



DESIGNING CONCRETE ACTION PLANS TO MITIGATE THE VIRAL DISEASE THREATS ON CASSAVA IN NIGERIA

West African Virus Epidemiology for Food Security (Wave)

December 2018

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ABBREVIATIONS

APHIS	African Plant Health Initiatives
BMGF	Bill and Melinda Gates Foundation
CAD	Cassava Anthracnose Diseases
CBB	Cassava Bacterial Blight
CBSD	Cassava brown streak disease
CBSV	Cassava brown streak virus
CGM	Cassava Green Mite
CMD	Cassava Mosaic Disease
CORAF	Council for Agricultural Research and Development
CU	Covenant University
DFID	Department for International Development
DG	Director General
DNA	De-oxyribonucleic Acid
DRC	Democratic Republic of Congo
EACMV	East African cassava mosaic
EACMV-Ug	East African cassava mosaic disease Ugandan
ECOWAS	Economic Community of West African States
EOC	Emergency Operation Centre
FAO	Food and Agricultural Organization
FMARD	Federal Ministry of Agriculture and rural development
FOASTAT	Food and Agricultural Organization statistics
GIS	Geographic Information System
GPS	Global Positioning System
IFAD	International Fund for Agricultural Development
IITA	International Institute for tropical Agriculture

IT	Information Technology
KSUSTA	Kebbi State University of Science and Technology, Aliero
M&E	Monitoring and Evaluation
NAQs	Nigerian Agricultural Quarantine Services
ARCN	Agricultural Research Council of Nigeria
NASC	National Seed Council
NASS	National Seed System
NGOs	Non-Government Organizations
NRCRI	National Root Crops research Institute
QMP	Quality Management Protocol
RTEP	Root and Tuber Expansion Programme
SMS	Short Message Service
TMS	Tropical Manihot selection
WAVE	West African Virus Epidemiology

FOREWORD BY THE MINISTER OF AGRICULTURE

Nigeria is the world's largest producer of cassava by recording annual average production of 50 million metric tons. Despite cassava's strengths, the crop is subjected to several constraints that affect its productivity. Apart from minor diseases such as fungal and bacterial infections, viral diseases have the most damaging impact on cassava.

Cassava mosaic and Cassava brown streak diseases are the two critical viral diseases of cassava globally and they pose a major threat to cassava production. Due to its wide geographical distribution, Cassava mosaic disease (CMD) caused by *Geminiviruses*, is the primary production constraint to cassava globally. It has been discovered that in sub-Saharan Africa, CMD can lead to 40-50% yield losses, resulting in annual economic losses of \$3 billion USD. In addition, the recent emergence of Cassava Brown Streak Disease (CBSD) in central Africa adds to the threat to cassava productivity causing yield losses of up to 90% or even 100%. These two viral diseases are transmitted by the insect vector; the whiteflies (*Bemisia tabaci*) and are also disseminated by human using infected cassava cuttings for planting.

Nigeria is taking drastic steps towards creating a clean seed and crop health system as a measure to prevent the devastating Cassava Brown Streak Disease (CBSD), known as Cassava Ebola. The measure will go a long way in solving other existing and emerging crop health challenges, especially in the cassava value chain, and will eventually boost farmers' productivity.

To ensure that Nigeria is adequately equipped with the core capacities to prevent, detect and respond rapidly and efficiently in a coordinated manner to these cassava viral disease threats, this document defines clear plans on how to monitor and manage CMD and/or respond to a CBSD invasion with a view to reducing the potential human suffering that may result. Nigeria is ready to set up an emergency operation center and to build synergies with other stakeholders in the sub-region to form a network that will ensure effective control of the spread of cassava diseases. As such, the Federal Ministry of Agriculture and Rural Development (FMARD) will ensure that policies are formulated to address specific areas in the cassava value chain that will have direct effect on prevention and control of cassava diseases as follows:

- Continue to build stakeholder's capacity in cassava diseases management
- Set up a monitoring system through innovative participatory surveillance using the latest technologies
- Develop a country early warning and response systems against cassava diseases and other emerging plant diseases
- Develop an effective communication strategy on cassava viral diseases
- Consolidate synergy between breeders, entomologists and virologists for an effective control of cassava viral diseases
- Provide clean planting materials by strengthening our cassava multiplication system
- Improve control measures of planting material exchange at Nigerian borders
- Better protect smallholder farmers, a vulnerable link of the cassava value chain

Signature

Honorable Minister of Agriculture & Rural development

Federal Republic of Nigeria

EXECUTIVE SUMMARY

Cassava is an important food crop in Nigeria as it provides more than half the daily dietary requirements for over 168 million Nigerians, whilst also having widespread industrial applications and a huge potential to drive economic growth in the country. Although Nigeria is the highest producer of cassava in the world, average yield of the crop is still much lower than those obtainable in Asia and elsewhere around the world. This observed low yield can be attributed to several biotic and abiotic pressures particularly pests and diseases.

A myriad of bacterial (Cassava bacterial blight), fungal (Cassava anthracnose, Cassava leaf spot, Cassava root rot) and viral (Cassava mosaic disease (CMD)) diseases affect cassava in Nigeria, limiting the crop's potential for high tuber yield. Cassava mosaic disease is particularly important because its characteristic leaf mosaic symptoms hinder the efficiency of photosynthesis, thus directly impacting on yield. Secondly, CMD is transmitted using infected cassava planting materials and unlike bacterial and fungal diseases, it is not manageable using chemicals. Furthermore, another more devastating viral disease, the Cassava brown streak disease (CBSD), which was previously confined to East and Central Africa, is now reported to be spreading dangerously westward towards Nigeria. Therefore, effective prevention and management of cassava diseases, especially viral diseases, will be a major step to enhancing cassava productivity in Nigeria.

This national response plan describes the activities to be put in place and the responsibilities of various key stakeholders towards the effective management of existing cassava viral diseases, and the prevention and/or coordinated response in the event of a CBSD outbreak in Nigeria. A federally coordinated response will be adopted with major activities undertaken at the state and zonal levels. The plan provides a framework for a coordinated effort between relevant government agencies, national and international research organizations with the overall aim of reducing cassava tuber yield losses caused by cassava diseases in Nigeria. This plan will also facilitate data sharing, enhance adequate and clear communication between agencies, as well as with other relevant cassava stakeholders, especially the farmers. The plan includes the structure of cassava monitoring/management operating centers, the operational and implementation strategies of the centers, as well as a clearly defined monitoring and evaluation plan.

Key executors of the plan include but are not limited to, the Federal and State governments, the Nigeria Agricultural Quarantine Services (NAQS), the National Root Crops Research Institute (NRCRI), the Nigerian Agricultural Seed Council (NASC), the International Institute of Tropical Agriculture (IITA), and the three existing zoned hubs of the West African Virus Epidemiology (WAVE) project in Nigeria situated at NRCRI, Covenant University (CU) and Kebbi State University of Science and Technology Aliero (KSUSTA). The initial three years of the action plan will concentrate on boosting and scaling current ongoing activities towards the management of CMD in Nigeria and on pre-emptive management of CBSD. Pre-emptive management of CBSD is critical, with a view to minimizing the human suffering and losses that can result from a delayed response if the virus invades the country. Although CBSD is currently restricted to Eastern and Central Africa, it poses the greatest threat to cassava production in Nigeria through potential inadvertent introductions.

I. CONTEXT

Current national situation on Cassava Viral Threats

Economic and social importance of cassava in the country

Cassava, in its different processed forms, is a major source of carbohydrate for the growing Nigerian population. At about 53 million tons per year, Nigeria is the largest cassava producer in the world (FAOSTAT, 2016). Most of this is produced by smallholder farmers in rural regions who rely on cassava for food and income. Cassava is a crop of choice for many farmers due to its resilient nature, giving yields in dry and extreme conditions, where other crops fail. While Nigeria is the largest producer of cassava, the country has very low yields of 10-14T/ha despite having the potential for yields as high as 40T/ha. The low yields experienced by farmers in Nigeria is of concern as population projections have shown that cassava yields would need to double to meet up with the dietary needs of the populace by 2050.

The Federal Government of Nigeria had initiated various measures aimed at boosting cassava production in the past, including policies in support of enhancing utilization of cassava flour, new processing industries, and release of high yielding, improved varieties. All these measures to improve the cassava-based economy critically depend on managing various threats known to hamper cassava production and productivity.

Summary of current situation on the threats to cassava and current mitigation actions

As in most other sub-Saharan African countries, several pests and diseases are associated with cassava production in Nigeria, and constitute major factors contributing to keeping cassava productivity very low in comparison to other continents. These diseases include Cassava Mosaic Disease (CMD), Cassava Bacterial Blight (CBB), Cassava Anthracnose Diseases (CAD), Cassava Green Mite (CGM) among others.

The cassava mosaic disease (CMD) caused by the *Geminiviruses* (more specifically, *Begomovirus*) is the most significant disease affecting cassava in Nigeria, with the potential to cause an appreciable yield loss in susceptible varieties. The government of Nigeria alongside other international organizations have mitigated the devastating effects of CMD via various programs. Efforts by the government of Nigeria alongside international bodies via various programs and campaigns have led to significant results in the control of CMD across Nigeria. One of such programs was the Presidential Initiative on Cassava launched by the Federal Government of Nigeria in 2003 which employed massive deployment of resistant varieties to prevent severe outbreaks of CMD. This intervention increased average cassava yield in the country from 10 tons per hectare to 14 tons per hectare.

Amidst all the milestones achieved, new threats, facilitated partly by open trade routes and increased whitefly population have emerged from the East African Region. The East African Mosaic Virus (EACMV) which causes a more virulent form of CMD, not previously reported in Nigeria has

recently been found in Nigeria. This calls for prompt action to control this new virus strain and prevent the entry of even more virulent cassava viruses such as the Cassava brown streak virus (CBSV) which causes cassava brown streak disease (CBSD).

CBSD, which emerged in the Eastern region of the African continent has demonstrated a greater potential to devastate cassava production resulting in up to 100% loss in infected farms. Although CBSD has been known for decades, it was originally confined to coastal zones of Mozambique, Tanzania, Kenya and shores of Lake Malawi. However, within the last decade, the disease has spread quickly across east African countries and to neighboring southern and central African countries of Rwanda, Burundi, Zambia and eastern Democratic Republic of Congo (DRC). The pattern of spread suggests a westward migration supported by abundance of the whitefly vector and through accidental use of infected stems for cassava propagation. The possibility of this disease spreading to Nigeria or any of her neighboring countries presents a critical threat to cassava production in the country.

In response to these threats, the WAVE project and IITA are currently conducting second stage pre-emptive breeding for CBSD resistance/tolerance for Nigeria in Uganda and Tanzania through the following procedures:

1. In vitro plantlets (sanitized through tissue culture) of thirty Nigerian varieties and advance breeding lines were sent to East Africa for screening under high CBSD and high whitefly population pressure.
2. Development of CBSD resistant varieties appropriate to Nigeria using DNA markers was achieved by IITA in Nigeria. Examples of these varieties are: IITA-TMS-IBA961089A and IITA-TMS-IBA000388. These varieties were tested in Tanzania and have shown good tolerance to CBSD. Plans are in place for wider testing of these varieties as backup varieties with seed stocks developed to serve as emergency backup varieties if CBSD is detected in Nigeria.

Following a high-level delegation stakeholder meeting held on June 6th, 2018 in Benin, the WAVE team sent a report to the Minister of Agriculture, Federal Republic of Nigeria who approved the massive production and dissemination of virus-free, high quality planting material to cassava farmers in the country. The overarching strategy is to quickly multiply and disseminate high quality planting material of virus-resistant cassava varieties (seed systems) in all the cassava producing states in Nigeria targeting 5,000 farm households per state.

Meanwhile, to ensure the sustainability of clean seed distribution, WAVE seeks to do the followings:

1. Implement Quality Management Protocol (QMP) for the multiplication of clean planting materials by farmers involved in cassava planting material production in Nigeria.
2. Establish virus-free foundation stocks of Nigerian-farmer preferred varieties in the major cassava producing states.
3. Establish and maintain pest and disease-free production sites already identified by WAVE.

4. To ensure preparedness for the emergence of exotic virus strains such as CBSD, emergency seed stocks for known CBSD resistance varieties would be set up in collaboration with the various cassava stakeholders in the country.

Other developments made in terms of understanding the virus biology and ecology, development of diagnostic tools and CBSD resistant sources.

Rapid diagnostic tests (e.g. LAMP and RPA) developed to detect CBSVs in the field, less than 10 min.

- Advances also made in use of artificial intelligence to recognize CBSD symptoms using mobile phone – NURU app. It has accuracy of 60 to 70% but technology is getting better with time
- The “Cassava Disease Surveillance (CDS)” app was developed for rapid communication, coordination, early diagnosis and deployment of emergency response plan is a useful to coordinate surveillance action in Nigeria. NAQS has pilot tested the program.
- The ‘Seed Tracker’ app developed for seed value chain integration is a useful tool to coordinate quality seed multiplication and seed traceability vital for monitoring seed flows within the country
- Excellent progress made in identification of promising CBSD resistant/tolerant sources and development of improvement varieties some of which have been released in East Africa are faring well. The same have been deployed in Nigeria for evaluation and further breeding.
- Excellent progress made in development of CBSD resistant transgenic lines in Uganda. Response plan should consider introduction of CBSD transgenic lines into Nigeria for validation and hosting on shelf for use on need basis.

These are just few highlights and more technologies are envisaged in the next couple of years to improve disease diagnostics, surveillance tools, including use of drones and satellites, and host resistance. The second phase of WAVE will boost these developments.

Mapping of key stakeholders

Along cassava value chain

	Research & Development	Inputs	Production	Storage and Transport	Processing	Marketing and Promotion
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Public	<ul style="list-style-type: none"> - National Root Crops Research Institute (NRCRI) - Kebbi State University of Science and Technology Aliero (KSUSTA) - National Agricultural Research Council (NARC) 	<ul style="list-style-type: none"> - National Seed System (NASS) - Agro-dealers - Contract farmers - Cooperatives 	-	-	<ul style="list-style-type: none"> - Processors - millers 	<ul style="list-style-type: none"> - Farmers - Processors - Government agencies - Cooperative - Wholesalers - Retailers - Trade associations - Unions
Private	<ul style="list-style-type: none"> - International Institute of Tropical Agriculture (IITA) - Covenant University (CU) 	<ul style="list-style-type: none"> - Agro-dealers - Contract farmers - Cooperatives 	<ul style="list-style-type: none"> - Cassava growers association of Nigeria in various states 	<ul style="list-style-type: none"> - Farmers - Processors - Wholesalers - cooperative 	-	-

Other relevant actors

Government actors	Private sector	Civil society organizations/NGOs	Bilateral and multilateral partners	Others
<ul style="list-style-type: none"> - State Ministry of Agriculture - Federal Ministry of Agriculture and Rural Development (FMARD) - Federal Ministry of Science and Technology - Nigerian Agricultural Quarantine Service (NAQS) 	<ul style="list-style-type: none"> - Processors 	<ul style="list-style-type: none"> - CRS - MADE - CORAF - WAVE 	<ul style="list-style-type: none"> - DFID - World Bank - FAO - IFAD - IFC - AfDB - ECOWAS 	<ul style="list-style-type: none"> - BMGF

Risk Assessment

Names of the main threats	Level of risk (Low / Moderate / High)	Current consequences on crops	Probability of outbreak (Low / Moderate / High)	Further consequences if nothing is done
Fungal threats				
Cassava Anthracnose (CAD)	Low	Poor planting materials	Low	Compromised planting material
Bacterial threats				
Cassava Bacterial Blight (CBB)	Low	Poor planting materials	Moderate	Yield loss
Viral threats				
Cassava Mosaic Disease (CMD)	Moderate	Significant yield loss	Moderate	Yield Loss
Cassava Brown Streak Disease (CBSD)	High	Significant yield loss	High	Yield Loss/Risk of spreading to neighboring countries
Other threats				
Whitefly	Moderate	...	High	Introduction of new CBSD or new biotype of the CMD pathogen

Current risk management process

Actions currently taken (*)

Type of risk	Prevention, Mitigation, and Preparedness	Detection and Response	Monitoring & Evaluation
Cassava Mosaic Disease (CMD)	<ul style="list-style-type: none"> - Breeding for CMD resistant cassava varieties - Establishment of seed multiplication system - Education and training of farmers in good farm practices - Distribution of CMD symptom free planting material for the next planting season 	<ul style="list-style-type: none"> - Country wide surveys and virus status mapping were conducted by WAVE in 2015 and 2016 to identify three virus strains associated with CMD in Nigeria - EACMV-UG has not been detected in Nigeria 	<ul style="list-style-type: none"> - Disease burden data obtained from periodic field surveillance - Farmer and stakeholder surveys to measure impact of farmer education and compliance - Disease burden data available to the public through WAVE website, published in academic journals and/or shared

			with appropriate authorities
Cassava Brown Streak Disease (CBSD)	<ul style="list-style-type: none"> - Good farm practices - Farmer education - Establishment of seed multiplication system - CBSV resistant planting materials have been developed and are kept on standby for propagation should an outbreak occur 	<ul style="list-style-type: none"> - Laboratories equipped with molecular diagnostic tools are available in member institutions around the country - CBSD has not been detected in Nigeria 	<ul style="list-style-type: none"> - Disease burden data obtained from periodic field surveillance. - Farmer and stakeholder surveys to measure knowledge and compliance. - Disease burden data available to the public through WAVE website, published in academic journals and/or shared with appropriate authorities

(*) For each of the threats rated above as high and at least moderate

Gap Assessment

Strengths

CBSD resistant varieties are already available in the tissue culture laboratory of IITA and can be quickly used, in the short term, for the development of adapted resistant genetic stocks.

Weaknesses

1. Cassava is a highly heterozygous plant and breeding takes a long time, making progress with conventional breeding alone difficult
2. Data from field surveys takes time to collect
3. Stakeholders such as the quarantine agency and extension services often lack adequate resources to initiate response
4. The current approach to farmer education is time consuming and labor intensive as such it does not scale properly

Key takeaways

1. To ensure preparedness, CBSD resistant varieties should be deployed to cassava growing regions in the country paying attention to hotspot zones close to the borders
2. Mobile plant clinics, as is currently used in East African countries, can be used to boost the capacity of quarantine agencies at control and cassava disease monitoring.
3. Scalable approaches to farmer education need to be developed to ensure proper coverage. Traditional media sources such as the radio could be leveraged to reach farmers in remote regions of the country.
4. Since produce from farms with CBSD infection would be destroyed, agricultural policies that encapsulate farmer compensation should be enacted. This is to ensure that farmers who encounter CBSD in their farms are motivated to come forward.

5. Develop state level multi-sectoral working groups; Engagement with all relevant stakeholders (Ministry of Agriculture, Ministry of Commerce, Research, NGOs, Development organizations, Farmer organizations)
6. Development of a National working group; a group with key representation from each geopolitical zone established to share information and State plans.
7. High level engagement; get CBSD on the agenda of meetings of the executive councils with Ministers, President and ex-Presidents.
8. Assign a champion for the CBSD issues in Nigeria within the Federal Ministry of Agriculture – someone who will bring it to the table and pull others along
9. Explore Public – Private models for research, development and extension

II. STRATEGIC OBJECTIVES AND VISION OF THE NATIONAL RESPONSE PLAN

Vision

A sustainable increase in cassava productivity in Nigeria through the development of effective management measures for the bacterial, fungal and viral diseases that affect cassava by 2023.

Strategic Objectives

Short term objectives and activities

Strategic Objective 1: Enhance coordination and collaboration among key government institutions, national and international research organizations in Nigeria for cassava disease monitoring and management

Activity 1: Constitute a national cassava disease monitoring/management steering committee comprising of representatives of the Federal Ministry of Agriculture and Rural Development (FMARD), the National Root Crops Research Institute (NRCRI), the Nigerian Agricultural Quarantine Services (NAQS), the Nigerian Agricultural Seed Council, the West African Virus Epidemiology (WAVE) for Root and Tuber Crops Project, and the International Institute of Tropical Agriculture.

Activity 2: Build on state and zonal monitoring/response capacity by establishing routine cassava disease monitoring and assessment program within State Ministry of Agriculture, as well as clearly defining and/or establishing the chain of data reporting within states, zones and centrally.

Activity 3: Coordinate data and information management and sharing among all key players.

Activity 4: Strengthen border control legislations to prevent the movement of cassava planting materials in and out of Nigeria and promote collaboration with quarantine institutions in neighboring countries.

Activity 5: Set up state and zonal clean and resistant seed distribution systems

Activity 6: Develop a national policy on the prevention and management of bacterial, fungal and viral diseases of cassava in the country

Strategic Objective 2: Implement a communication strategy for effective public education, including government officials and farmers, to prevent the introduction and potential impacts of Cassava diseases in Nigeria.

Activity 1: Conduct sensitization campaigns on the need and best practices for the use of cassava clean seeds for small holder cassava farmers across the country

Activity 2: Promote active and continuous communication through radio and television call in programs and by establishing disease reporting centers across the country.

Mid-term Objectives and activities

Strategic Objective 3: Assess the current status of cassava viral diseases in Nigeria

Activity 1: Undertake nationwide cassava field surveys to assess the status, distribution and economic importance of all previously reported and/or emerging cassava viral diseases.

Activity 2: Collect field samples for laboratory testing.

Activity 3: Analyze the field and laboratory data to determine the key diseases that currently require attention and to determine if any emerging cassava disease needs to be highlighted.

Strategic Objective 4: Reinforce the existing improved community-based cassava seed system to ensure availability and demand for clean seeds

Activity 1: Conduct sensitization campaigns on management and prevention of cassava diseases for small holder cassava farmers across the country, leveraging on established and functional farmer associations that exist across the country.

Activity 2: Conduct sensitization campaigns on the need and best practices for the use of cassava clean seeds for small holder cassava farmers across the country, leveraging on established and functional farmer associations that exist across the country.

Activity 3: Promote active and continuous communication through radio and television call in programs and by establishing disease reporting centers across the country.

Activity 4: Provide professional support for adequate evaluation and certification of clean seeds by trained scientists.

Long-term objective and activities

Strategic Objective 5: Reinforce human and infrastructural capacities for the management of existing cassava diseases and to prevent and/or respond to new disease threats such as CBSD through sustainable funding from different development partners

Activity 1: Train a critical mass of scientists (MSc and PhD students, Researchers etc.) on various aspects related to the management and control of bacterial, fungal and viral diseases of cassava, including the development of disease resistant cassava breeds.

Activity 2: Conduct periodic short-term refresher training courses and workshops for existing staff of relevant institutions as the need arises.

Activity 3: Establish, refurbish and/or equip research laboratories and information management systems within states and/or zones in the country.

Activity 4: Purchase and maintain field assessment vehicles for routine monitoring and rapid response.

III. STRUCTURE OF THE EMERGENCY OPERATIONS CENTER (EOC)

Institutional anchoring

The emergency operation center (EOC) will be anchored within the existing root and tuber section of the Federal Department of Agriculture, Federal Ministry of Agriculture and Rural Development (FMARD), Area 11, Gorki Abuja.

The existing WAVE hubs will serve as the sub-Centers responsible for undertaking all response activities in the six geopolitical zones of Nigeria. The National Root Crops Research Institute (NRCRI), Umudike Hub will undertake all response activities in all the states within the south-south and south-east zones, Kebbi State University of Science and Technology, Aliero Hub will cover the states in the North-west and North-east zones; and Covenant University Ota will undertake response activities in all the states in the South-west and North-central zones.

Specialized Support Centers will be situated at the Nigerian Agricultural Quarantine Services (NAQS), the Nigerian Agricultural Seed Council (NASC) and the International Institute of Tropical Agriculture (IITA). These support centers will provide support for the implementation of this plan based on their existing strengths and mandates in specialized areas that are critical to the success of the plan. The NAQS will be responsible for all border control issues, phytosanitary laws and policies, The NASC will coordinate and regulate functional clean cassava seed system while the IITA will provide breeding and tissue culture expertise.

Governance

Mandate

The mission of the EOC will be to coordinate a functional, nationwide effort aimed at managing the viral disease threats to cassava in Nigeria through:

1. Strengthening, maximizing the outputs, scaling and sustaining all CMD control efforts currently ongoing in the country.
2. Establishing preparedness and response measures necessary to stop the invasion of CBSD into Nigeria and/or prevent the spread of CBSD within the cassava growing areas of the country where exclusion fails.

The EOC will be fall into the existing frameworks of the plant department of the NAQS which is mandated to protect the cultivated crops and natural flora of Nigeria from destructive pests (especially foreign pests), The NRCRI which has the mandate for genetic improvement of root and tuber crops in Nigeria including cassava; as well as the National Agricultural Seeds Act No. 72 of 1992 which established the NASC. The NASC is charged with development and regulation of national seed industry and as it relates to this plan, there is clearly a need for the development and regulation of a functional cassava seed system/industry.

Given that there is currently no specific agency or institute within the FMARD that has the mandate for national in-country plant disease monitoring and prevention, since NAQS activities concentrate on exotic pests, it is now critical that the EOC proposed in this plan be structured and legalized within the FMARD with the legal mandate to cater for cassava viruses and other plant diseases.

Organizational Oversight

A Task Force will lead the implementation of this emergency response plan. The Task Force will coordinate and monitor the implementation of the activities of the EOC and report directly to the Honorable Minister of Agriculture. More specifically the Task Force will:

1. Provide leadership in coordinating all relevant structures at the state, zonal and national level in support of the national plan.
2. Convene periodic National inter-sectorial meetings to monitor the implementation of the response plan.
3. Identify, recommend and actively advocate the deployment of relevant/additional resources (Human and/or infrastructural) to strengthen key activities across each zone.
4. Organize cross border consultations to facilitate exchange of information.

The Task Force will have the following as its core members:

- **FMARD:** Permanent Secretary Federal Ministry of Agriculture and Rural Development (Chairman of the task force)
- **FDA:** FDA representative
- **RTEP:** RTEP representative
- **NRCRI:** J. Onyeka (NRCRI/WAVE hub Lead), Chukwuemeka Nkere
- **NAQS:** NAQS representative
- **IITA:** Peter Kulakow (IITA Lead), C.N Egesi and Lava Kumar
- **CU:** Angela Eni (WAVE-South West and North-Central Hub Lead)
- **KSUSTA:** Ibrahim Mohammed (WAVE – North West and North East Hub Lead)
- **EOC Director Administration:** as Secretary of the task force
- **ARCN:** One member
- **NASC:** One member
- **Senate Committee on Agriculture:** One member
- **House Committee on Agriculture:** One member
- NCGA: One member
- FEDERATION OF AGRICULTURAL COMMODITY ASS. OF NIG.
- STATES MINISTRY OF AGRICULTURE

- UNIVERSITIES OF AGRICULTURE – Abeokuta, Ogun, Umudike, Abia and Makurdi, Benue States.

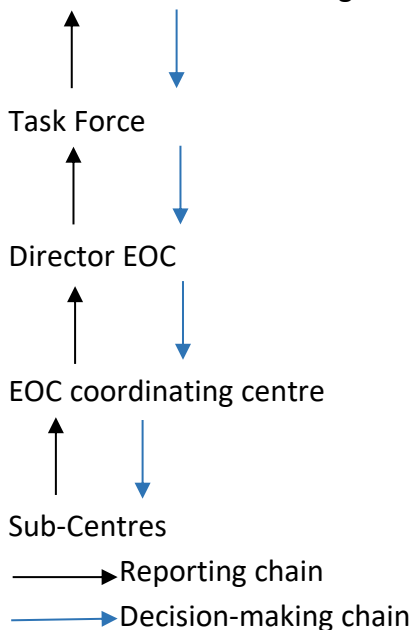
Organizational structure

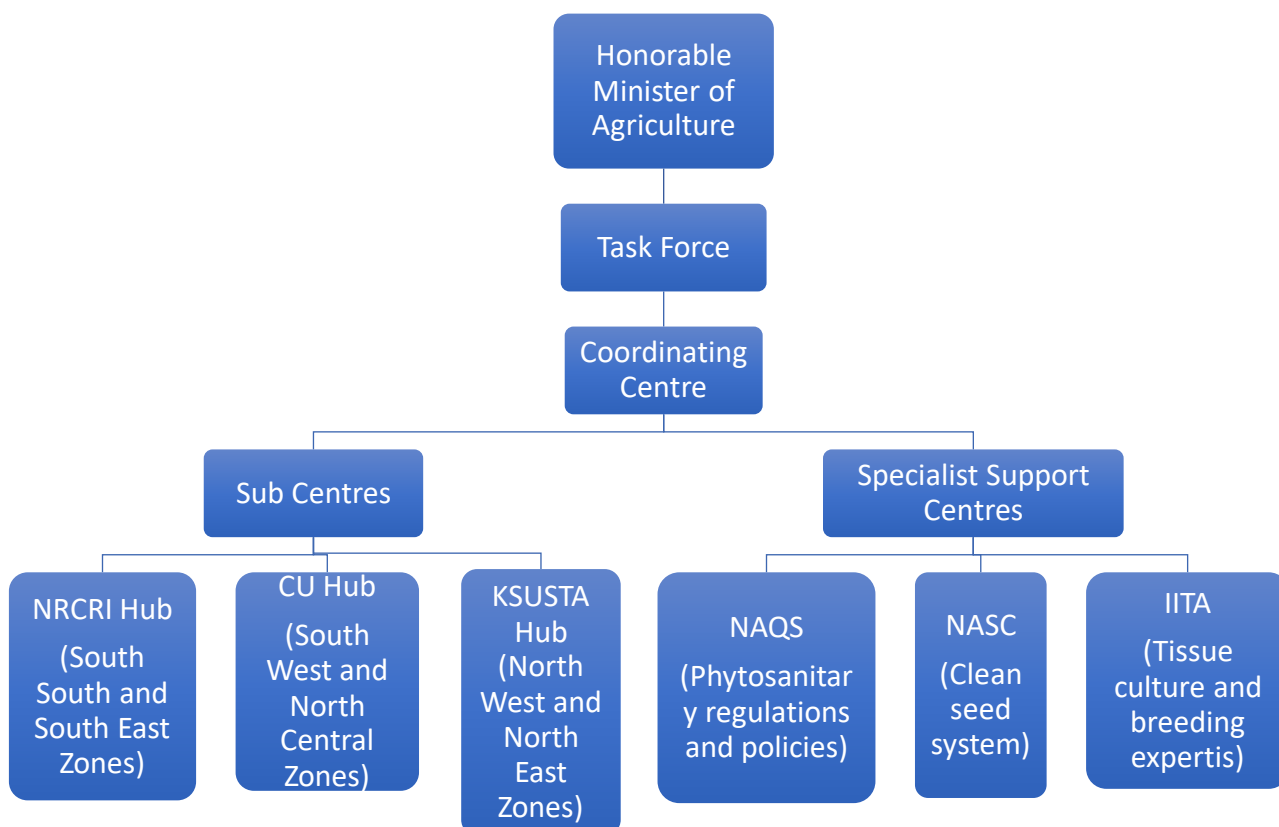
EOC Coordinating centre will oversee and coordinate the activities of the three EOC sub-centres in South-South/South-East, South-West/North-Central and North-West/North-East, as well as the specialist activities of the three specialist support centres namely NAQS, NASC and IITA. Since the EOC coordinating centre will be situated within the FMARD, it will leverage on existing units within the FMARD such as Human resources, Finance/budgeting and communication etc.

Reporting and decision-making structure

The reporting and decision-making chain of communications cascades downwards and upwards from the Minister of Agriculture to the sub-Centres as follows:

Honourable Minister of Agriculture and Rural Development





Human Resources

Core Competencies

Key Skills needed for the operations of EOC:

1. Permanent skills / staff: Project manager, M&E specialist, Communications manager, Operations manager
2. Temporary skills / staff: Professionals: Virologists, Breeders, Entomologists, GIS/IT Experts, Drivers, Containment officers, post-harvest expert

Key skills needed in key areas of crisis management:

1. Prevention: Virologists, Entomologists, Breeders, Disease Epidemiologist, Tissue Culture experts, Communication experts
2. Mitigation and Preparation: Operation manager, Communication Manager/Experts, Project Manager
3. Detection and Response: Virologists, Lab Technologist and technicians, Data analysts, Drivers, Field staff, Containment Officers

4. Monitoring and Evaluation: M & E specialist, Virologists, Disease Epidemiologists Project Manager, GIS/IT Experts, Socio-Economists

Roles and Responsibilities

1. EOC Director
 - a. Oversees the daily activities of the EOC
 - b. Maintains and monitors project plans, schedules, budgets and expenditures
 - c. Organizes and participates in stakeholder meetings
 - d. Reports to the Task Force
2. Monitoring and Evaluation Coordinator
 - a. Ensures that monitoring and evaluation systems are in place and implemented as intended
 - b. Ensures reporting in a comprehensive and timely manner from program coordinators and managers on the delivery of programs and outcomes/impacts achieved
 - c. Ensures the collection of field data
3. Communications manager
 - a. Handles both internal and external communication
 - b. Prepares periodic reports for dissemination to stakeholder
 - c. Develops behavior communication change strategies
4. Field Operations managers
 - a. Oversees the implementation of field activities such as field surveys and awareness exercises
 - b. Trains field operatives
 - c. Ensures the collection of field data
5. Virologists, Entomologists, Breeders, disease epidemiologist etc.
 - a. Lead prevention, monitoring and evaluation and field operations

Recruitment Strategy

Recruitment will be conducted through the following activities

1. A gap analysis to identify the skills needed for an emergency response
2. Creation of a database of skilled staff in the country
3. Recruitment of staff to join the EOC 'stand-by' team and will be enlisted in training programs and simulation exercises

Qualified staff from the collaborating institutions will fill the permanent and temporary positions of the EOC.

Training

New hires: will be enlisted in training programmes and simulation exercises on disease symptom identification, surveillance and monitoring, and detection.

Existing staff: will be trained periodically on current state-of-art technologies for disease prevention, surveillance monitoring and detection.

Financial and material resources

Financial needs

Summary of the main figures for the setup of the new structure and operational costs per year (3years):

1. Year 1: Fixed, variables and contingency costs are \$1,950,000.00
2. Year 2: Fixed, variables and contingency costs are \$1,950,000.00
3. Year 3: Fixed, variables and contingency costs are \$1,950,000.00

Materials needs

For EOC setup and operations:

1. Field vehicles
2. Internet and communication technology
3. Resistant cassava varieties
4. Field notebooks
5. GPS gadgets
6. Sample collection kit
7. Stationaries
8. Laboratory equipment
9. Laboratory reagents and consumables
10. Standby generators
11. Office accommodation
12. Office furniture's and facilities

Resource management plan

The EOC should have an independent budget for its operation. Effective allocation and distribution of finances and materials during crisis requires a direct Executive Order championed by the FMARD. Fund disbursement should target activities set to achieved by the EOC example production, multiplication and distribution of resistant varieties, Surveillance/monitoring, Data analysis, Elimination/Containment and compensation. For financial accountability, both Internal and External auditing will be conducted on quarterly basis.

Partnerships

1. Technical partners:
 - a. National research institutions: NRCRI, RTEP, root and tuber units of States and Federal Ministries of Agriculture and rural development
 - b. International research Institutions: IITA, ECOWAS, CORAF etc.
 - c. Nigerian Agricultural Quarantine services
 - d. Agricultural research council of Nigeria
 - e. National seed system
 - f. Public and Private Universities
2. Financial partners
 - a. Federal Government of Nigeria (FMARD)
 - b. States and Local Governments in Nigeria
 - c. Development Partners (Donors): BMGF, DFID
 - d. National Foundations (Dangote, Care National Foundation, Elumelu Foundation etc.)
 - e. Rockefeller foundation
 - f. African Union
 - g. ECOWAS
 - h. Grand Challenge Exploration
 - i. African Development Bank
 - j. World Bank
 - k. United Nation
 - l. African Plant Health Initiatives (APHIS)

IV. EMERGENCY RESPONSE PLAN

Actions to be taken before an outbreak

	Risk analysis and definition of risk level	Planning	Surveillance	Mitigation	Community engagement	Partnerships
Actions	<ol style="list-style-type: none"> 1. Risk assessment to know the status of the disease in Nigeria 2. Periodic Surveillance 	<ol style="list-style-type: none"> 1. Update detection/ diagnostic protocols 2. Upgrade diagnostic labs /centres 3. Upgrade human capacity training 	<ol style="list-style-type: none"> 1. Deploy rapid on-farm diagnostics kits 2. Train extension agents and lead farmers 	<ol style="list-style-type: none"> 1. Multiplication of CBSD resistant varieties 2. Establishment of two new tissue culture lab/Rapid multiplication centers for cassava planting materials 	<ol style="list-style-type: none"> 1. Disease awareness sensitization in town hall meetings, village squares with Village heads, Local chiefs, community leaders, women groups youths and youth leaders, farmers/ farmers groups 	<ol style="list-style-type: none"> 1. Both Local and State ADPs and Agric Extension agents
Responsibility	NRCRI, WAVE, IITA	ALL stakeholders	NRCRI, WAVE, IITA	FMARD, NRCRI, WAVE, IITA	NRCRI, WAVE, IITA, Farmers, Royal and Local Chiefs, community heads, Youths	FMARD, ARCN, NRCRI, WAVE, IITA

<p style="text-align: center;">Process</p>	<p>Field staff – Virologists, entomologists, epidemiologists, field assistances from the operational units/ departments will be engaged in periodic surveys across the country</p>	<p>Three operational centres will be established in different parts of Nigeria. The operational centers will cover all the states in the six geo-political zones in Nigeria.</p> <ul style="list-style-type: none"> - NRCRI will cover states in the SS/SE zone, - Kebbi State University will cover the NE/NW - Covenant University will cover SW/NC zone <p>In addition, three specialized centers will be established. The specialized centres – IITA, NASC and NAQS – will be responsible for rapid detection, breeding of resistant varieties, phytosanitary certification</p>	<p>Sampling at every 10 km interval across all the states and boarders in the country.</p> <p>Both asymptomatic and symptomatic samples will be collected for analysis</p>	<p>Survey will identify low and high disease pressure areas.</p> <p>The low disease pressure sites will serve as centres for the multiplication of resistant varieties.</p>	<p>National and zonal stakeholder’s forum</p>	<p>Local and State ADPs / Agric extension agents, NAQS</p>
<p style="text-align: center;">Frequency</p>	<p>Quarterly</p>	<p>Quarterly</p>	<p>Bi-annual surveys</p>	<p>Quarterly</p>	<p>Quarterly</p>	<p>On-going</p>

Actions to be taken in case of an outbreak

	Detection, Identification and Confirmation	Response, Containment, Quarantine and Elimination	Response system activation	Response system operation	Evaluation of the response to the outbreak
Actions	<p>1. A nationwide survey will be conducted. This will be led by the zonal operations centre/unit (WAVE Hubs in the country)</p>	<p>a. Complete destruction of infected farmers/fields</p> <p>b. Map out of infected areas</p> <p>c. Compensation</p> <p>d. Monitor farmers to ensure they plant CBSD resistant varieties</p>	<p>1. Task force convey meeting to review results from analysis of the threat.</p> <p>2. The meeting will prepare a brief for the HMA with suggestion of immediate lines of action</p>	<p>Deployment of CBSD cassava resistant varieties</p> <p>Immediate deployment of NAQS officers to affected areas/field and deployment of resistant varieties to affected areas/field</p>	<p>1. The effectiveness of diagnostic tool deployed</p>
Responsibility	<p>Framers, processors, extension agents alert the appropriate authority</p> <p>Researchers identify and with NAQS confirm</p>	<p>Through the Cassava Viral Diseases Task force NAQS leadership.</p> <p>Phytosanitary measures to be handled by the sub-committee headed by NAQS</p>	<p>Task force</p>	<p>Minister of Agriculture</p>	<p>The field staff – Virologists, Technologists</p> <p>Trained ADP/ Agric extension agents, epidemiologist, etc</p>

Process	<p>The farmer raises alert through the local Agriculture Extension Agents /ADP personnel.</p> <p>The Agricultural Extension Agent/ADP personnel contacts the Zonal Sub-EOC centre for sample collection and indexing in the laboratory.</p>	<p>Upon confirmation of lab analysis, The NAQs team identifies infected fields/farms, contain and confined the area.</p> <p>infected fields/ farms is destroyed by burning and movement of planting materials restricted within the community until no further incidence is detected</p>	<p>The steering committee alerts the different operational and specialized Units for immediate action</p>	<p>The Task force issues instructions through the central coordinating centre to the sub-centres and the specialized support centres.</p>	<p>To ensure the effectiveness of the diagnosis, samples will be collected and sent to the different operational laboratories in the sub-centres and specialized support centres for confirmation.</p>
Frequency	<p>During the bi-annual periodic sampling</p>	<p>Immediately, on confirmation of infection</p>	<p>Immediately, on confirmation of infection</p>	<p>Immediately, on confirmation of infection</p>	<p>On-going</p>

Phytosanitary Measures

Laws and regulations on Biosecurity

Agriculture (Control of importation) Act 1959; which states that: Where plants, seeds, soil, containers, straw or other packing materials or any other similar goods or things are on importation found or suspected to be infected with any plant disease or pest, an authorized officer may order them to be destroyed or may direct that they shall not be imported until they have been treated to his satisfaction for the removal of the plant disease or pest, Plants (Control of importation) regulations of 1964; which make provisions for regulating the importation of articles for the purpose of controlling plant diseases and pests and NAQS Act 2018,

Regulations strengthen issuance of Phytosanitary Certificate on every consignment meant for export and import permit for any plant and plant product coming to the country.

1. There is embargo on the importation and exportation of Cassava stem cuttings into/out of Nigeria
2. Immediate seizure and report sent through SMS or Phone call to the Zonal Officers, Head of Plant Department and DG.
3. Report can also be sent to the Cassava disease surveillance (www.cassavadiseasenet.org) platform through the internet

Seed system

1. Registered seed company by NASC approaches NAQS for import permit/Phytosanitary certificate
2. Field are inspected for disease status and production practices
3. Regular monitoring to encourage compliance, ensure distribution of clean planting material and ensure early response to pest situations
4. Issuance of appropriate certificate

Note: Importation of Cassava planting materials from East and Central Africa are prohibited into Nigeria. Even within West Africa cassava planting materials are handled through a reduce in-country movement by:

1. encouraging the establishment of certified seed producers in target communities where clean seeds can be sold
2. Introduction of certification and quality standard tools for registered producers in target communities to reduce exchange of uncertified planting materials.

Also, transportation of cassava cuttings is done using sealed, transparent polythene bags arrange properly with minimum contact with adjacent bags

Vector control

Resistant varieties and use of biocontrol options are recommended for the control of insect pests in Nigeria. Mechanisms are in place at all Point-of-entry to seize and incinerate all cassava planting materials from uncertified sources. Depending on the prevailing pests in the area, we work with other stakeholders to recommend appropriate measure for the vectors control. Pests and disease resistant cassava are distributed through Federal Ministry of Agriculture and Rural Development State Offices, State ADPS and Farmers' organizations/groups.

Communication & Awareness

Actors are; Farmers, Extension agents, Phytosanitary officers

The training needed are:

1. Develop programs on Cassava diseases identification and other emerging pests such as CBSV, EACMV etc.
2. Developing multiplication technique for generating quality clean planting material of improved varieties
3. Develop certification protocol and regulation enforcement for cassava pests
4. Improve Surveillance, Early-warning, monitoring and emergency response system
5. Build Institutional capacity of the government regulators, Researcher and extension service on pest identification and diagnostics
6. Build staff competency in diagnostic and field inspection

Awareness campaign needed are:

1. Develop an app/website for search of quality seeds producers, reporting pest incidence and seeking other information on cassava
2. Design Farmers education and awareness materials on cassava diseases
3. Organize stakeholders' workshops and invite resource persons to make presentation during the workshop
4. Organize tv, radio and farmers field days to create awareness among farmers, extension workers and policy-makers on cassava diseases in Nigeria

The channels of communications are:

Farmers field day, Smart phones, SMS alert, Posters, Cassava production manuals etc.

Engagement with actors is often, depends on the prevailing situation and relevant actors to be involved. NAQS collaborates with many organizations like other regulatory agencies (NAFDAC, Custom Service, Immigrations), stakeholders in trade (farmers, exporters, warehouse owners) Agricultural Research Institute and Universities.

V. OPERATIONAL STRATEGY

Implementation Plan

Roadmap

Based on the urgent need for Nigeria to address the potential threat of CBSD to the livelihoods of Nigerian farmers and consumers who depend on cassava, the following pre-emptive activities would be conducted in the first three years of a ten-year initiative to address this issue. The full project also will include medium-term and long-term actions. This proposal presents immediate short-term measures that are needed.

The following immediate short-term measures are proposed for the initial three-year project period:

Strategic Objectives	Main Activities	2019		2020		2021	
		S1	S2	S1	S2	S1	S2
Enhance coordination and collaboration among key government institutions, national and international research organizations in Nigeria for cassava disease monitoring and management	Constitute a national cassava disease monitoring/management steering committee		✓				
	Establish routine cassava disease monitoring and assessment program within State Ministry of Agriculture, as well as clearly defining and/or establishing the chain of data reporting within states, zones and centrally.						
	Coordinate data and information management and sharing among all key players						
	Strengthen border control legislations to prevent the movement of cassava planting materials in and out of Nigeria and promote collaboration with quarantine institutions in neighboring countries						
	Set up state and zonal clean and resistant seed		✓				

	distribution systems						
	Develop a national policy on the prevention and management of bacterial, fungal and viral diseases of cassava in the country						
Assess the current status of cassava viral diseases in Nigeria	Undertake nationwide cassava field surveys to assess the status, distribution and economic importance of all previously reported and/or emerging cassava viral diseases.	✓		✓		✓	
	Collect field samples for laboratory testing		✓		✓		✓
	Analyze the field and laboratory data to determine the key diseases that currently require attention and also to determine if any emerging cassava disease needs to be highlighted.	✓		✓		✓	
Implement a communication strategy for effective public education, including government officials and farmers, to prevent the introduction and potential impacts of Cassava diseases in Nigeria.	Conduct sensitization campaigns on the need and best practices for the use of cassava clean seeds for small holder cassava farmers across the country				✓		✓
	Promote active and continuous communication through radio and television call in programs and by establishing disease reporting centers across the country		✓		✓		✓
Reinforce the existing improved community-based cassava seed system to ensure availability and demand for clean seeds	Conduct sensitization campaigns on management and prevention of cassava diseases for small holder cassava farmers across the country, leveraging on established and functional farmer associations that exist across the country	✓		✓		✓	

	Conduct sensitization campaigns on the need and best practices for the use of cassava clean seeds for small holder cassava farmers across the country, leveraging on established and functional farmer associations that exist across the country.		✓		✓		✓
	Promote active and continuous communication through radio and television call in programs and by establishing disease reporting centres across the country.	✓	✓	✓	✓	✓	✓
	Provide professional support for adequate evaluation and certification of clean seeds by trained scientists		✓		✓		✓
Reinforce human and infrastructural capacities for the management of existing cassava diseases and to prevent and/or respond to new disease threats such as CBSD through sustainable funding from different development partners	Train a critical mass of scientists (MSc and PhD students, Researchers etc.) on various aspects related to the management and control of bacterial, fungal and viral diseases of cassava, including the development of disease resistant cassava breeds.		✓		✓		✓
	Conduct periodic short-term refresher training courses and workshops for existing staff of relevant institutions as the need arises		✓		✓		✓
	Establish, refurbish and/or equip research laboratories and information management systems within states and/or zones in the country		✓		✓		✓
	Purchase and maintain field assessment vehicles for routine monitoring and rapid response						

Resource Mobilization Plan

Sources of funding:

The estimated budget for annual operation of the EOC is:

Annual Budget on Establishment of EOC and annual Operations					
Activities	Type of cost	Year 1 (\$)	Year 2 (\$)	Year 3 (\$)	Total (\$)
Operational Expenditure	Variable cost	1,092,200.00	1,092,200.00	1,092,200.00	3,276,600.00
	Fixed cost	355,000.00	355,000.00	355,000.00	1,065,000.00
Capital Expenditure	Variable cost	170,000.00	170,000.00	1700,000.00	510,000.00
	Fixed cost	1,255,000.00	380,000.00	380,000.00	2,15,000.00
Contingency expenditure	Variable cost	287,220.00	199,700,00.00	199,700.00	686,620.00
	Fixed cost	-	-	-	-
Grant Total (\$)		3,159,420.00	2,196, 900.00	2,196, 900.00	7,553,220.00

This funding is expected to come from the:

- The Government - State and Federal anchored by the FMARD
- International Partners and donors eg BMGF, DFID, USAID, FAO etc.
- NGOs/ Private sectors

These funds will be used to champion the following activities:

- Implement an organizational management structure for pre-emptive action to limit potential spread and impact of Cassava diseases in Nigeria
- Build professional capacity in Nigeria to address CBSD and other emerging diseases of food crops.
- Enhance capacity of policy makers and government officials in Nigeria to make decisions and lead effective pre-emptive actions to address CBSD and other emerging diseases of food crops.
- Implement a communication strategy for effective public education, including government officials and farmers, to prevent the introduction and potential impacts of Cassava diseases in Nigeria.
- Determine the status of CBSD and conduct a disease risk assessment in Nigeria.
- Create an early warning network for rapid detection and emergency response if CBSD is observed in Nigeria.

- Conduct the first stages of pre-emptive breeding for resistance to CBSD in Nigeria preferred cassava varieties and deploy these varieties in a fast-track process to prevent potential devastating impacts from CBSD.
- Massively multiply and disseminate virus-free, high quality planting materials for Nigerian farmers.

Efforts of the local government will be geared towards community awareness and provision of human capacity in terms of the services ADPs and Agric extension agents

The long-term financial sustainability strategy is to have a legislative policy on cassava virus disease mitigation. This will ensure yearly allocation of funds for cassava disease threat will be captured in the national appropriation bill/budgets.

Implementation Risk Management

RISK	RISK LEVEL	MITIGATION
Political instability	High	The establish EOC will take this into cognisance and will work with the implementing institutions which are stable to minimize any risk that could arise from political instability.
Government initiatives focusing on dissemination of uncertified cassava planting material	High	EOC will critically engage these stakeholders in awareness creation.
Cassava viral disease introduction into Nigeria through the country porous boarder	High	Quarantine officials will be encouraged to strengthen boarder control
Climate Change	Very High	Use of tolerant varieties and adoption of risk sharing.
Insurgenciles	Very high	Advocacy and use of local Champions

Monitoring and Evaluation Plan

Intervention logic	Activities	Expected Result	Monitoring indicators	Monitoring frequency	Responsibility for monitoring	Audit Sources	Assumptions	Evaluation frequency	Responsibility for evaluation
Objective 1: To enhance coordination and collaboration among key government institutions, national and international research organizations in Nigeria for cassava disease monitoring and management	Build on state and zonal monitoring/response capacity by establishing routine cassava disease monitoring and assessment program within State Ministry of Agriculture, as well as clearly defining and/or establishing the	An effective root crops protection consortium network created in Nigeria through active dialogue and collaboration between NARS and various relevant subject-matters professions and institutions	National cassava disease monitoring/management steering committee constituted and functional	Six months after approval of plan	FMARD, NRCRI, WAVE, IITA	Minutes of meeting	Effective involvement of all relevant structures	Annual	Independent evaluator
			Plans for routine State and zonal cassava disease monitoring and assessment surveys in place and implemented	Six months after approval of plan	FMARD, NRCRI, WAVE	Number of State/zonal customized /updated SOP	Effective involvement of State Ministry of Agriculture	Annual	National Steering Committee
			Chain of central data reporting and collation defined and implemented	Six months after approval	FMARD, NRCRI, WAVE	Optimized SOP and signed rules of	Effective involvement of all relevant structures	Annual	National Steering Committee

<p>chain of data reporting within states, zones and centrally. Coordinate data and information management and sharing among all key players. Strengthen States and International border control legislations to prevent the movement of cassava planting materials in and out of Nigeria and promote collaboration with quarantine institutions in neighboring countries.</p>				al of plan		engagement			
	All States and zonal report/submit routine survey data regularly	Yearly	FMARD, NRCRI, WAVE	Field survey data	Favourable economic and social environment	Annual	National Steering Committee		
	Existing quarantine legislature revised for CBSD alert and implemented	One year after approval of plan	FMARD, NAQS	Revised quarantine policy	Effective involvement of NAQS and FMARD	One year after approval of plan	Independent evaluator		
	Clean seed distribution centres available in each state/zone	One year after approval of plan	FMARD, NRCRI, WAVE	Number of functional seed distribution centres in each State/Zone	Effective involvement of all relevant structures	Annual	National Steering Committee		

	<p>Set up state and zonal clean and resistant seed distribution systems</p> <p>Develop a national policy on the prevention and management of bacterial, fungal and viral diseases of cassava in the country</p>								
<p>Objective 2: Implement a communication strategy for effective public education, including government officials and farmers, to prevent the introduction and</p>	<p>Conduct sensitization campaigns on the need and best practices for the use of cassava clean seeds for small holder cassava farmers across</p>	<p>Cassava stakeholders' capacity to understand, respond and manage to cassava virus diseases strengthened in Nigeria</p>	<p>Social mobilization and awareness strategies in place and implemented in each state through radio/TV programs and training workshops</p>	<p>Bi-Annual 10 months after approval of plan</p>	<p>FMARD, NRCRI, WAVE</p>	<p>Field survey data</p>	<p>Favourable economic and social environment</p>	<p>One year after approval of plan</p>	<p>National Steering Committee</p>
			<p>Number of stakeholder engagement</p>		<p>FMARD, NRCRI, WAVE</p>	<p>Field and laboratory data</p>	<p>Favourable social environment/effective</p>	<p>18 months after approval of plan</p>	<p>National Steering Committee</p>

potential impacts of Cassava diseases in Nigeria.	the country. Promote active and continuous communication through radio and television call in programs and by establishing disease reporting centers across the country.	An effective participatory cassava disease surveillance approach established in Nigeria					involvement of relevant stakeholders		
					FMARD, NRCRI, WAVE	Field and laboratory data	Effective data collection	18 months after approval of plan	National Steering Committee
Objective 3: To assess the current status of bacterial, fungal and viral diseases of cassava in Nigeria	Undertake nationwide cassava field surveys to assess the status, distribution and economic importance of all previously reported and/or	Improved knowledge of cassava viral diseases in Nigeria	Nationwide cassava field surveys completed Updated information on the status of cassava diseases in each State available	10 months after approval of plan 18 months after approval of plan	FMARD, NRCRI, WAVE	Monthly State report	Effective media mobilization	Based on project	National Steering Committee

	emerging cassava viral diseases. Collect field samples for laboratory testing. Analyze the field and laboratory data to determine the key diseases that currently require attention and also to determine if any emerging cassava disease needs to be highlighted.		Critical cassava diseases requiring attention in each state identified						
				Quarterly	FMARD, WAVE	Meeting report	Effective involvement of all relevant structures	Based on project	Independent evaluator
Objective 4: Reinforce the existing improved community-based cassava seed system to ensure	Conduct sensitization campaigns on management and prevention		Number of certified community-based cassava seed producers per state	Annual	NRCRI, WAVE, State ministry of Agriculture	Reports of involved structures	Effective involvement of all relevant structures	Mid-term evaluation/impact assessment	Independent evaluator

availability and demand for clean seeds	of cassava diseases for small holder cassava farmers across the country, leveraging on established and functional farmer associations that exist across the country. Conduct sensitization campaigns on the need and best practices for the use of cassava clean seeds for small holder cassava farmers across the country, leveraging on established and functional	Cassava yield of farmers in Nigeria protected, leading to increase of income for small holder farmer households in Nigeria. Nigerian cassava varieties resistant to CBSD and high whitefly populations identified.	Number of farmers sourcing clean seeds	Annual	NRCRI, WAVE, State ministry of Agriculture	Reports of involved structures	Effective involvement of all relevant structures	Mid-term evaluation/impact assessment	Independent evaluator
			Number of farmers using clean seeds	Annual	NRCRI, WAVE, State ministry of Agriculture	Reports of involved structures	Effective involvement of all relevant structures	Mid-term evaluation/impact assessment	Independent evaluator
			Number of cassava disease reporting centres within each state	Annual	NRCRI, WAVE, State Ministry of Agriculture	Reports of involved structures	Effective involvement of all relevant structures	Mid-term evaluation/impact assessment	Independent evaluator

	<p>farmer associations that exist across the country.</p> <p>Promote active and continuous communication through radio and television call in programs and by establishing disease reporting centers across the country.</p> <p>Provide professional support for adequate evaluation and certification of clean seeds by trained scientists.</p>								
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Objective 5: Reinforce human and infrastructural capacities for the management of existing cassava diseases and to prevent and/or respond to new disease threats such as CBSD through sustainable funding from different development partners	Train a critical mass of scientists (MSc and PhD students, Researchers etc.) on various aspects related to the management and control of bacterial, fungal and viral diseases of cassava, including the development of disease resistant cassava breeds. Conduct periodic short-term refresher training courses and workshops for existing staff of relevant	A critical mass of young scientists (female and male) trained in plant virology, breeding and entomology. Accurate models to combat cassava viral diseases are available to the scientific community and relevant stakeholders.	Number of MSc and PhD students completing cassava disease management related projects	Annual beginning two years after approval of plan	WAVE	WAVE project report	Effective recruitment of committed students	Mid-term evaluation/impact assessment	Independent evaluator
			Number of existing staff within partner institutions trained	Annual	FMARD, NRCRI, WAVE	Reports of involved structures	Effective involvement of all relevant structures	Mid-term evaluation/impact assessment	Independent evaluator
			Number of functional laboratories within each zone	Annual	FMARD, NRCRI, WAVE	Reports of involved structures	Effective involvement of all relevant structures	Mid-term evaluation	Independent evaluator
			Number of functional monitoring centres enabled with	Bi-Annual	FMARD, NRCRI, WAVE	Reports of involved structures	Effective and timely disbursement of project funds	Mid-term evaluation	Independent evaluator

	institutions as the need arises. Establish, refurbish and/or equip research laboratories and information management systems within states and/or zones in the country. Purchase and maintain field assessment vehicles for routine monitoring and rapid response.		communication facilities						
			Number of functional field vehicles within each state	Annual	FMARD, NRCRI, WAVE	Reports of involved structures	Effective and timely disbursement of project funds	Mid-term evaluation	Independent evaluator