, fertilizers, irrigation, mechanization, postharvest handling, processing and marketing) will be explored. The interested micro-, small-, medium- and macro entrepreneurs will be assisted in preparing investment/business proposals and will be facilitated towards the various avenues of fund-matching instruments and public-private partnerships, and provide feedback on the impacts of such investments through Joint Sector Review (JSR) process.

6.3 Implementation

6.3.1 Organizational structures

NRDS II is structured to complement ASDP II (2017/2018-2027/2028). The NRDS II implementation will be done by public (Agricultural Sector Lead Ministries, local authorities, Research institutions and Agencies) and private agencies (input suppliers, seed companies, financial institutions, farmers, processors, traders and other value chain actors) and Development Partners (NGOs, funders) under the coordination of the Ministry of Agriculture through the Task Force appointed by Permanent Secretary. A schematic diagram of the implementation structure is shown in figure 2.

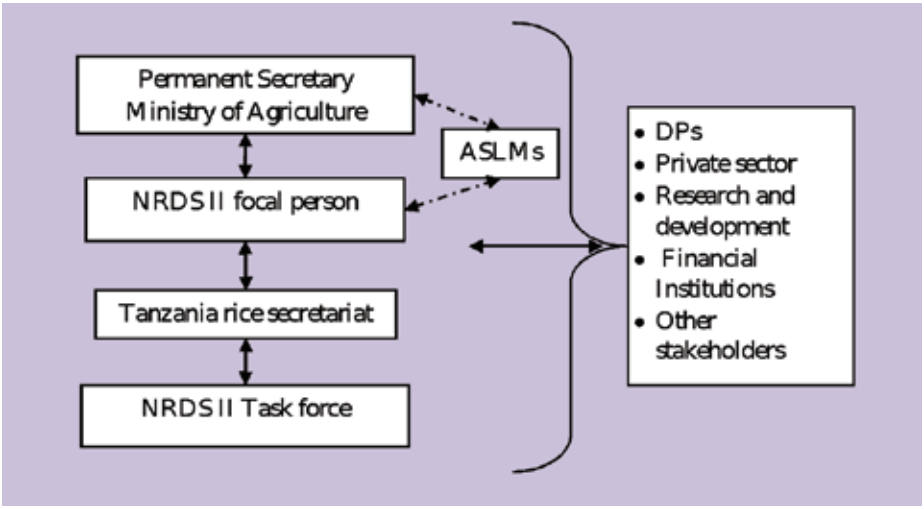

Figure 2: NRDS II implementation and coordination structure

The roles of NRDS II coordination components are as follows: -

a) **Permanent Secretary of Ministry of Agriculture** roles

- Higher level coordination with Ministers, other line ministries' Permanent Secretaries (PSs) and Development partners
- Providing higher level strategic guidance for NRDS II implementation

b) **NRDS II focal person:** This is a person appointed by Permanent Secretary of Ministry of Agriculture to lead and coordinate NRDS II implementation. His roles include: -

- Coordination of the NRDS II secretariat's activities and meetings
- Serve as Focal point for NRDS II communication between PS-MoA, other ASLMs and DPs, value chain actors and other stakeholders
- Fund mobilization for rice related programs/projects
- Represent NRDS II task force in ASDP II steering committee and other national and regional fora
- Liaise with CARD and other initiatives on rice-related development in the country and the region

c) **NRDS II secretariat:** About six (6) people from different departments in the Ministry of Agriculture shall serve in the secretariat. Their major role is to support the day to day activities of NRDS II. Their key roles shall include: -

- Coordinate interventions in the rice sub-sector by ASLMs, DPs, VC actors and other stakeholders
- Promote public, private investment towards implementation of NRDS II.
- Provide linkages between value chain actors
- Provide technical support guides to DPs, VCAs and other stakeholders
- Support development of rice Subsector development projects
- Constantly monitor NRDS II implementation
- Support organizing NRDS II task force meetings
- Aggregate data from stakeholders, establish and maintain rice database
- Organize annual rice stakeholders' forum/workshops
- Monitor and evaluate the progress on rice value chain development
- Prepare annual report on progress on NRDS II implementation

d) **NRDS II task force:** The taskforce provides technical assistance towards the revision of the NRDS II priorities, as appropriate and the implementation of the NRDS II. The taskforce shall include NRDS II secretariat members; representatives from government agencies, DPs and other stakeholders' representatives appointed by Permanent Secretary of Ministry of Agriculture. The roles of NRDS II task force are to: -

- Develop NRDS II mid-term and a short-term implementation plan
- Review and monitor implementation of NRDS II plans.
- Fund mobilization through proposal development
- Review progress in stakeholders' interventions on rice related projects and provide inputs to the monitoring and evaluation of the implementation of the NRDS II
- Developing semi-annual/annual NRDS II report on the progress on the rice sector development

6.3.2 Monitoring and evaluation

The NRDS II will be monitored by the NRDS II task force under the supervision of a focal person appointed by the PS Ministry of Agriculture. The following will be done to ensure effective and efficient in implementation, monitoring and evaluation of all rice sub-sector programs/projects: -

- All stakeholders implementing rice-related projects shall share/submit annual progress reports to the NRDS II focal person
- NRDS II task force meeting will review progress of rice programmes/projects; consolidate and produce an annual report
- Set and track indicators of progress on implementation against the baseline data on various segments of the rice value chain (e.g. seed usage, fertilizer usage, adoption of good agronomic practices, postharvest losses, marketing practices)
- Annual stakeholders' workshop/meeting/platform for reviewing NRDS II progress and validate annual rice development report
- Mid-term evaluation of NRDS II will be conducted in 2025 and ex-post evaluation in early 2031.

These evaluations will help ensure effective monitoring of NRDS II implementation through: -

- Assessment of effective implementation of projects/programmes
- Identification of gaps in NRDS II implementation by stakeholders
- Avoiding overlapping/duplication of efforts/interventions through profiling of rice stakeholders in the country
- Aggregation and dissemination of rice data and information
- Providing feedback to stakeholders on progress on NRDS II implementation

CHAPTER SEVEN

7.0 SUSTAINABILITY

Developments in the rice subsector is expected to provide income, employment and food at affordable prices as well as raw materials for the processing industry and foreign exchange from exports. Creating a sustainable rice sub-sector development path therefore means improving the quality of life in rural areas, ensuring enough food for present and future generations and generating sufficient income for farmers. To ensure sustainable development of the rice value chain through the implementation of the NRDS II, three areas are considered viz., economic-, social- and environmental sustainability.

7.1 Economic Sustainability

The implementation of this strategy could lead to oversupply of rice in the country, thus posing a problem of rice marketing and downward pressure on domestic rice prices. This could lead to reduction of profit accrued to rice farmers. In order to address this issue, marketing strategies as suggested in this strategy should be implemented. The strategies considered include exploring the rice markets within the EAC and SADC Countries by producing quality rice. Another intervention to increase profit to rice farmers is to make sure that farmers carry out value addition before selling and make use of the rice by-products as envisaged in the strategy.

Economic sustenance in rice production by farmers will require increased availability and accessibility to farm inputs. The suggested strategic approaches under this NRDS II include empowering agro-dealers by guaranteeing them through financial institutions, supporting input suppliers for distributing fertilizers, improved seeds and agro-chemicals hence increasing their availability, and giving input loans to farmers in availing these inputs. It is anticipated that by establishing such an input network, farmers will be able to get inputs all year round at affordable prices and within their localities. This will enable farmers to sustainably increase production, productivity and profitability of rice farming. The increased production and productivity of rice would also increase the ability of the paddy farmers to reinvest their profits by procuring more farm inputs and explore additional opportunities of adding value through farming. Provision of quality extension services to rice farmers would also ensure such economic sustainability through improved awareness on the production and marketing of rice.

7.2 Social Sustainability

The involvement of all gender dimensions in the planning and implementation process of the strategy would contribute to the sustainability of the strategy, as they would feel owners of the initiated interventions such as rehabilitation and construction of irrigation schemes, formation of producers' and farmers' organizations. Promoting women and youth to own land, especially on newly developed irrigation schemes would also lead to social sustainability as women and youth are the major players in rice production activities. The promotion of the use of appropriate technologies and farming tools that reduce drudgery in rice farming as suggested in the strategy could also help improve the inclusivity of women and youth in rice production, processing and marketing. Use of other modern technologies (such as smart phone apps, drones in application of fertilizers and Agrochemicals, by-product management and value addition) will attract more youth to rice farming.

7.3 Environmental Sustainability

Implementation of the NRDS II is among the interventions which could have negative environmental impacts, if not well planned. Some of the negative impacts could include deprivation of water table and reduced availability of irrigation water for downstream users due to over abstraction of water and inefficient use by irrigation schemes; prevalence of water borne diseases such as malaria, bilharzias, diarrhea due to stagnant water in irrigation systems; increased salinity and alkalinity in the soils as a result of poor drainage systems and extensive inappropriate application of fertilizers and agro-chemicals; inundating settlement areas as a result of reservoir extension and dam constructions for the purpose of irrigation development and other uses; and land degradation due to clearing of vegetation when introducing new areas for rice cultivation. To address such environmental issues during the course of NRDS II implementation, the following would be considered:

a. Creating continuous awareness and monitoring of fertilizer and agro-chemical use to reduce environmental problems associated with it;

b. Training of farmers on environmental issues related to irrigated agriculture;

c. Training of technical staff on environmental issues so that they know the implications of irrigation development on the environment;

d. Use of Integrated Water Resource Management (IWRM) approach in irrigation development to ensure equity distribution of water resources among different water users;

e. Use of soil and water conservation methods to control land degradation

f. Undertaking Cumulative Environmental Impact Assessment after every five years.

g. Undertaking Integrated Pest Management Capacity Building in rice growing areas