



National Seed Road Map for Nigeria

Document submitted to the Netherlands Enterprise Agency (RVO) and Embassy of the Kingdom of the Netherlands, Abuja, in conclusion of a seed sector review in Nigeria (September 2019 – February 2020)

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Wageningen Centre for Development Innovation
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Partners in the Seed Sector Review:



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The seed sector review of which the National Seed Road Map is an outcome was a joint activity shaping the collaboration between the Federal Ministry of Agriculture and Rural Development of Nigeria and the Embassy of the Kingdom of the Netherlands, Abuja



The National Seed Road Map is the result of a consultative process in which critical stakeholders of the seed sector in Nigeria participated. The policy context for this process is an agreement between the Federal Ministry of Agriculture and Rural Development (FMARD) of the Government of Nigeria and the Embassy of the Kingdom of the Netherlands (EKN) in Abuja to jointly engage in a seed sector review, exploring ways to collaborate in the development of Nigeria's seed sector. One of the steps in this review was the development of a multi-year seed sector development strategy or National Seed Road Map. A team of consultants has been contracted by the EKN through the Netherlands Enterprise Agency (RVO). The team included members of Wageningen Centre for Development Innovation (WCDI), Sahel Consulting, National Agricultural Seeds Council (NASC), East-West Seed (Company and Knowledge Transfer Foundation) and EKN.

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List of abbreviations and acronyms

ADWG	Agricultural Development Working Group
APP	Agricultural Promotion Policy
BASICS	Building an Economically Sustainable Integrated Seed System for Cassava for Nigeria
B2B	Business to business
BPAT	Breeding Program Assessment Tool
CBSP	Community Based Seed Production
COMESA	Common Market for Eastern and Southern Africa
CSO	Civil society organization
DUS	Distinctiveness, uniformity and stability
EGS	Early generation seed
FGD	Focus group discussion
GES	Growth Enhancement Scheme
HV	Hybrid varieties
ICT	Information and communication technology
IMS	Information management and sharing
ISSD	Integrated Seed Sector Development
NARI	National Agricultural Research Institute
NCVLBRRC	National Crop Varieties and Livestock Breeds Registration and Release Committee
NGO	Non-governmental organization
NSRM	National Seed Road Map
OPV	Open-pollinated variety
PASS	Programme for Africa's Seeds Systems
PPP	Public-private partnership
PVP	Plant variety protection
QDS	Quality declared seed
RTB	Roots, Tubers and Bananas
SIP	Strategic innovation pathway
SSA	Sub-Saharan Africa
STA	Seed Trade Association
TRIPS	Trade-Related Aspects of Intellectual Property Rights
VCU	Value for cultivation and use

List of organizations

ABU	Ahmadu Bello University, Zaria, Kaduna State, Nigeria
AECF	Africa Enterprise Challenge Fund, Nairobi, Kenya
AfDB	African Development Bank, Abidjan, Côte d'Ivoire
AFSTA	African Seed Trade Association
AGRA	Alliance for a Green Revolution in Africa, Nairobi, Kenya
ASIWA	Alliance for Seed Industry in West Africa
AtSI	Access to Seeds Index, Amsterdam, the Netherlands
BMGF	Bill & Melinda Gates Foundation, Seattle, USA
BNDA	Banque Nationale du Mali, Bamako, Mali
CARD	Coalition for African Rice Development, hosted at AGRA, Nairobi, Kenya
CBN	Central Bank of Nigeria, Abuja, Federal Capital Territory (FCT), Nigeria
CIP	International Potato Center (CGIAR Research Center)
ECOWAS	Economic Community of West African States, Abuja, FCT, Nigeria
EBA	Enabling the Business of Agriculture, World Bank, Washington-DC, USA
EKN	Embassy of the Kingdom of the Netherlands, Abuja, FCT, Nigeria
FAO	Food and Agriculture Organization of the United Nations
FMARD	Federal Ministry of Agriculture and Rural Development, Abuja, FCT, Nigeria
FMoF	Federal Ministry of Finance, Abuja, FCT, Nigeria
GiZ	German Corporation for International Cooperation, Bonn/Eschborn, Germany
GNIS	French Interprofessional Organisation for Seeds and Plants, Paris, France
IAR	Institute for Agricultural Research, Zaria, Kaduna State, Nigeria
ICD	Islamic Corporation for the Development of the Private Sector, Jeddah, Saudi Arabia (part of the Islamic Development Bank Group)
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics, Hyderabad, India (CGIAR Research Center)
IFAD	International Fund for Agricultural Development, Rome, Italy
IFC	International Finance Corporation, Washington-DC, USA (part of World Bank Group)
IFDC	International Fertilizer Development Center, Muscle Shoals-AL, USA
IFPRI	International Food Policy Research Institute, Washington-DC, USA (CGIAR Research Center)
IITA	International Institute of Tropical Agriculture, Ibadan, Oyo State, Nigeria (CGIAR Research Center)
IsDB	Islamic Development Bank, Jeddah, Saudi Arabia
ISTA	International Seed Testing Association, Bassersdorf, Switzerland
JICA	Japan International Cooperation Agency, Tokyo, Japan
KEPHIS	Kenya Plant Health Inspectorate Service, Nairobi, Kenya
MSU	Michigan State University, East Lansing-MI, USA
NACGRAB	National Centre for Genetic Resources and Biotechnology, Ibadan, Oyo State, Nigeria
NAERLS	National Agricultural Extension and Research Liaison Services, Zaria, Kaduna State, Nigeria
NAQS	Nigeria Agricultural Quarantine Service, Abuja, FCT, Nigeria
NASC	National Agricultural Seeds Council, Abuja, FCT, Nigeria
NBS	National Bureau of Statistics, Abuja, FCT, Nigeria
NESG	National Economic Summit Group, Lagos, Lagos State, Nigeria
NEPC	Nigeria Export Promotion Council
OECD	Organisation for Economic Co-operation and Development, Paris, France
RVO	Netherlands Enterprise Agency, The Hague, the Netherlands
SANSOR	South African National Seed Organization, Pretoria, South Africa
SCCI	Seed Control and Certification Institute, Lusaka, Zambia

SEEDAN	Seed Entrepreneurs Association of Nigeria, Abuja, FCT, Nigeria
STAK	Seed Trade Association of Kenya
TASAI	The African Seed Access Index, Cornell University, Ithaca-NY, USA
UPOV	International Union for the Protection of New Varieties of Plants, Geneva, Switzerland
USAID	United States Agency for International Development, Washington-DC, USA
WCDI	Wageningen Centre for Development Innovation, Wageningen University & Research, Wageningen, the Netherlands
WEcR	Wageningen Economic Research, the Hague, the Netherlands
WUR	Wageningen University & Research, Wageningen, the Netherlands

Executive summary

The National Seed Road Map (NSRM) is a strategic policy document that guides stakeholders in the seed sector of Nigeria to work towards an increase in farmers' access to and use of quality seed of improved varieties. The document is a critical input to the development of major agricultural policies of the government, while it can also guide the government, stakeholders and development partners in exploring and agreeing on ways to foster the development of the sector in a coordinated, aligned and structured fashion. The NSRM includes a vision, describes current achievements and challenges, and outlines ambitions and strategic innovation pathways contributing to the realization of those ambitions. The NSRM document is structured by three primary questions on seed sector performance: (i) Where are we now? (ii) Where do we want to go? and (iii) How will we get there?

The policy context is framed by the Agricultural Promotion Policy (APP; 2016-2020), the recently amended National Agricultural Seeds Council Act (NASC; 2019) and the new strategic plan of NASC (2019). The Federal Ministry of Agriculture and Rural Development (FMARD) is currently in the process of reviewing its policy document; the NSRM is a resource for that effort.

Stakeholders in the seed sector include a high number and diversity of government organizations, industry, and knowledge organizations (including research organizations and universities), regulatory bodies, civil society organizations (CSOs) and farmer organizations. 314 formally registered seed companies, of which the majority annually processes less than 1,000 metric tons of seed of grain crops, together with agro-dealers shape the formal and commercial seed system. Individual and mostly unorganized seed producers, community-based seed production schemes and various types of seed entrepreneurs, like informal seed traders, primarily shape the intermediary and informal seed systems. The Seed Entrepreneurs Association of Nigeria (SEEDAN) is the country's seed trade association, with 72 seed companies registered as members in 2019. National Agricultural Research Institutes (NARIs) and CGIAR Research Centers are important for the development of new crop varieties for most food crops as well as for the production of early generation seed (EGS); the private sector constitutes 13% of variety releases in the seed market. The NASC is the government body responsible for promoting and stimulating the development of a dependable seed industry, regulating and controlling seed registration and release, protecting farmers from the sale of poor-quality seed, and facilitating the production and marketing of high-quality seed.

Despite the operations, infrastructure and economies of scale of a wide diversity of seed sector stakeholders, farmers' access to and use of quality seed of new and improved varieties farmer remains limited, which contributes to crop productivity in Nigeria continuing to be low. The gap between demand and supply of quality seed of improved varieties continues to be more than 90-95% for all crops, except for open-pollinated maize varieties for which the market is saturated.

The NSRM as a document is the result of a consultative process involving domestic and international stakeholders critical to the sector. It was formulated and compiled through a participatory and iterative process that included a desk study, crop and crop group-based focus group discussions, expert consultations, a multi-stakeholder workshop, and a review by national and international resource persons.

The framework for seed sector transformation guided the review. Where other assessment frameworks focus on individual crops or value chains, specific seed systems, technological innovations or stakeholders, seed sector transformation looks beyond - it applies "systems' thinking", i.e. it takes a holistic approach with complementary strategies for the development of the seed sector as a whole. The framework considers that a well-performing seed sector needs a strong production base; it needs to perform well in relation to the functions of (i) service provision, (ii) seed production, and (iii) market development. This production base requires strong governance, and the sector needs to perform well in

relation to the functions of (iv) revenue generation and reinvestment, (v) coordination and governance, and (vi) regulation and management.

The NSRM as a strategic document identifies challenges that are placed within the above-mentioned six functions of seed sector transformation. No single response exists to the question, “Where are we now?”, because the structure of the seed sector, and the diversity of crops and situations therein, is too complex. Rather, the assembly of challenges structured along the six functions responds to this question.

The challenges have been synthesized and transformed into ambitions, which are descriptions of a desired state or outcome of a transformation process. The collection of ambitions within each of the six functions shape a future vision in which the seed sector becomes high performing in ensuring access to and availability and use of quality seed of improved varieties of all crops for farmers.

The vision for the seed sector in Nigeria is to be competitive, resilient, profitable, innovative and adaptive, sustainable, inclusive, resistant and transparent.

An assembly of 22 prioritized topics, with their ambitions grouped along the six seed sector performance functions, shapes the response to the NSRM’s guiding question, “Where do we want to go?”. The ambitions that are marked as general, i.e. relevant to the entire seed sector and all crops, are elaborated in the NSRM. However, it should be noted that ambitions can be specific to certain crops or crop groups. Table 1 illustrates the 22 prioritized topics for each of the ambitions across the six functions.

Table 1 National Seed Road Map - presentation of the topics associated with ambitions for seed sector transformation

Service provision	Production systems	Market development
<i>The seed sector is capable of providing high quality, inclusive and differentiated services to seed producers and seed value chain actors</i>	<i>The seed sector has viable and sustainable seed production systems for all crops</i>	<i>The seed sector has efficient, fair and transparent seed value chains and seed markets</i>
<ul style="list-style-type: none"> • Decentralization of seed quality assurance • Professional variety development 	<ul style="list-style-type: none"> • Early generation seed supply • Infrastructural capacity for seed production & marketing • Company professionalization & specialization • Community-based seed production 	<ul style="list-style-type: none"> • Extension on seed & cultivation practices • Tackling of counterfeit seed • Seed company marketing & promotion • Crop value chains & food security policies stimulating seed demand • Seed distribution networks • Institutional markets
Revenue generation & reinvestment	Coordination & governance	Regulation & management
<i>The seed sector has the capacity to generate revenues and make strategic reinvestments</i>	<i>The seed sector has appropriate coordination and governance mechanisms in place, which result in alignment and accountability among different seed stakeholders</i>	<i>The seed sector has rules and systems in place that govern seed markets, production systems, service provision and coordination</i>
<ul style="list-style-type: none"> • Revenue generation for seed quality assurance services • Financial services & products 	<ul style="list-style-type: none"> • Sector governance & coordination • Seed information • Seed trade association • Alignment of donor interventions 	<ul style="list-style-type: none"> • Plant variety protection • Variety release • Seed import • Seed export

The core of the NSRM responds to the final question, “How will we get there?”. For each of the 22 topics, the document provides a detailed description of the ambitions and associated challenges. Through what is referred to as strategic innovation pathways, the document elaborates for each topic a maximum of five steps/activity groups, unfolding what can be done to achieve the ambition in a

sustainable manner. The stakeholders critical to achieving each ambition are mentioned. A catalyst, i.e. an organization that is in the best position to initiate and facilitate the change process, is proposed. Furthermore, each pathway provides reference to the primary policy documents, including the APP (2016-2020), the NASC Act (2019) and the NASC's five-year strategy (2020-2024). To make changes tangible, for each of the pathways a two-, five- and/or ten-year horizon is described. To illustrate that the proposed pathways are not isolated from developments in Nigeria, Africa and other regions of the world, the description of the pathway concludes with illustrative examples of systemic change processes or situations in which similar ambitions have been achieved.

Glossary

Accreditation	Delegation of responsibility to a party other than the officially responsible government authority; for example, delegation of responsibility for seed certification.
Advanced cultivation practices	Improved practices in crop production that result in increased productivity and crop quality. Improvements relate to the use of quality seed and improved varieties, agro-ecologically specific and crop-specific fertilizers and crop protection products, and irrigation and other agronomic practices.
Agriculture Promotion Policy (2016-2020)	Strategy of the Federal Ministry of Agriculture and Rural Development guiding agricultural development with the purpose to produce enough high-quality foods for the Nigerian market, successfully serve the export market, and generate foreign exchange earnings (FMARD, 2016).
Agricultural value chain	The people and activities that bring an agricultural product from the farmer's field to the consumer, through stages such as processing, packaging and distribution.
Agricultural value chain programme	Donor-supported programmes promoting the development of agricultural value chains for food, livestock, fisheries and artisan products, addressing production, processing, marketing and finance.
Breeder seed	The seed class produced by the breeder/owner of the variety, or his or her agent, under the plant breeder's supervision; this seed is used to produce foundation seed.
Business plan	A business plan lays out the basic idea for a venture, describing where a business is now, indicating where it wants to go, and outlining how to get there, including a clear evaluation of the viability of the venture as well as success factors.
Certified seed	The seed class produced from foundation seed, which has been inspected and tested to ensure it adheres to minimum quality standards, and which is sold to farmers for crop production.
Development partner	Donor organization, or its executive agency, which collaborates with federal or state governments and other stakeholders in the development of the country and/or specific sectors like the agricultural sector.
DUS testing	The testing of new varieties for distinctiveness, uniformity (homogeneity) and stability for the purpose of granting plant breeders' rights.
Early generation seed	The classes of breeder seed and foundation seed used as the basis for the production of certified/quality seed.
Farmer group	An organized group of farmers that jointly engage in an agricultural enterprise, such as seed production; the number of members in each farmer group varies; the group may or may not be registered.
Farmer-saved seed	Seed harvested from the farmer's crop used as input for the next cropping season; farmers may save seed for their own use or may exchange or even sell seed to others.
Field inspection	Inspection of a seed field as part of a seed certification scheme to check on isolation, seed crop management, hectareage of the seed field, presence of diseases and weeds, off-types and varietal identity.
Formal seed system	Seed supply that involves specialized activities of the seed value chain by breeders, producers of early generation seed, seed producers, and marketing agents, governed by an official regulatory environment. Seed in formal systems is mostly certified and activities along the seed value chain are to a large extent commercialized.
Foundation seed	The seed class produced from breeder seed, grown by or under the supervision of a plant breeder or his or her agent for use in the production of certified seed.
Hybrid variety	A variety of which the seed is produced by controlled crossing of two or more parental lines with contrasting characters, resulting in uniform and more vigorous progenies; when reproduced in a non-controlled manner, parental characters get segregated and the variety loses its uniformity and vigour.
Informal seed systems	Seed supply that includes the activities of farmers, rural communities and other stakeholders saving, exchanging, bartering, gifting and selling seed without formal regulatory involvement and varying degrees of commercial orientation.
Institutional market	Government agencies, non-governmental organizations (NGOs) and projects that purchase seed in large quantities and subsequently disseminate or market the seed to farmers within private sector development or agricultural value chain programmes with the aim of boosting production and increasing productivity, or in food security or humanitarian programmes with the aim of enhancing food and/or nutrition security of rural populations.
Integrated seed sector development	A pluralistic approach that recognizes the relevance of formal and informal seed systems and aims to balance public- and private-sector involvement; it replaces a linear or blue-print approach towards the development of fully commercial and formal seed systems.

Intermediary seed systems	Seed supply that involves individual seed entrepreneurs and organized groups of seed producers and entrepreneurs and/or their associations, that are engaged in commercial seed production and marketing, with loose or temporary linkages to formal organizations including research, extension, markets, financial services, seed quality assurance and other regulations.
Local seed entrepreneur	An individual, organization or company that engages in seed business in terms of production and/or marketing of seed, operating within informal and intermediary seed systems in which seed quality assurance is based on trust.
NASC Strategy (2020-2024)	Five-year strategic plan to guide the growth and development of the National Agricultural Seeds Council (NASC) between 2020 and 2024, including vision and mission statements as well as three core strategic objectives, and key implementation strategies, with activities, required resources, key performance indicators, timelines and suggested departments to drive execution (NASC, 2019).
National Agricultural Seeds Council Act (2019)	Bill that enacts the NASC to promote and stimulate the development of a dependable seed industry, regulate and control the registration of released varieties, protect the farmers from the sale of poor-quality seed, facilitate the production and marketing of high quality seed in Nigeria and provide legal backing for official testing, certification, sales, importation, exportation and use of seed and related matters (FMARD, 2019).
Open-pollinated variety	Variety multiplied through random pollination/fertilization, i.e. in contrast to hybrid varieties for which the crossing of parental lines is controlled.
Plant breeders' rights	The legal right of the originator of a new crop variety within a plant variety protection system.
Plant variety protection	Legal system of granting exclusive rights over varieties to the originator, i.e. the breeder or discoverer.
Private sector development programme	Donor-supported programmes implemented by the federal or state governments with other stakeholders in order to promote the private sector in agriculture, including collaborations with large multinational companies and the development of small- and medium-sized enterprises.
Quality seed	Seed that is varietally pure with a high germination percentage, free from diseases, and with a proper moisture content and weight. The use of quality seed ensures good germination, rapid emergence, and vigorous growth of the crop. Quality seed can be purchased as certified seed through commercial channels, but also obtained from informal sources.
Seed	Part of the crop used for propagation either as a seed in a botanical sense, which is developed from a fertilized ovule, as a seedling, or as other parts such as a corn, cutting, bulb, root, scion, tuber or stem, used for vegetative propagation.
Seed certification	Assuring a minimum level of seed quality by an official certifying agency, including field inspection and seed testing; classes of certified seed include breeder seed, foundation seed and certified seed.
Seed company	A company that engages in seed business in terms of production and/or marketing of certified seed of registered varieties, which is registered with the NASC; such entrepreneurs operate within formal seed systems.
Seed entrepreneur	An individual, company or organization that engages in seed business in terms of production and/or marketing of seed independent of whether operating in formal, intermediary or informal seed systems.
Seed processing	All the treatments that the seed is subjected to other than laboratory seed testing between harvesting and sale, aimed at maximizing seed viability, vigour and health, including drying, threshing, (pre)cleaning, size grading, treating, packaging and labelling.
Seed producer	An individual, organization or company that grows a crop intended to produce seed, is registered as such with the NASC, and is enrolled in seed certification or other approved quality assurance mechanism.
Seed quality	The sum of all factors such as varietal purity, seed health, germination, moisture content and vigour which affect the performance of the seed crop.
Seed quality assurance	The assurance of varietal identity and purity, viability in terms of physiological and health conditions, and other standards in seed production and processing through control, inspection and labelling; including certification through NASC and/or accredited third parties.
Seed sector function	Within the framework of seed sector transformation, six functions cover the production base and governance; the performance of a sector is dependent on all functions; in the assessment framework, all functions are considered and reviewed, identifying challenges and ambitions for the stage desired.
Seed sector transformation framework	An assessment framework that applies a holistic approach with complementary strategies for the development of the seed sector as a whole; it considers the sector's need for a strong production base and performance in relation to the functions of (i) service provision, (ii) seed production, and (iii) market development; as well as the need for strong governance and performance in relation to the functions of (iv) revenue generation and reinvestment, (v) coordination, and (vi) regulation and management.

Seed testing	The laboratory examination of a sample of seed to determine its quality.
Seed value chain	The successive operations and services leading to seed supply, i.e. breeding, early seed production and supply, seed production, seed processing, conditioning and packaging, promotion and marketing, including seed quality assurance and other support services.
Third-party certification	Independent impartial certification services provided by a company, organization or individual that is qualified, licenced and monitored by the national authority responsible, such as the NASC for seed certification.
Variety	A taxonomic category below that of species or subspecies, defined by the expression of characteristics resulting from a given genotype or combination of genotypes, and sufficiently homogenous to be distinguished from other such groups by the expression of at least one characteristic; when reproduced sexually or asexually, a variety retains its distinguishing characteristics.
Variety development	The process of plant breeding through the generation of variation, the selection of plants, and the genetic stabilization of traits to obtain varieties with reproducible desired characteristics.
Variety release	The official approval of a variety for multiplication and distribution.
VCU testing	Testing for value for cultivation and use, i.e. the combined values of a variety, through field and on-farm trials.

1 Introduction

1.1 Purpose

The National Seed Road Map (NSRM) is a strategic policy document that guides stakeholders in the seed sector of Nigeria to work towards a seed sector that increases farmers' access to and use of quality seed of improved varieties. The document is a critical input in the development of major agricultural policies of the government, while also guiding the seed industry and other seed sector stakeholders. Moreover, the NSRM can serve as a reference for collaboration between the government, stakeholders and development partners, guiding them in exploring and agreeing on ways to foster the development of the sector in a coordinated, aligned and structured fashion. The document includes a vision, describes current achievements and challenges, and outlines ambitions and strategic innovation pathways, which contribute to the realization of those ambitions. The following questions for seed sector performance structure the document: (i) Where are we now? (ii) Where do we want to go? and (iii) How will we get there?

1.2 Guiding seed sector transformation

The NSRM is the result of a participatory and iterative process referred to as a seed sector review or assessment. A team of international and Nigerian consultants, further referred to as 'the consultancy team' implemented the assessment. The review included a desk study, focus group discussions (FDGs) and a multi-stakeholder workshop. Both Nigerian and international experts were consulted during several steps of the process. Moreover, critical development partners of the Federal Government of Nigeria (e.g. donors and international development organizations) were consulted. The team has used a framework for guiding sector transformation ([Aidenvironment et al. 2017](#)) to support the development of the NSRM. Box 1 provides more insights into this framework.

Box 1. Seed sector transformation

Inspired by the approach of integrated seed sector development (ISSD) (WUR, 2020), seed sector transformation moves away from linear thinking, i.e. it realizes that seed systems for different crops face different challenges. It looks beyond individual crop value chains and applies "systems' thinking", i.e. a holistic approach with complementary strategies for the development of the seed sector as a whole. The framework uses the future vision as the point of departure, and not today's problems. To perform well the sector needs a strong production base, and it needs to perform well in relation to the functions of (i) service provision, (ii) seed production and (iii) market development. This production base needs to be complemented with strong governance; the sector needs to perform well in relation to the functions of (iv) revenue generation and reinvestment, (v) coordination, and (vi) regulation and management. A seed sector assessment identifies challenges that are placed within the six functions.



The challenges are synthesized and transformed into ambitions. The combined ambitions within the six functions shape a future vision in which the seed sector becomes high performing in ensuring the availability of, access to and use of quality seed of all crops by farmers.

2 Where are we now?

2.1 Agricultural development

Despite 50 years of significant investments in crop improvement and formal seed system development, more than 90% of the seed used by farmers in sub-Saharan Africa (SSA) is obtained from informal seed sources. Crop productivity in SSA is considerably lower than in other continents (see Figure 1). The [Global Yield Gap Atlas \(2020\)](#) illustrates the difference between potential yields and yields achieved in practice with the example of maize and rainfed rice in Nigeria, where the gap is more than 250%. It is estimated that 50% of the yield gap can be closed with the use of quality seed of improved and/or hybrid varieties; the other 50% through the application of good agronomic practices and the use of fertilizers. The percentage of Nigerian farmers using quality seed of improved varieties is below 15% ([TASAI, 2019](#)).

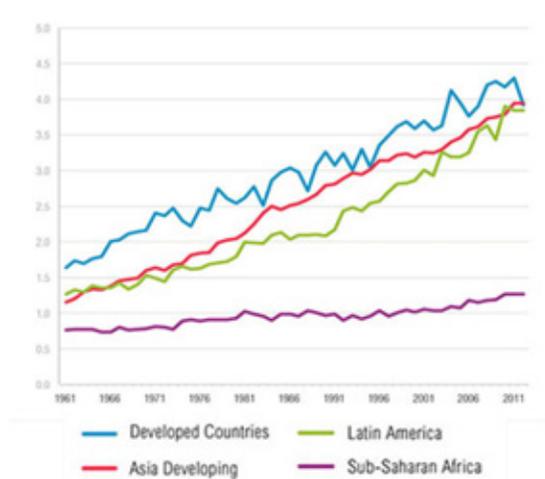


Figure 1 Cereal yields - global trends

2.2 Policy context

Agricultural sector

The Agriculture Promotion Policy (APP, 2016–2020) ([FMARD, 2016](#)), the policy document for the agricultural sector of the previous government, considers the agricultural sector a key instrument to long-term economic growth. The APP promotes reinforcing private sector-led agribusiness; strengthening of commodity value chains; improving market orientation through infrastructure and commodity exchanges; mainstreaming climate change measures; and implementing nutrition interventions for vulnerable groups. The APP, within its “Access to inputs” section, aims to increase the availability of and access to quality seed through strengthening seed policies, leveraging global expertise and facilitating private sector development. The FMARD is currently in the process of reviewing its policy document; the NSRM is a resource for that effort.

Seed sector

Prior to 2019, the main legal documents guiding the development of the seed sector in Nigeria were the National Seeds Decree of 1992 and the National Agricultural Seeds Act, Cap N5 of 2004. In 2015, the national seed policy was passed, which provides a framework to encourage private sector participation, fast-track variety development, registration and release, and improve the quality of seed available to farmers. The 2004 Act was repealed and has been replaced by the National Agricultural

Seeds Council Act of 2019 (FMARD, 2019). This Act was passed by the House of Representatives in December 2018, passed by the Senate in April 2019, and given Presidential assent in June 2019. The Act consolidates the establishment of the National Agricultural Seeds Council (NASC) with the responsibility to promote and stimulate the development of a dependable seed industry, regulate and control seed production, support variety registration and release, protect farmers from the sale of poor-quality seed, and facilitate the production and marketing of high-quality seed. In addition, it promotes greater participation of the private sector in the seed industry. As member of the Economic Community of West African States (ECOWAS), Nigeria's 2019 NASC Act conforms with the ECOWAS Seed Regulation (C/Reg.4/05/2008), passed in 2008. For example, the NASC Act elaborates standards for seed certification in compliance with ECOWAS regulations and institutes a National Seed Catalogue with the ECOWAS Catalogue of Plant Species and Varieties as reference. However, in contrast to ECOWAS, harmonization on variety release is not yet implemented.

Nigeria is signatory to various international treaties of the Food and Agriculture Organization of the United Nations, and to the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). Work is ongoing to get approval of a law for plant variety protection (PVP) that will be in line with the International Convention for the Protection of New Varieties of Plants (UPOV Convention, 1991).

The strategic plan of the National Agricultural Seeds Council (2020-2024) (NASC, 2019) guides the organization's growth and development between 2020 and 2024. The strategy aims to enhance service delivery by the NASC and increase its financial sustainability and operational effectiveness. The strategy is expected to result in more timely and cost-efficient certification processes; increased availability of quality seed, and a 40% increase in farmer adoption; reduced counterfeiting; the recognition of the NASC as a point of reference for the seed industry; enhanced capacity of key industry stakeholders and NASC staff; and diversification of revenue streams and reduction in operational costs by the NASC.

2.3 Seed sector stakeholders

The seed sector includes government organizations, industry, and knowledge organizations (e.g. agricultural research institutes and universities), regulatory bodies, civil society organizations and farmer organizations. The diversity and number of stakeholders shows that the sector is vibrant and in a process of growth and development. Several international and domestic research organizations operating in the public domain are responsible for variety development and evaluation; they also engage in the production and supply of early generation seed (EGS) of improved varieties. These organizations include national agricultural research institutes (NARIs), international agricultural research institutes (e.g., the International Institute of Tropical Agriculture - IITA; the International Crops Research Institute for the Semi-Arid Tropics - ICRISAT; and AfricaRice), state government agricultural departments and universities (e.g. Ahmadu Bello University). The industry includes foreign and domestic seed companies, community-based seed production schemes, other local seed entrepreneurs and agro-dealers. They engage in the production and/or marketing of quality seed. According to the NASC, there are currently 314 registered seed companies in Nigeria, with the majority producing fewer than 1,000 metric tons of seeds annually. Development partners, through NGOs and projects, are engaged in the promotion and dissemination of quality seed of improved varieties. The NASC is the government entity responsible for regulating seed in Nigeria (see Section 2.2). The Nigeria Agricultural Quarantine Service (NAQS) is responsible for phytosanitary aspects in the sector. The National Crop Varieties and Livestock Breeds Registration and Release Committee (NCVLBRRC), hosted by the National Centre for Genetic Resources and Biotechnology (NACGRAB), is responsible for the release of crop varieties. The Seed Entrepreneurs Association of Nigeria (SEEDAN) brings together seed companies and other key private sector players in the industry; the association currently has 72 registered members.

2.4 Farmers' current seed sources

Based on a desk study and focus group discussions (FGDs) as part of the seed sector review, the consultancy team has compiled an overview of farmers' current seed sources (see Figure 2). It illustrates the predominance of farmer-saved seed, with the exception of maize hybrid varieties (HVs). Whereas commercial certified seed is readily available for open-pollinated varieties (OPVs) of maize, it is only available to a limited extent for the other crops/crop groups. For rice, as well as legumes and small grains, community-based seed schemes are a source of seed. Informal markets are currently the most important source of seed for various crops/crop groups, although the quality of the seed is often no different to that of grain.

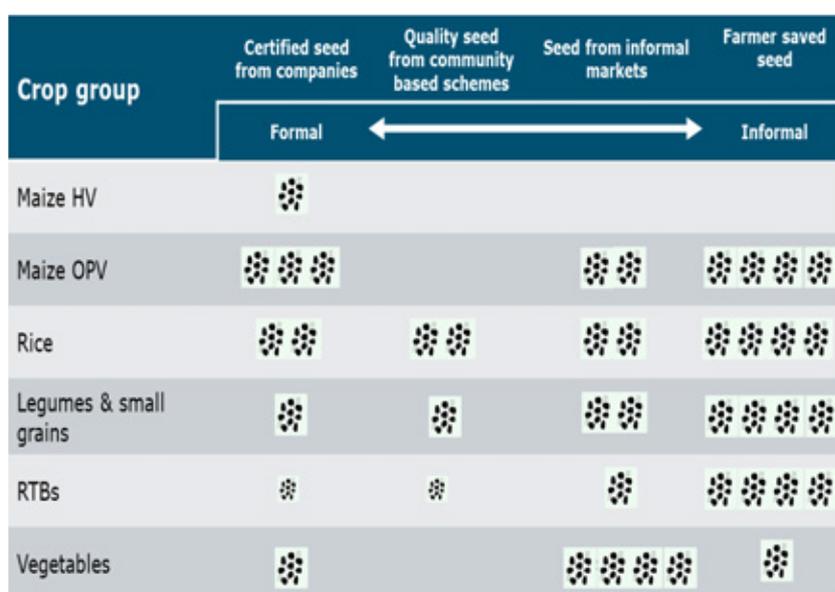


Figure 2 Farmers' seed sources for various crops and crop groups

2.5 The seed gap

During the FGDs, as part of the seed sector review, groups of crop and seed experts engaged in making projections for crop production and seed demand. Based on FAOSTAT data for 2010 and 2015, and expectations of the experts in relation to future development and demand for the crop, the experts estimated for a number of indicator crops, cropping area, crop production and crop productivity for 2020, 2025 and 2030. Subsequently, they calculated seed demand for the same years (see Table 2). While the market for maize OPVs seems saturated, huge seed gaps are expected for the other crops for 2020 as well as for 2025 and 2030. Since the market for quality tomato seed is dominated by the procurement of seed produced by international and regional companies, the consultancy team did not consider seed production and the seed gap for this crop. The projections assisted in the identification of challenges and opportunities for improving the performance of the seed sector for the following crop groups: maize; legumes, rice and small grains; roots, tubers and bananas (RTBs); and vegetables. More details on the assumptions for the projections can be found in the crop briefs ([WUR, 2019a](#)) that have been developed as part of the seed sector review.

Table 2 Seed gap projections for various crops as elaborated during FGDs for the seed sector review

Crop	2020		2025	2030
	Seed demand	Seed production	Seed gap	Seed gap
	Metric ton (MT)	MT	%	%
Maize HV	17,163	1,464	90	95
Maize OPV	26,088	27,811	-7	0
Cowpea	9,710	1,940	80	75
Groundnut	34,000	2,000	94	90
Yam	10,000	NA*	100	99
Irish potato	288,620	2,886	99	98
Tomato HV	21	NA+	NA	NA
Tomato OPV	126	NA+	NA	NA
Onion	128	20	84	82

* Currently, yam seed production is informal; seed value chain for improved varieties is not yet operational

+ Tomato seed is primarily imported from regionally and globally operating seed companies

2.6 Seed sector challenges

Enhancing the availability, access to and use of quality seed is complex. Seed needs to be: (i) physically available in sufficient quantity at the right place and time; (ii) accessible at an affordable price; and (iii) to be of a variety well suited to the local agro-ecological conditions, and to farmer and market demands. Farmers access and use seed from several sources or seed systems. Each seed system has its own strengths and weaknesses. To strengthen the performance of a seed sector, each seed system requires targeted interventions for improvement.

The estimated seed gaps, together with insights of resource persons shared during FGDs and individual consultations, informed the consultancy team in the identification of challenges that negatively impact the performance of the seed sector. Additional challenges were identified based on key references like the Enabling the Business of Agriculture report for Nigeria (EBA, 2017), the African Seed Access Index: Nigeria Brief (TASAI, 2019) and the Access to Seeds Index: Western and Central Africa report (AtSI, 2019). The challenges identified were grouped and structured according to the six functions for seed sector transformation. The team indicated if challenges are important to all crops, or if they are crop/crop group specific. Challenges have been verified through a review of the assessment report (WUR, 2019b) by all experts involved in the prior consultations. The challenges for each of the six seed sector performance functions are outlined below. It should be noted that only the challenges that are general for all crops are presented; the challenges that are specific to crops and crop groups are presented in the assessment report. A total of 84 challenges, related to 34 different topics, were identified.

Service provision

- A disconnect between research and farmers reduces variety adoption
- Due to the limited capacity of research institutions, research results are not compelling and do not lead to significant economic gains
- Constrained capacity and infrastructure of research organizations results in inefficient variety release procedures
- Infrastructural and technical capacity for variety development and EGS supply at NARIs is limited
- Seed producers and seed companies do not have sufficient access to seed quality assurance services
- Seed companies do not have access to financial products and services for their production and marketing operations
- Business support services to seed companies are not available
- Low extensionist/farmer ratio and limited involvement of seed companies in extension limit farmers access to seed related knowledge and information.

Seed production systems

- The capacity of seed companies in production, marketing, and financial management is limited
- Seed companies and seed producers are constrained in their infrastructural capacity
- Seed companies do not have access to accurate industry/market information to inform proper production planning
- Structure and processes for EGS supply are constrained and hamper variety deployment and replacement
- EGS-demand forecasting systems that inform future EGS needs of companies are not available
- Predominance of institutional markets for several crops results in seed market inefficiencies and carryover seed
- The presence of non-genuine seed companies and traders hampers the development of the sector.

Seed market development

- Weak crop value chain structure and operation, combined with inefficient crop production practices, result in farmers investing to a limited degree in quality seed of new and better-performing varieties
- Instability in grain markets reduces farmers' willingness to invest in crop production, including the purchase of quality seed
- Farmers have limited awareness of quality seed and improved varieties; they do not use advanced practices required for their successful cultivation
- Limited investment by seed companies in seed marketing and promotion reduces quality seed uptake by farmers
- Weak commercial seed distribution networks fail to reach farmers with adequate quantities of seed at the right time
- Several agro-dealers are engaged in the marketing of fake seed
- Farmers and agro-dealers are not able to distinguish fake seed from quality seed
- Farmers consider purchasing certified seed a risk, due to their limited trust in seed companies/agro-dealers
- NGO/government subsidies/distribution schemes hinder farmers' willingness to pay for quality seed, hamper the functioning of seed markets and create imbalanced opportunities for national and international seed companies.

Revenue generation and reinvestment

- Relatively high costs of proprietary variety release and required breeder involvement constrain seed companies releasing varieties and therefore hamper competition
- The extent of seed-quality assurance services is dependent on government and project budgets; the system is not based on service-based revenues
- Seed companies have a short-term business perspective; they save and invest financial resources to only a limited degree
- Given the sector's immature financial status, tailored soft loans, and financial products and services are not available to seed companies and their operations
- Plant variety protection is not yet operational; therefore, private companies are currently reluctant to bring new improved varieties to the Nigerian market
- Government, NGO and project subsidies hamper revenue generation and the sustainability of private companies
- The zero tariffs applied to agricultural inputs is not applicable to seed, impacting on seed prices.

Seed sector coordination

- A structured seed sector platform, which includes stakeholders from public, private, civil society and knowledge organizations
- Some platforms have been established to support the sector, they are not functional and do not provides platform services
- The performance of the seed sector is hampered by the friction between public and private stakeholders' interests
- Limited coordination in the seed sector leads to individual interventions by donor and development organizations in specific crop value chains, thereby impacting the sector in an uncoordinated fashion
- Sector coordination and governance are jeopardized by the limited availability and reliability of data

-
- The NASC has the statutory mandate by law to regulate the seed sector, hence the NASC needs to provide leadership in the implementation of seed systems activities within larger value chains and related programmes
 - SEEDAN only has a basic governance structure, and does not have chapters on commodities, regions, or types of seed entrepreneurs; this results in the limited representation of specific demands.

Seed sector regulation and management

- Public investment in research, crop improvement and seed systems for food security crops is limited or not structural
- The NASC's focus on quality assurance for only a few grain crops impacts the quality of seed available in RTBs and vegetables
- The ECOWAS policy on variety release has not yet been implemented
- Limited enforcement of quality standards makes fake seed a rewarding business
- National seed companies are constrained in seed export due to the current status of the NASC's membership of world seed bodies, such as its observer status with the International Union for the Protection of New Varieties of Plants (UPOV); membership of the Seed Scheme of the Organization for Economic Co-operation and Development (OECD) is at the application stage
- Due to the weak partnership between the NASC and other relevant government agencies, such as the Nigeria Customs Service and the NAQS, the regulation of seed import is poor
- Corruption at ports and borders constrains seed import
- The Plant Variety Protection Bill is close to approval; the system to make PVP operational still needs to be designed and implemented.

3 Where do we want to go?

3.1 Vision

The vision for the seed sector in Nigeria is to become more competitive, resilient, profitable, innovative and adaptive, sustainable, inclusive, resistant and transparent. The vision is illustrated in Figure 3.



Figure 3 Seed sector vision

3.2 Selection of topics and ambitions

Based on the strategies for tackling challenges as identified during the FGDs of the seed sector review, and complemented with information resulting from the desk study, the consultancy team identified and elaborated “ambitions”. Ambitions are descriptions of a desired state or outcome of a transformation process. The consultancy team grouped ambitions by topics, and according to the six functions of sector transformation. The team identified 8 topics for service provision; 9 for seed production systems; 9 for seed market development; 11 for revenue generation and reinvestment; 7 for governance and coordination; and 8 for seed sector regulation and management. Like the challenges, topics may be related to several seed sector functions; however, with ambitions specific for the function. The ambitions were marked as general, i.e. relevant to the entire seed sector and all crops, or as specific to certain crop groups, e.g. maize; roots, tubers and bananas (RTBs); legumes, rice and small grains; and vegetables. In the multi-stakeholder workshop (WUR, 2019c), as part of the seed sector review, participants first prioritized topics according to crop group, and secondly according to stakeholder group. A total of 22 topics were prioritized for the NSRM. Further information can be found in the assessment report (WUR, 2019b). Below, the ambitions are listed as 22 prioritized topics, according the six functions.

Service provision

Ambition for function	The seed sector is capable of providing high quality, inclusive and differentiated services to seed producers and seed value chain actors.
Decentralization of seed quality assurance	Consolidated, effective and sustainable seed quality assurance systems cover multiple crops (cereals, legumes, RTBs, and vegetables) and provide services to different types of seed entrepreneurs. Specific seed quality assurance standards and protocols developed and implemented for all crops, especially for RTBs and vegetables.
Professional variety development	Enhanced public capacity for variety development with functional research, farmer and market linkages.

Production systems

Ambition for function	The seed sector has viable and sustainable seed production systems for all crops
Early generation seed supply	Enhanced commercial and sustainable public and private capacity, structures and processes for early generation seed (EGS) supply including an operational EGS forecasting system.
Infrastructural capacity for seed production & marketing	Enhanced infrastructural capacity for the production, processing, storing and marketing of quality seed, including early generation seed (EGS), driven by individual and specific crops or crop groups (e.g. RTBs, legumes and/or others) among seed companies and other seed entrepreneurs, including public research organizations engaged in PPPs for EGS supply.
Company professionalization & specialization	Increased professionalization and specialization of seed companies and other seed entrepreneurs in the production and marketing of seed of specific crops or crop groups.
Community-based seed production	Strengthened community-based seed production (CBSP) schemes and increased availability of quality seed of major cereals (except maize), legumes, small grains and RTBs, accessible to farmers; they have evolved into business-oriented, legitimate, legal, institutionally supported and organized, trustworthy and sustainable stakeholders in the production and marketing of quality seed of improved varieties. CBSP schemes and local seed entrepreneurs have structural linkages with public research organizations for access to new improved varieties, EGS and other technologies; they are also linked to the NASC, using decentralized modalities for seed quality assurance, and to financial organizations, enhancing their business orientation, available financial resources and sustainability.

Market development

Ambition for function	The seed sector has efficient, fair and transparent seed value chains and seed markets
Extension on seed & cultivation practices	Enhanced public and private extension services that promote farmers' use of quality seed of improved varieties combined with advanced cultivation practices.
Tackling of counterfeit seed	Increased enforcement of quality assurance and penalties for counterfeit seed marketing; reduced engagement in the marketing of fake seed by seed companies and agro-dealers; reduced profitability of counterfeit seed and thereby reduced viability of non-genuine seed companies and agro-dealers; increased farmers' trust in seed companies and agro-dealers.
Seed company marketing & promotion	Increased and more structural investment by seed companies in the marketing and promotion of quality seed and improved varieties that results in an increased awareness of farmers and enhanced willingness to pay for quality seed and improved varieties.
Crop value chains & food security policies stimulating seed demand	Enhanced food and nutrition security policies and more stable prices in grain and crop markets increase farmers' profitability and enable their investment in the production of food crops, thus contributing to increased use of inputs such as quality seed of improved varieties.
Seed distribution networks	Enhanced capacity of agro-dealer networks in the marketing of adequate quantities of quality seed of improved and demanded varieties of multiple crops, at the right time and affordable price.
Institutional markets	Increased demand- and market-driven, dynamic and functioning seed sector that operates sustainably with minimal government, NGO and project subsidies and interventions; if interventions are made, they promote accountability and sustainability.

Revenue generation & reinvestment

Ambition for function	The seed sector has the capacity to generate revenues and make strategic reinvestments
Revenue generation for seed quality assurance	Enhanced efficiency and effectiveness of the NASC in delivering seed quality assurance services, which are supported by a sustainable mechanism for generating revenues.
Financial services & products	Enhanced availability of financial services and products tailored to seed business, and their increased use by seed companies and producers in their production and marketing operations.

Coordination & governance

Ambition for function	The seed sector has appropriate coordination and governance mechanisms in place, which result in alignment and accountability among different seed stakeholders
Sector governance & coordination	Enhanced governance of the seed sector with institutional responsibilities for governance and regulation; a structured and functional National Seed Sector Platform; a collaborative and sector-driven implementation of the NSRM; and improved coordination between public and private stakeholders in seed sector development.
Seed information	Increased availability and reliability of information on seed and seed business for all stakeholders; enhanced access to and use by stakeholders of accurate industry and market information, which supports proper production planning, marketing and promotion of new varieties, EGS forecasting and supply, seed quality assurance and financial services tailored to the seed sector; increased efficiency and effectiveness of the sector through the use of modern systems for seed information management and sharing (IMS).
Seed trade association	Enhanced structure, functioning and governance of SEEDAN, ensuring coverage and representation of all agricultural zones, crops and business types.
Alignment of donor interventions	Increased coordination and alignment among donor and development organizations in the seed sector.

Regulation & management

Ambition for function	The seed sector has rules and systems in place that govern seed markets, production systems, service provision and coordination
Plant variety protection	Adopted Plant Variety Protection Bill; operational UPOV-PVP system that supports the development of the seed sector.
Variety release	Increased efficiency and transparency in variety release procedures with a more realistic cost-benefit ratio; enforced ECOWAS harmonization on variety release that supports private sector investment.
Seed import	Increased efficiency, predictability and transparency of seed import procedures and conditions at ports and borders, supported by a one-stop digital portal, that facilitate seed business development; zero import tariffs applied to seed of selected crops, similar to other agricultural inputs.
Seed export	Membership of the NASC with international bodies, like UPOV and the OECD Seed Scheme, established and consolidated, thereby supporting seed export; one-stop portal established for seed export.

4 How do we get there?

4.1 Strategic innovation pathways

A strategic innovation pathway (SIP) provides insights into the ambitions and functions of a topic relevant to seed sector transformation. Table 3 provides the structure for the description of a SIP.

Table 3 Structure for the presentation of strategic innovation pathways

SIP character	Description
Ambition	Description of the desired state or outcome of a transformation process, including a reference to the primary and <i>secondary</i> functions for seed sector transformation
Challenge	Brief description of the current context and problems in relation to the topic
Systemic innovation pathway	A maximum of five steps/activity groups describing what can be done to achieve the ambition in a sustainable manner
Stakeholders	The key stakeholders that need to be involved in the innovation pathway
Catalyst	The type of organization that is in the best position to pull and facilitate the change process proposed in the innovation pathway; it should be noted that stakeholders that have a major responsibility for the function or in achieving the change cannot operate as catalyst
Policy reference	Reference to the key policy documents, i.e. the Agricultural Promotion Policy (2016-2020) (FMARD, 2016), the NASC Act (2019) (FMARD, 2019) and the NASC strategy (2020-2024) (NASC, 2019)
Proposed two-, five- and/or ten-year horizon	Results to be obtained after two, five and/or ten years. The number of years indicated depends on the function and topic; some challenges can be addressed in a short time; others are more complex and will need more time
Illustrative examples	2 or 3 examples of successful intervention strategies, either in Nigeria or in other countries, that may be considered as a reference for ways to achieve the ambition using the proposed innovation pathway

Even though many of the SIPs are closely related, they may serve different functions and are presented individually in relation to the seed sector transformation function that they fit best. Table 4 provides an overview of the 22 prioritized topics for which SIPs have been developed, including their reference codes. The order of presentation of the SIPs within each function is based on priorities established during the multi-stakeholder workshop (WUR, 2019c), with numbers 1 indicating the highest priority. From section 4.3 to 4.8, the SIPs are individually elaborated.

Table 4 Overview of the SIP topics within the six functions of seed sector transformation

Service provision	Production systems	Market development
<ul style="list-style-type: none"> SP1: Decentralization of seed quality assurance SP2: Professional variety development. 	<ul style="list-style-type: none"> PS1: Early generation seed supply PS2: Infrastructural capacity for seed production & marketing PS3: Company professionalization & specialization PS4: Community-based seed production. 	<ul style="list-style-type: none"> MD1: Extension on seed & cultivation practices MD2: Tackling of counterfeit seed MD3: Seed company marketing & promotion MD4: Crop value chains & food security policies stimulating seed demand MD5: Seed distribution networks MD6: Institutional markets.
Revenue generation & reinvestment	Coordination & governance	Regulation & management
<ul style="list-style-type: none"> RR1: Revenue generation for seed quality assurance services RR2: Financial services & products. 	<ul style="list-style-type: none"> CG1: Sector governance & coordination CG2: Seed information CG3: Seed trade association CG4: Alignment of donor interventions. 	<ul style="list-style-type: none"> RM1: Plant variety protection RM2: Variety release RM3: Seed import RM4: Seed export.

4.2 Development partners and SIPs

During the seed sector assessment, the consultancy team interacted with the FMARD’s development partners. They were consulted on their engagement in specific SIPs, the outcome of the consultation is presented in Table 5. Individual SIPs are presented with a maximum of five steps or activity groups. Development partners are currently supporting and financing specific steps or parts of such steps within selected SIPs. For example, the Alliance for a Green Revolution in Africa (AGRA) with funding from the United States Agency for International Development (USAID), is financing step one of the SIP for tackling counterfeit seed, i.e. designing, piloting and scaling traceability innovations using information and communication technology (ICT). Note that interventions may be restricted to certain crops or states. The NSRM with its SIPs and the overview of development partner involvement provides options for future investments of development partners, ensuring demand orientation and alignment and avoiding duplication. An example of such a design option is where a number of SIPs or parts of them inspire and inform the proposal development for a four-year programme for the Nigeria-Netherlands Seed Partnership.

Table 5 Development partners and their engagement in SIPs structured along the six functions of seed sector transformation

Function	Strategic innovation pathways	Development partners*
Service provision	Decentralization of seed quality assurance	BMGF, IFAD
	Professional variety development	BMGF
Production systems	Early generation seed supply	BMGF/AGRA/USAID, JICA
	Infrastructural capacity for seed production & marketing	
	Company professionalization & specialization	BMGF, IFAD, IsDB, JICA, AGRA/USAID, WB
Market development	Community-based seed production	BMGF, GiZ, IFAD, WB
	Extension on seed & cultivation practices	IsDB, WB, IFAD, GiZ, NL
	Tackling of counterfeit seed	AGRA/USAID
	Seed company marketing & promotion	GiZ, IsDB, NL, USAID
	Crop value chains & food security policies stimulating seed demand	USAID
	Seed distribution networks	USAID
Revenue generation & reinvestment	Institutional markets	IFAD, IsDB, WB, GiZ, AGRA
	Revenue generation for seed quality assurance services	BMGF
Coordination & governance	Financial services & products	
	Sector governance & coordination	BMGF, NL
Regulation & management	Seed information	
	Seed trade association	
	Alignment of donor interventions	
	Plant variety protection	AGRA/USAID, NL
Regulation & management	Variety release	
	Seed import	GiZ
	Seed export	

* Acronyms: AGRA: Alliance for Green Revolution in Africa; BMGF: Bill & Melinda Gates Foundation; GiZ: German Corporation for International Cooperation; IFAD: International Fund for Agricultural Development; IsDB: Islamic Development Bank; JICA: Japan International Cooperation Agency; NL: Netherlands international development cooperation through various modalities; USAID: United States Agency for International Development; WB: World Bank

4.3 Service provision

Decentralization of seed quality assurance (SIP-SP1)

<i>Ambition</i>	Consolidated, effective and sustainable seed quality assurance systems cover multiple crops (cereals, legumes, RTBs, and vegetables) and provide services to different types of seed entrepreneurs (service provision). Specific seed quality assurance standards and protocols developed and implemented for all crops, especially for RTBs and vegetables (<i>regulation & management</i>).
<i>Challenge</i>	The NASC's human, technical, and operational capacity, including the available seed laboratories and vehicles in regional offices, are not yet fully equipped in accordance with the International Seed Testing Association (ISTA) nor able to cope with the industry's demand. Therefore, the NASC is unable to meet the national and diverse demand for seed quality assurance services by seed companies, seed producers, community-based seed production (CBSP) schemes and local seed entrepreneurs. The NASC primarily focuses on a few major cereal crops. Seed quality standards and protocols have not yet been developed for all crops; for those that have been developed, their implementation is limited. Standards, protocols, and the use of digital applications, including the Seed Tracker (IITA, 2020a) and Seed-Codex (AgroNigeria, 2019), are required to increase the effectiveness and efficiency of seed quality assurance systems. Stakeholders, particularly those within intermediary and informal seed systems engaging in seed production of crops of interest to the nation's food and nutrition security, other than the major cereals, are hampered in accessing seed quality assurance services and are unable to produce and market certified seed.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Review the NASC's existing operational approach to accreditation and third-party field inspection, seed testing and quality control, and seed certification; assess the opportunities for fostering decentralization and the inclusion of multiple crops within the NASC Act; assess the NASC's crop coverage in terms of standards, protocols and quality assurance modalities. 2. Assess linkages between seed entrepreneurs in multiple seed systems and the NASC for seed quality assurance services and crop coverage; assess the diversity of arrangements and modalities for third-party inspection by private seed certification entities, and accreditation of seed entrepreneurs for internal quality control; assess standards and protocols available for crops not covered in Nigeria but available elsewhere. 3. Pilot and promote the use of digital solutions such as Seed Tracker and Seed-Codex technologies within decentralized seed quality assurance modalities. 4. Pilot decentralized seed quality assurance modalities within major value chain development programmes; support tailored seed technology and systems-oriented human capacity; develop and test standards, protocols and modalities for crops not yet covered. 5. Monitor progress and impact of pilots, facilitate learning lessons, foster scaling and institutionalization.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • NASC • Seed entrepreneurs, including companies, producers, farmer seed producers and their associations engaged in CBSP • Value chain and private sector development programmes, including seed components.
<i>Catalyst</i>	Consulting company or NGO with knowledge of the seed sector, including a strong business profile; ICT company with ability to support the adaptation and use of Seed Tracker and Seed-Codex technologies.
<i>Policy reference</i>	Article 39 of the NASC Act (2019) states that seed of registered varieties from the informal sector, if commercialized, is subject to quality control procedures, and article 15 supports decentralized (third-party) seed quality assurance. The NASC Strategy (2020-2024) elaborates a strategy and plan to outsource seed certification to third-party stakeholders, through private seed certification entities and through a system of accreditation. It further provides guidelines for promoting the use of Seed Tracker technology to increase efficiency.
<i>Proposed five-year horizon</i>	Decentralized systems and modalities for seed quality assurance supported by Seed Tracker and Seed-Codex technologies have been piloted and tested in at least five crops, covering multiple seed systems and at least five states; lessons learned on modalities, ICT technologies, standards and protocols are available and incorporated in a plan for further scaling and institutionalization.
<i>Proposed ten-year horizon</i>	Decentralized systems and modalities for seed quality assurance are mainstream, which results in certified seed being available for a wide diversity of crops; various seed quality assurance modalities are used by seed entrepreneurs; the NASC oversees the larger seed quality assurance structure, which is effective and efficient.

<i>Illustrative examples</i>	<ul style="list-style-type: none"> • The Seed Control and Certification Institute (SCCI) in Zambia is responsible for the regulation of the seed sector; its services are well coordinated and automated, thereby ensuring that quality seed is delivered to buyers. Private sector inspectors and laboratories are accredited and engaged directly by seed companies and other entrepreneurs to conduct seed quality assurance services in a manner tailored to specific seed systems; the SCCI audits private testing laboratories and private seed inspectors. • The project 'Building an Economically Sustainable Integrated Seed System for Cassava for Nigeria' (BASICS) (RTB-CGIAR, 2020a) establishes and supports a network of geographically distributed, community-based village seed entrepreneurs, including decentralized forms of seed quality assurance. • IFAD's Integrated Value Chain Project in Nigeria engages in third-party inspection of seed produced by local rice seed producers in various states (IFAD, 2020). • Wageningen University & Research (WUR) seed projects in Myanmar have supported government partners to develop a digital application system and seed portal that facilitate seed quality assurance (WUR, 2020a). • The Integrated Seed Sector Development project in Uganda has developed a decentralized system of quality declared seed (QDS), and modalities involving third-party seed quality assurance services (WUR, 2020b).
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Professional variety development (SIP-SP2)

<i>Ambition</i>	Enhanced public capacity for variety development with functional research, farmer and market linkages (service provision).
<i>Challenge</i>	The public capacity for variety development of crops of importance for food and nutrition security, where private sector investment is currently not profitable, is limited in Nigeria. Few breeders cover crops that are vital for food security and agricultural development. The capacity of breeders and their programmes is limited, because their budgets are restricted and unreliable; their infrastructure and facilities are hindered from operating professionally and in line with their national responsibilities. Until NARIs have sufficient, secure and sustainable budget allocations for variety development, they will remain dependent on externally funded projects and will thus continue to be donor driven. If such circumstances continue, NARIs will continue to be perceived as low-paid testing and labour partners of CGIAR crop development programmes. To a limited degree, they engage in public-private partnerships with seed companies and other seed entrepreneurs, which may foster their business and variety promotion. There are no mechanisms in place for partial cost recovery for research through PVP or other instruments. The national capacity for crop development for critical food crops continues to be dependent on CGIAR, supported by a few international development and philanthropic organizations.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Assess national breeding programmes using the Breeding Program Assessment Tool (BPAT) (UQ, 2020); design and restructure programmes to enhance their efficiency and effectiveness; engage in human and institutional capacity development in technical, business and management aspects; invest in infrastructure. 2. Operationalize and enforce laws and regulations for variety development and the protection of varieties developed by public and private breeders. 3. Co-create a space for and pilot public-private partnerships in variety development covering maize, rice, legumes and RTBs. 4. Assess public financing and policies required for a more structured and sustainable funding of public crop improvement programmes, especially for food crops whose seed systems are commercially less attractive; foster and engage in advocacy for sustainable and reliable public financing for variety development programmes for food security crops. 5. Establish a research tax fund combined with tax breaks for investors in variety development through studies, advocacy and reform support (for example, in collaboration with the Agricultural Development Trust Fund, which is currently being developed by FMARD).
<i>Stakeholders</i>	<ul style="list-style-type: none"> • FMARD, Federal Ministry of Finance (FMoF) • NARIs and universities • IITA, ICRISAT, AfricaRice, the International Potato Center (CIP) and WorldVeg • Seed companies, producers and other seed entrepreneurs.
<i>Catalyst</i>	University of Queensland through BPAT with regional consultants and/or partnership with CGIAR Centers in Nigeria that have gone through a BPAT process; consulting firm or knowledge organization with insights in public financing.

<i>Policy reference</i>	The APP (2016-2020) in its input section refers to the critical role that public research organizations play in variety development; with its strong focus on private sector development, the APP does not elaborate mechanisms to foster the linkage between public organizations and seed entrepreneurs. The NASC Act (2019), in article 38, indicates that the NASC shall approve of and implement programmes and measures for promoting genetic improvement of plant varieties and the protection of breeders' rights.
<i>Proposed five-year horizon</i>	The capacities of at least five variety development programmes within NARIs and/or universities have been improved in human resource, management and infrastructural capacity making use of BPAT. Public-private partnerships (PPPs) for variety development are operational for maize and RTBs. Fiscal incentive structures are studied and in a pilot stage of implementation. Opportunities for creating more sustainable public funding of variety development have been identified and piloted.
<i>Proposed ten-year horizon</i>	NARIs, universities and seed companies gain revenues for variety development and reinvest such resources; FMARD commits and provides stable and reliable budgets to the programmes. NARIs and universities benefit through PVP and their dependence on CGIAR is reduced. PPPs in variety development have become operational for maize, legumes, small grains and RTBs. Fiscal incentive structures supporting investment in variety development are operational, and various investors are benefiting from them.
<i>Illustrative examples</i>	The BPAT (UQ, 2020) reviews key technical capacity and management components of plant breeding programmes. It supports the design of improvements that increase efficiency and result in higher rates of genetic gain; it is used to enhance CGIAR programmes (CGIAR, 2020), and has also strengthened national programmes in Ethiopia and India.

4.4 Production systems

Early generation seed supply (SIP-PS1)

<i>Ambition</i>	Enhanced commercial and sustainable public and private capacity, structures and processes for early generation seed (EGS) supply including an operational EGS forecasting system (<i>service provision; production systems; revenue generation & reinvestment</i>).
<i>Challenge</i>	Seed companies and producers depend on public research organizations for effective, regular and sustainable access to quality EGS. This supply is constrained for seed of all food crops, except for foundation seed of OPVs of maize. Major constraints hampering EGS supply are the following: (i) the inadequate infrastructural and technical capacity of public research organizations for EGS production and supply; (ii) the limited technical, infrastructural and professional capacity of seed companies and seed producers, which does not allow them to assume responsibilities for EGS production; (iii) the limited human resource and infrastructural capacity of the NASC, which limits it to perform EGS certification across the nation; (iv) the ineffective and non-transparent processes for EGS supply and linkages between public and private stakeholders; and (v) the absence of an EGS forecasting system critical for planning its supply. A global (BMGF & USAID, 2015) and national study (Context Network & Sahel Capital, 2016) on commercial and sustainable EGS supply commissioned by BMGF and USAID provide insights on how to improve the organization and structure of EGS supply with tailored strategies for hybrid maize, major cereals (rice, OPV maize), small grains, legumes, and RTBs.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Explore and facilitate structures and processes for the division of responsibilities and collaboration between public and private stakeholders in EGS supply for specific crop groups (follow-up to the national study). 2. Engage in advocacy and the development of mechanisms for sustainable public financing and investments in EGS production and supply; conduct follow-up activities to the EGS study with critical stakeholders. 3. Design and support the implementation of specialized business models and/or PPPs, involving critical public and private stakeholders for EGS production and supply, with specialization for maize hybrids and OPVs, other major cereals, small grains, legumes, RTBs and indigenous vegetables, including tailored human capacity development. 4. Assess and support the development of a structure and modalities for EGS forecasting. 5. Support the NASC's capacity to conduct EGS certification, including specific diagnostics.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • FMARD; NASC • NARIs, universities and CGIAR Centers • Specialized EGS seed companies • Seed companies and producers • Development partners.

<i>Catalyst</i>	Consulting firm with insights into seed sector development, capabilities in the design and facilitation of PPPs and business development, and insights into the structure of public finance in close collaboration with NARIs, the NASC, seed companies and other seed entrepreneurs.
<i>Policy references</i>	The APP (2016-2020) aims to increase the availability of quality seed and prioritizes EGS supply. The NASC Act (2019) defines classes for seed, including EGS. The NASC strategy (2020-2024) outlines that the NASC will introduce a diagnostic certification process for ensuring EGS purity.
<i>Proposed five-year horizon</i>	Specialized seed companies for the production and marketing of EGS for maize and/or other crops are operational; EGS-targeted PPPs for a few legume, small grain and RTB crops are in a piloting phase; increasingly, in a more structured and transparent manner, seed companies and producers source EGS from those specialized companies and PPPs; initial public financing arrangements support public components of EGS supply; an EGS forecasting system is operational for a few crops.
<i>Proposed 10-year horizon</i>	Seed companies and producers source EGS through a regular, structured and transparent manner from specialized companies and PPPs; these specialized seed companies and PPPs have gained a specific place in the market and are financially sustainable; dedicated and sustainable public financing arrangements cover public components of those PPPs; an EGS forecasting system covers all crops.
<i>Illustrative examples</i>	<ul style="list-style-type: none"> GoSeed is responsible for the commercial promotion and supply of EGS of improved crop varieties generated by IITA and other CGIAR Centers (IITA, 2020b). It includes banana, cassava, cowpea, maize, plantain, rice, soybean and yam. It was established in 2016 as a unit of the IITA Business Incubation Platform and is registered as a limited liability company. AVISA (ICRISAT, 2020a) is an information portal managed by ICRISAT, which aims to boost the availability of EGS for legumes and small grains for seed companies and producers in West Africa; BASICS (RTB-CGIAR, 2020b), strengthens and supports the set-up of an EGS system for cassava. QualiBasic Seed Company is a foundation seed company established in Kenya to produce and supply quality foundation seed for seed companies in East and Southern Africa (QualiSeed, 2020); it targets the production and supply particularly of maize inbred lines, and thereby aims to increase production and marketing of new, better-performing hybrid maize varieties. It has subsidiaries in Zambia and South Africa.

Infrastructural capacity for seed production & marketing (SIP-PS2)

<i>Ambition</i>	Enhanced infrastructural capacity for the production, processing, storing and marketing of quality seed, including early generation seed (EGS), driven by individual and specific crops or crop groups (e.g. RTBs, legumes and/or others) among seed companies and other seed entrepreneurs, including public research organizations engaged in PPPs for EGS supply (production systems; market development; service provision).
<i>Challenge</i>	Seed companies, seed producers and other seed entrepreneurs are constrained by poor infrastructural capacity, particularly in terms of seed processing and storage for crops like legumes and RTBs. This also applies to public research organizations responsible for EGS supply of crops, such as RTBs, requiring specific production capacity. Entrepreneurs and such organizations need to invest in nurseries, tissue culture laboratories or other rapid multiplication technologies. Currently, they leverage facilities owned by international research centres like IITA and this trend is expected to continue in the future. Seed entrepreneurs have no other choice than to maintain a short-term business perspective; they save and invest financial resources to a limited degree only. A number of factors explain this business behaviour and are a reflection that they operate in an immature sector. Problems include the mixed messages that farmers get through donor-funded and government-driven giveaway programmes and campaigns, which tend to reduce the reference value of quality seed and associated insecurity in terms of an enabling environment for the seed market. These factors thus reduce the ability and willingness of entrepreneurs to invest in the infrastructural capacity (especially storage) required for further professionalization, with impact on the quality, quantity and diversity of available seed. Moreover, they invest only to a limited degree in seed marketing and promotion, which further reduces uptake by farmers.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Assess in the context of individual crops and crop groups, the current capacity of seed companies and other seed entrepreneurs, in infrastructure (buildings, storage, processing and other equipment) for production and marketing; assess the current business plans, operations, financial resources and access to finance for investment; included in the assessment are NARIs engaged in PPPs for EGS supply. 2. Define potential demands and opportunities for infrastructural investments by various seed entrepreneurs and PPPs for individual crops and crop groups. 3. Identify potential financial support or financing mechanisms to support seed entrepreneurs and PPPs to upgrade their infrastructural capacity.

	<ol style="list-style-type: none"> 4. Facilitate matchmaking between seed entrepreneurs and PPPs, with potential organizations providing financial support; provide technical and financial services to seed entrepreneurs and PPPs to enhance their eligibility for support. 5. Monitor the progress and impact of support, facilitate lessons learned and foster scaling.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • Seed companies, seed producers and other seed entrepreneurs • Public research organizations that are part of PPPs engaged in EGS supply • Value chain development and private sector development programmes • Commercial financial service providers and banks operating in the agricultural sector • International development banks including the African Development Bank (AFDB), IsDB, World Bank or programmes such as the Africa Enterprise Challenge Fund (AECF).
<i>Catalyst</i>	Consulting company or NGO with knowledge of the seed sector, including a strong business profile, with insights into financing an upgrade of the infrastructural capacity of seed entrepreneurs, and insights into the world of agricultural finance.
<i>Policy reference</i>	No policy references.
<i>Proposed two-year horizon</i>	An assessment of the capacity of the seed production and marketing infrastructure of a diversity of seed entrepreneurs is available, including companies, producers and other local entrepreneurs, and public organizations engaged in PPPs for EGS supply. The entrepreneurs and PPPs included operate in at least five states and are engaged in the production and marketing of quality seed and/or EGS of cereals, legumes, RTBs and/or vegetables. An overview of the opportunities for financial support and/or finance for upgrading infrastructural capacity, is available, and it includes eligibility criteria for obtaining such support.
<i>Proposed five-year horizon</i>	Seed entrepreneurs and PPPs for EGS supply covering multiple crops have upgraded their infrastructural capacity for production and marketing of quality seed and EGS; enhanced their professionalization, mid-term business perspective and degree of specialization; and use, as part of their business model us financial products and services in upgrading and maintaining their infrastructure.
<i>Illustrative examples</i>	<ul style="list-style-type: none"> • AGRA's Program for African Seed Systems (PASS) has supported seed companies and agro-dealers in their capacity to market quality seed in several African countries (AGRA, 2017). • BASICS (RTB-CGIAR, 2020c) and YIFSWA (IITA, 2020c) facilitate establishment of and support seed entrepreneurs who respectively produce and sell certified stems of market-preferred improved cassava varieties and engage in a pilot-setting in the production and marketing of seed yam; they provide some support, enhancing the infrastructural capacity required for these crops. • TLIII works with seed companies and seed entrepreneurs to produce and market quality seed of different classes of legumes preferred by farmers (ICRISAT, 2020b).

Company professionalization & specialization (SIP-PS3)

<i>Ambition</i>	Increased professionalization and specialization of seed companies and other seed entrepreneurs in the production and marketing of seed of specific crops or crop groups (production systems; market development; service provision).
<i>Challenge</i>	Nigerian seed companies have a wide portfolio of crops for which they produce, procure and market seed. A seed company's engagement in specific crops is oftentimes encouraged by institutional markets, through which government, NGOs and projects purchase seed in large quantities. This, coupled with the insecure business environment, causes the primary business model to remain short- rather than mid- or long-term focused, while also to a limited degree invest in highly capable human resources. For the industry and sector to mature, seed companies need to become professional in the production and marketing of quality seed. Instead of following singular opportunities in their crop portfolio, they need to specialize in a limited crop portfolio. For example, seed business of RTBs (e.g. yam, cassava and potato) requires specialized capacities in the production of quality EGS, specific processing and storage infrastructure, and development of specialized marketing networks. Another example is for companies that market vegetable seed: they procure seed from internationally operating seed companies. However, they lack dedication and professionalism in their practices in identifying varieties, (re-) packaging, promotion and marketing; these are all practices required to boost seed business in the horticultural sector.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Assess the capacity of seed companies with a perspective of further professionalization and specialization and the market potential for quality seed for various crops. 2. Explore the viability, business modalities and institutional positioning for business support services that promote seed company professionalization and specialization. 3. Based on the assessments, establish and promote business support service entities that engage in capacity development in technical and business aspects, facilitate business linkages and planning, as

	<p>well as provide coaching on production, marketing and financial management of seed companies, with a focus on specific crops and markets (e.g. RTBs – cassava, yam and/or potato; legumes and/or vegetables).</p> <ol style="list-style-type: none"> 4. Monitor the progress and impact of pilots, facilitate lessons learned and foster scaling. 5. Support SEEDAN and/or other organizations to facilitate the piloted types of services for specialization in a structured and commercial manner.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • Seed companies • NARIs and universities, CGIAR Centers • SEEDAN • Business support services.
<i>Catalyst</i>	Consulting firm or services provider with strong profile in business development and the seed sector.
<i>Policy reference</i>	Neither the APP (2016-2020) nor the NASC strategy (2020-2024) provide policy references for professionalization and specialization of seed companies.
<i>Proposed five-year horizon</i>	A network of at least three business support service entities supports seed companies covering three regions of the country; while still being subsidized, their business is becoming commercially viable and autonomous. For individual or combinations of crops that include RTBs (cassava, yam and/or potato) or vegetables, at least ten seed companies have specialized, they cover at least three states per crop/crop group.
<i>Illustrative examples</i>	<ul style="list-style-type: none"> • AGRA-PASS has provided significant support to seed companies in their capacity to produce and market quality seed in several African countries (AGRA, 2017). • BASICS supports multiple business models in cassava seed production and marketing; it assists seed entrepreneurs to specialize and make a business in cassava seed production (RTB-CGIAR, 2020a).

Community-based seed production (SIP-PS4)

<i>Ambition</i>	Strengthened community-based seed production (CBSP) schemes and local seed entrepreneurs contribute to the increased availability of quality seed of major cereals (except maize), legumes, small grains and RTBs, accessible to farmers; they have evolved into business-oriented, legitimate, legal, institutionally supported and organized, trustworthy and sustainable stakeholders in the production and marketing of quality seed of improved varieties (production systems; market development); CBSP schemes and local seed entrepreneurs have structural linkages with public research organizations for access to new improved varieties, EGS and other technologies; they are also linked to the NASC, using decentralized modalities for seed quality assurance and with financial organizations, enhancing their business orientation, available financial resources and sustainability (service provision).
<i>Challenge</i>	The fact that quality seed of new improved varieties for major cereals (except maize), legumes, small grains and RTBs is not readily available to farmers limits variety replacement and opportunities to increase productivity for those crops. Moreover, farmers do not get the chance to compare improved varieties in fields similar to their own; they are hesitant to risk trying them. The low profitability of seed business for those crops limits the investment from seed companies in their production, promotion and marketing, unless triggered by institutional markets or by a strong demand from value chain actors like aggregators and processors. Variety development is the responsibility of public research organizations. CBSP schemes and local seed entrepreneurs depend on structural linkages with public organizations engaged in variety development and seed quality assurance; currently, such linkages are project dependent. They often operate without a legal and regulatory status, which further jeopardizes their linkages and operations, as well as restricts their access to financial products and services to further develop as a business and ensure their sustainability.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Assess current CBSP, local and informal seed production systems for linkages with organizations engaged in variety development and seed quality assurance; assess the legal and regulatory requirements for seed producers and entrepreneurs; assess their access to and availability of tailored financial products and services; assess farmers' willingness to pay for quality seed produced and marketed for those crops. 2. Explore and pilot mechanisms within major value chain development programmes to strengthen at scale the linkages between seed entrepreneurs and research, seed quality assurance, and financial organizations; engage in technical and business-focused capacity development, such as in the coaching of entrepreneurs, business-to-business facilitation, and financial incentivization; combine these mechanisms with activities among farmers and their organizations to demonstrate the value proposition, and promote the use, of quality seed of improved varieties. 3. Monitor the progress and impact of pilots, facilitate learning lessons, and foster scaling.

	4. Bring together local seed entrepreneurs and CBSP organizations in a new association or subchapter of an existing association (e.g. SEEDAN), which hosts a unit that provides services in a commercial and thereby sustainable manner.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • Community-based seed producers, local seed entrepreneurs and their associations • NARIs, universities and CGIAR Centers • NASC, SEEDAN and/or farmers' associations • Value chain development programmes, including CBSP and local seed entrepreneurship components.
<i>Catalyst</i>	Consulting company or NGO with knowledge of the seed sector, including a strong business profile and understanding of informal markets.
<i>Policy reference</i>	Article 39 of the NASC Act (2019) defines that seed from the informal sector of registered varieties, if commercialized, is subject to quality control procedures; and article 15 supports decentralized (third party) seed quality assurance. The NASC strategy (2020-2024) aims to register and issue licenses to community-based seed entrepreneurs to produce quality seed, and outlines that the NASC engages in local entrepreneur training.
<i>Proposed five-year horizon</i>	Seed producers engaged in CBSP and local seed entrepreneurs have stronger and more structural linkages with research organizations for accessing new varieties and EGS. These seed producers and entrepreneurs have a clear legal and regulatory status, which ensures their access to various services and creates opportunities for accessing tailored finance. They are organized in a specific association or subchapter of an existing association that hosts the service provision unit. Decentralized seed quality assurance is well-functioning and financially viable.
<i>Proposed ten-year horizon</i>	The use of quality seed of improved varieties for the crops produced and marketed by farmers engaged in CBSP, and by local seed entrepreneurs, has increased significantly. These entrepreneurs have coalesced into commercial and sustainable networks to enjoy the benefits of scale and association. They are a critical part of the seed sector and have structural linkages with research, seed quality assurance and financial organizations. They are organized in a subchapter of an existing or new association, which facilitates their linkages with critical stakeholders, and provides commercial services in business development.
<i>Illustrative examples</i>	<ul style="list-style-type: none"> • BASICS established and supported a network of geographically distributed, village seed entrepreneurs (or CBSPs) who produce and sell certified stems of market-preferred improved cassava varieties (RTB-CGIAR, 2020c). • Both ISSD Ethiopia (WUR, 2020c) and ISSD Uganda (WUR, 2020d) have been successful in establishing local seed business, and supporting their linkages with research and quality assurance organizations on a structural basis.

4.5 Market development

Extension on seed & cultivation practices (SIP-MD1)

<i>Ambition</i>	Enhanced public and private extension services that promote farmers' use of quality seed of improved varieties combined with advanced cultivation practices (market development; service provision).
<i>Challenge</i>	Increasing crop productivity and closing the yield gap for all crops in Nigeria requires a combination of quality seed of improved varieties and advanced cultivation practices. If both interventions are not utilized, farmers may not be able to earn back their investment in quality seed. Current low extension agent-to-farmer ratios, combined with limited involvement of seed companies and other seed entrepreneurs in extension support, constrain farmers' access to knowledge and information on quality seed and advanced cultivation practices that suit their agro-ecology and farming systems. Moreover, public extension workers lack the skills for promoting quality seed of new and improved varieties for distinct crops and advanced cropping practices. For example, they have limited knowledge and expertise in RTBs and horticulture, which in cases when inappropriate advice is given aggregates the problem.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Design and pilot a facility that supports public and private extension organizations in training and demonstration, including tailored (seed technology and business oriented) human capacity development; where appropriate, link the services with major donor-funded private sector development and value chain programmes. 2. Through the facility, support at scale development of the human and technical capacity of public and private extension organizations on the benefits of quality seed and improved varieties, the sources of quality seed, and the use of advanced cultivation practices; promote the use of modalities such as variety and seed quality demonstrations, farmers' field days, and large-scale awareness campaigns (e.g. radio shows and fairs).

	<ol style="list-style-type: none"> 3. Support universities and research in the design and implementation of action research, proving the benefits of using quality seed of improved varieties and improved cultivation. 4. Establish a pathway for communication between primarily domestic research and extension organizations, if appropriate linked to the facility, on the use of quality seed of improved varieties and advanced cultivation practices. 5. Develop a knowledge management system, if appropriate, linked to the facility, supporting extensionists and trainers with e-learning modules and quality promotion materials.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • National Agricultural Extension and Research Liaison Services (NAERLS), Training-of-trainer units and Agricultural Development Programmes (ADPs) • NARIs • Private extension outfits; seed companies and other seed entrepreneurs • NGOs • Farmers.
<i>Catalyst</i>	NAERLS, based at Ahmadu Bello University (ABU), in collaboration with an NGO or consulting firm with strong communication and institutional development skills.
<i>Policy reference</i>	The APP (2016-2020) highlights the importance of access to information and knowledge for all stakeholders, including farmers, to improve agricultural productivity. It mentions the development of a new strategy for promoting demand-driven and pluralistic extension services, involving public and qualified NGO and private sector players, closely linked to research.
<i>Proposed two-year horizon</i>	The facility for support to public and private extension, and the promotion of quality seed and advanced cultivation practices for RTBs, vegetables and other crops, is tested and operational in at least five states in collaboration with private sector and value chain development programmes that are supported by donors and development partners.
<i>Proposed five-year horizon</i>	Public and private extension has knowledge on quality seed, improved varieties and advanced cultivation practices targeting specific crops (e.g. RTBs, vegetables), and use more effective communication tools in more than ten states of the country; the facility supports them in a structural manner; its services are sustainable, facilitating linkages with research as well allowing for knowledge management; extension is reaching scale through major private sector and value chain programmes.
<i>Illustrative examples</i>	<ul style="list-style-type: none"> • ISSD Uganda vegetable component: training of sector professionals; establishment of a network of trained agronomists for knowledge exchange; a facility for variety demonstrations; and farmer extension services by third parties and companies (WUR, 2020e). • SEVIA Tanzania: campaigning for advanced varieties and high-quality vegetable seeds, combined with improved nursery, crop nutrition, crop protection and crop cultivation techniques adapted to smallholder farms (SEVIA, 2020).

Tackling of counterfeit seed (SIP-MD2)

<i>Ambition</i>	Increased enforcement of quality assurance and penalties for counterfeit seed marketing (<i>regulation & management</i>); reduced engagement in the marketing of fake seed by seed companies and agro-dealers; reduced profitability of counterfeiting and thereby reduced viability of non-genuine seed companies and agro-dealers (<i>production systems</i>); increased farmers' trust in seed companies and agro-dealers (<i>market development</i>).
<i>Challenge</i>	Counterfeit or fake seed is currently widely available in the market; increasingly, farmers consider purchasing seed a risky proposition, which jeopardizes the development of the entire industry. Disincentives to counterfeiting have not been working. Penalties have only recently been increased but require enforcement. Non-genuine seed companies and agro-dealers continue their practices given that marketing counterfeit seed, despite the risk of penalties, is highly profitable. Institutional markets (government, NGOs and projects) continue to be a major source of revenues for seed companies; together, they account for almost 50% of the maize and rice seed market (TASAI, 2019). Packing and labelling practices in those markets favour the delivery of counterfeit or substandard quality seed, especially when institutional players procure bulk quantities of seed that are subsequently repacked. Consequently, delivering substandard quantity seed does not put seed companies' reputation at risk. The illegal entrance of seed into the country further jeopardizes the trust in the industry.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Design, pilot and scale traceability innovations using ICT (ongoing pilot in collaboration with the NASC, AGRA and MPedigree). 2. Support the enforcement of penalties and sanctions through short-term training of regulators and inspectors; support enforcement of the NASC and the legal system in these functions; support SEEDAN and the NASC in the set-up of a qualification system for genuine seed companies and in disqualifying non-genuine companies.

	<ol style="list-style-type: none"> 3. Enhance the standardization of packaging in a public-private partnership through a process of assessment, piloting and scaling. 4. Target changes in the business behaviour of seed companies, market associations, agro-dealers and farmer associations; and create awareness among farmers on identifying and purchasing quality seed. 5. Design and pilot mechanisms and guidelines for the procurement of seed by institutional players that favour quality seed and restrict opportunities for counterfeit or substandard quality seed marketing.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • FMARD, legal system, NASC, NAQS, Nigeria Customs and other law enforcement agencies • SEEDAN, seed companies, market associations, agro-dealers • ICT providers (e.g. MPedigree) and packaging industry • Extension officers, NGOs and farmers • Institutional market players (government, NGOs and projects).
<i>Catalyst</i>	Consultancy firm with insights into seed business, seed laws and regulations and ICT technology, in close collaboration with NASC and SEEDAN.
<i>Policy reference</i>	The APP (2016-2020) refers in its input section to the delivery of sub-standard or counterfeit inputs; it does not highlight actions to tackle this problem. The NASC Act (2019), section IX, addresses infringement and offences, including increasing penalties. The effectuation depends on the legal system.
<i>Proposed two-year horizon</i>	The pilot with the tracking system is effective, and the enforcement of penalties and sanctions has increased; pilots have started among institutional market players to change their procurement practices; a register of trustworthy companies eligible to bid for seed tenders is in place; packaging practices in institutional markets have changed.
<i>Proposed five-year horizon</i>	Various measures are common practice and have reduced the presence and profitability of counterfeiting companies and agro-dealers; awareness among farmers and other stakeholders on the value of quality seed is common; counterfeiting has changed from being a structural problem, into a problem that is sporadic and appears in isolated cases.
<i>Illustrative examples</i>	<ul style="list-style-type: none"> • The NASC collaborates with MPedigree, USAID and AGRA in the use of the SeedCodex tracking app to check counterfeit seeds (AgroNigeria, 2019). • The Kenya Plant Health Inspectorate Service (KEPHIS, Kenya) collaborates with MPedigree to enable ICT verification of seed quality (Kariuki, 2017); likewise efforts are implemented in Uganda (Ashour et al., 2015).

Seed company marketing & promotion (SIP-MD3)

<i>Ambitions</i>	Increased and more structural investment by seed companies in the marketing and promotion of quality seed and improved varieties that results in an increased awareness of farmers and enhanced willingness to pay for quality seed and improved varieties (market development).
<i>Challenge</i>	Quality seed and improved varieties are catalysts for raising crop productivity and profitability; they allow farmers to achieve higher yields and incomes. However, rates of adoption of new varieties and seed replacement of farm-saved with quality seed remain low with implications on crop productivity. Farmers have limited awareness of the benefits, and do not always know what varieties best fit their farming system, agro-ecology and market demands. They are not aware of innovations in seed systems like for example of seed yam, cassava stems, seed of hybrid varieties of crops such maize and tomato, but also quality seed of various other cereals, legumes, RTBs and vegetables. To stimulate a demand for quality seed and improved varieties for various crops, seed companies are required to invest in seed marketing and promotion to educate potential farmer clients and create market demand.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Enhance the human capacity of seed companies in the development of their marketing and promotion strategy. 2. Support companies in the implementation of marketing and promotion strategies tailored to farmers. These include a wide range of activities, such as: (i) enhancing the company's last-mile distribution capabilities; (ii) supporting the installation of rural points of sale; (iii) promoting seed sales in farmer-friendly pack sizes; (iv) supporting the organization of wide-scale variety and seed quality demonstrations and farmers' field days; (v) enhancing seed companies' participation in agricultural trade shows and seed fairs to promote their products; (vi) supporting the installation of rural micro-seed quality demonstration units; and (vii) engaging in the organization of communication campaigns using local radio and printed promotion materials that illustrate the benefits of quality seed and improved varieties, and facilitate the differentiation of quality from counterfeit seed.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • Domestic and international seed companies; SEEDAN • National research organizations

	<ul style="list-style-type: none"> • NASC • Extension and business development services, media • Agro-dealers, farmer market organizations and farmers.
<i>Catalyst</i>	NGO/consulting firm with expertise on seed marketing and promotion.
<i>Policy reference</i>	The NASC in its strategic plan (2020-2024) aims to increase the adoption of quality seed of improved varieties by investing in promotion of quality seed through its website, (social) media campaigns and seed fairs, as well as by corrective actions towards the sales of counterfeit or substandard seed.
<i>Proposed two-year horizon</i>	At least eight domestic and three international seed companies have a strategy for, and engage in the promotion and marketing of, quality seed; they have implemented an awareness-raising campaign using different communication tools; each of them has started activities in at least four states.
<i>Proposed five-year horizon</i>	At least 15 domestic seed companies, complemented by at least six international companies, are implementing their seed marketing and promotion strategy in a structural manner as part of their business strategy; they are also implementing an awareness-raising campaign promoting quality seed use; each company demonstrates varieties and participates in promotional activities in at least ten states.
<i>Illustrative examples</i>	<ul style="list-style-type: none"> • AGRA-PASS has supported seed companies and agro-dealers in their capacity to market quality seed in several African countries (AGRA, 2017). • The ISSD Uganda programme has implemented a comprehensive awareness-raising campaign promoting the uptake of quality seed from domestic companies, local seed businesses and international seed companies (WUR, 2020e). • East-West Seed's Knowledge Transfer programme is promoting the use of improved agronomic technologies in several states of Nigeria, through pre-competitive activities; quality seed of improved vegetable varieties is seen as one of many technologies which farmers need to better understand (East-West Seed, 2020).

Crop value chains & food security policies stimulating seed demand (SIP-MD4)

<i>Ambition</i>	Enhanced food security policies and more stable prices in grain and crop markets increase farmers' profitability and enable their investment in the production of food crops, thus contributing to increased use of inputs such as quality seed of improved varieties (market development; regulation & management).
<i>Challenge</i>	Farmers' willingness to invest in quality seed of improved and new varieties, including hybrids, remains limited. Uncertainties on cereal grain prices (e.g. maize and rice) relate to government interventions, trade policies (tariffs and quotas), and flip-flopping of incentives that promote import substitution versus export-led growth. Opening borders to imports in years when prospects of domestic production fail to meet national demand, results in low prices for producers and grain smuggling in the border states. The Anchor Borrower's Programme is an example of an intervention of the Central Bank of Nigeria that promotes and creates a conducive market for specific commodities in certain areas (CBN, 2016). It encourages farmers to prioritize focus crops, such as rice, over others. As such, government policies and interventions impact on the predictability of farm-gate prices, especially for major cereals, thereby influencing farmers' willingness to invest in inputs. This reality reduces seed companies' motivation to invest in the production of certified seed of new varieties; for example, they would rather keep to the production and marketing of seed of older OPV maize varieties than of hybrids. Meeting national food security and driving economic development, as illustrated in other countries going through a process of agricultural transformation, creates the conditions needed to incentivize farmers to invest in crop production and thus invest in purchasing quality seed of new varieties.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Conduct a study on the relationship between food security policies, cereal market development and farmers' willingness to invest in crop inputs including quality seed of improved varieties. 2. Elaborate scenarios for promoting agricultural transformation, based on country-studies and experiences, combined with strategies that incentivize or enable farmers' profitable use of inputs, including quality seed of new, improved varieties. 3. Engage in advocacy work to inform policy makers on relevant scenarios.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • FMARD, Ministry of Trade & Investment, FMOF, Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS) • Policy research groups, e.g. Nigerian Economic Summit Group (NESG) • SEEDAN and NASC • Grain market associations and aggregators, potential end-users of grain, including manufacturers, industry associations or animal feed producers • Marketing associations or aggregators • Farmers and their organizations.

<i>Catalyst</i>	Research group or think tank with a strong profile in policy and economic analysis, in close collaboration with FMARD, FMOF and CBN.
<i>Policy reference</i>	The APP (2016-2020) focuses its instruments on stimulating agricultural production on a sustainable basis, and stimulating supply and demand for agricultural produce, by facilitating linkages between producers and off-takers, while stabilizing prices or reducing price volatility for agricultural produce through market-led price stabilization mechanisms (commodity exchanges, negotiated off-take agreements, extended farm-gate prices under value chain coordination mechanisms, agricultural insurance, etc.).
<i>Proposed ten-year horizon</i>	Farmers' willingness to invest in agricultural inputs and technologies, including quality seed of new varieties, has increased significantly as predictability of farm-gate prices has increased, and their investment in inputs and thus increased productivity is profitable. Seed companies engage in the production and marketing of quality seed of new and improved varieties, including hybrid maize. The changes result from the clear vision of the Federal Government of Nigeria in implementing policies for enhanced food security, combined with incentivizing and enabling farmers to invest in increasing productivity.
<i>Illustrative examples</i>	Both the International Food Policy Research Institute (IFPRI, 2020) and the Department of Agricultural, Food and Resource Economics of Michigan State University (MSU, 2020) have engaged for many years in studies on the impact of government interventions on food markets in Africa (e.g. Kenya and South Africa, where the seed sector is thriving) and beyond, including the impact on input markets. They advise governments and development organizations of the possible scenarios and impacts of potential interventions on food and input markets.

Seed distribution networks (SIP-MD5)

<i>Ambition</i>	Enhanced capacity of agro-dealer networks in the marketing of adequate quantities of quality seed of improved and demanded varieties of multiple crops, at the right time and affordable price (market development).
<i>Challenge</i>	Commercial seed distribution through agro-dealer networks is weak; agro-dealers reach farmers only to a limited extent, if at all, with adequate quantities of seed of the right variety, and in a timely fashion. Institutional markets or free distribution campaigns distort the business of agro-dealers and their networks; by subsidizing delivery, they influence farmers' willingness to pay for quality seed. Several agro-dealers are engaged in the marketing of fake seed; the quality assurance system does not address the operations of agro-dealers. Due to their limited trust in seed entrepreneurs, farmers consider it a risk to purchase seed.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Assess the current business models and practices of agro-dealers in seed marketing, including seed quality assurance. 2. Explore and pilot mechanisms within major value chain and private sector development programmes to strengthen the capacity and business models of agro-dealer networks, including seed companies and other seed entrepreneurs as their suppliers, and farmer organizations, aggregators, processors, and other market players as their customers. 3. Develop modalities and structures for business development support service units that include technical, operational and human capacity development, coaching in entrepreneurship, business-to-business (B2B) facilitation with seed companies and producers, development and facilitation of financial incentives and set-up of third-party seed quality assurance. 4. Monitor progress and impact of pilots and facilitate lessons learned with business development support service units; foster scaling of successful pilots and modalities. 5. Support SEEDAN to consider agro-dealers to become eligible for membership within a specific chapter; support SEEDAN and/or other organizations to facilitate the piloted types of units and modalities on a commercial basis.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • FMARD, Central Bank of Nigeria • Agro-dealer and networks • Seed companies and producers • NASC, SEEDAN • Value chain - and private sector development programmes.
<i>Catalyst</i>	Consulting company or NGO with knowledge of the seed sector including a strong business profile.
<i>Policy reference</i>	The APP (2016-2020) highlights unreliable agro-dealer networks as a constraint to seed distribution; it aims at promoting private sector rural market penetration of agro-dealer networks. Article 33 of the NASC Act (2019) indicates that the NASC shall approve procedures and requirements for post-certification control, including seed processing and marketing. It does not indicate that the NASC inspects the quality

	of seed at agro-dealer sales level. The NASC Strategy (2019) states that it will engage with agro-dealers in capacity development and awareness raising on quality seed.
<i>Proposed five-year horizon</i>	Agro-dealers and their networks have become more professional in increasing farmers' access to quality seed and providing services. They have stronger and more structural linkages with seed companies for a diversity of crops. The NASC contributes to quality assurance at agro-dealer sales level; it enhances their awareness of seed management practices. SEEDAN has established a specific chapter for this type of seed entrepreneur and has started to provide business support services on a commercial basis. The percentage of quality seed sold through agro-dealers has increased significantly for several crops.
<i>Proposed ten-year horizon</i>	Agro-dealers are vibrant, covering a larger area of the country; they are a critical and trustworthy part of the seed sector and have structural linkages with seed companies, extension and quality assurance organizations. The seed gap for most crops has significantly reduced and varieties are replaced regularly with new, more productive and adapted varieties. SEEDAN provides business support and other services to local seed entrepreneurs that include agro-dealers as part of its organizational mandate. The share of quality seed sold through agro-dealers for most crops is more than 50%.
<i>Illustrative examples</i>	<ul style="list-style-type: none"> • The Agro-dealer Support Programme of PASS trained and certified more than 40,000 private agro-dealers across sub-Saharan Africa, as they are the primary conduit of seed, fertilizers, and knowledge of their proper use, for smallholder farmers (AGRA, 2017). • BASICS is piloting agro-dealers as NASC third-party inspectors and has connected agro-dealers with a group of local cassava seed producers as their centralized sales agency (RTB-CGIAR, 2020).

Institutional markets (SIP-MD6)

<i>Ambition</i>	Increased demand- and market-driven, dynamic and functioning seed sector that operates sustainably with minimal government, NGO and project subsidies and interventions; if interventions are made, they promote accountability and sustainability (market development; production systems; revenue generation & reinvestment).
<i>Challenge</i>	Institutional markets (government, NGOs and development programmes) constitute a major share of the Nigerian seed market. The African Seed Access Index (TASAI, 2019) estimates that institutional markets represent approximately 50% of the total volume of maize and rice seed transacted in the market. While institutional buyers have the potential to power the growth of the seed industry, they are often a leading cause of market distortion. Both value chain and private sector development programmes engage in the dissemination and marketing of quality seed of maize, rice, soybean, cowpea, cassava, potatoes and vegetables. Humanitarian and food security programmes purchase and disseminate seed for maize, sorghum, legumes and vegetables. Areas of concern include the size of the demand from institutional markets, the ad-hoc nature of institutional purchases, the inability of institutional buyers to engage in long-term contracts with seed companies, and the practice of procuring seed in bulk. As such, entrepreneurs enter the seed market without the requisite knowledge and skills, a reliable network of seed producers, or common seed business ethics. This reduces the overall functionality of the seed sector as well as the quality of goods and services generated by the industry. With the practice of procuring seed in bulk, institutional players break a critical feature of a healthy seed industry: package integrity. As a result, farmers don't know who produced the seed that they grow, and the reputation of seed companies is no longer at stake when selling seed of a substandard quality. The observation was confirmed during the federal government initiative, Growth Enhancement Scheme (GES). Even though the aspiration is that normal seed markets grow, institutional markets are expected to continue playing an important role in the coming decade. Therefore, institutional players should operate in ways that promote rather than hamper the development of an accountable seed sector, e.g. aligning their interventions with the capabilities, production capacity and planning of genuine seed companies, and engaging in practices promoting sustainable and genuine seed entrepreneurship.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Assess challenges and opportunities within existing seed procurement, dissemination and marketing practices of large value chain, private sector development, humanitarian and food security programmes. 2. Assess current business models and production capacity of seed companies that supply to institutional markets; assess the current institutional arrangement between institutional players and seed companies. 3. Explore viability, modalities and institutional positioning, and support the operationalization of a service provision unit that coordinates the interface between institutional players and seed companies; provide advisory and technical support services, through the unit, to institutional market players in designing and implementing seed procurement, dissemination and marketing guidelines in a manner that is aligned with the capabilities, production capacity, and multiple-year planning of genuine seed companies; include opportunities for multiple-year contracts.

	<ol style="list-style-type: none"> 4. Strengthen and support the service provision unit to develop seed business-friendly procurement strategies and engage with institutional buyers for their piloting and scaling. 5. Assess the impact of the service provision unit as well as monitor practices used by institutional market players and seed companies; learn lessons on the role and contributions of institutional players promoting seed sector development.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • Government, NGOs and development programmes that procure, disseminate and market seed • Seed companies • SEEDAN & NASC • Business support services.
<i>Catalyst</i>	Independent consulting firm or service provider with a strong profile in business development, risk assessment and seed sector development, operating in close collaboration with both the NASC and SEEDAN, either of which could host the service provision unit.
<i>Policy reference</i>	The APP (2016-2020) refers to attempts of previous governments to improve the use of inputs through subsidy programmes (e.g. GES) and halt the use and delivery of sub-standard or counterfeit inputs. The NASC strategy (2020-2024) does not address the topic of institutional markets and its impact on the development of the seed sector.
<i>Proposed five-year horizon</i>	Government agencies, NGOs and projects use practices that are aligned with the production capacity of genuine seed companies, in the procurement, dissemination and marketing of quality seed, supported by a qualified and independent service unit; they foster the development of an accountable, professional and sustainable seed sector.
<i>Illustrative examples</i>	The Private Seed Sector Development Project in Burundi implemented by the International Fertilizer Development Center (IFDC) has supported the national seed producer's association to partner with government to engage institutional buyers in the issue of bulk procurement. The association aims to reduce the impact of large institutional buyers on the market and guide them towards a working relationship that fosters seed business-friendly procurement strategies.

4.6 Revenue generation & reinvestment

Revenue generation for seed quality assurance services (SIP-RR1)

<i>Ambition</i>	Enhanced efficiency and effectiveness of the NASC in delivering seed quality assurance services, which are supported by a sustainable mechanism for generating revenues (revenue generation & reinvestment).
<i>Challenge</i>	Seed quality assurance services of the NASC are funded through government budget. There is limited linkage between the NASC's operational budget and the delivery of services such as field inspection, laboratory testing and accreditation of internal seed quality control systems of seed companies and seed producers. The fees paid by seed companies and producers for NASC services do not directly cover the costs of those services but are considered government revenues. Payments from individual seed producers for field inspection and seed lab testing are not feasible. With a growing and more decentralized seed sector, the NASC faces challenges in ensuring efficiency and effectiveness in delivering its services. To improve financial sustainability, Stronger links are needed between the NASC's financial resources and its operations, alongside greater independence from government defined budget.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Conduct a baseline study on the current revenue system; assess the impact of the current financial model on the implementation of seed quality assurance services, including a cost-benefit analysis; conduct a willingness-to-pay assessment for seed quality assurance services among seed entrepreneurs; assess and learn lessons from revenue-generating mechanisms for seed quality assurance used in other countries (e.g. Kenya, Zambia and South Africa); and explore financing opportunities for reform within the context of the NASC Act (2019) and the larger government structure. 2. Design alternative modalities for financing of seed quality assurance services with the NASC, FMARD, FMoF and representatives of the sector, including the set-up of the NASC Seed Fund, and options for cost reduction; and engage in advocacy to support a pilot. 3. Implement a pilot that operationalizes the NASC Seed Fund, with new financial modalities for payment of seed quality assurance services for a few crops and in a few states. 4. Learn lessons from the pilot, design a mechanism for mainstreaming and create awareness among relevant stakeholders. 5. Arrange for policy support and requirements for institutionalization, and subsequently engage in mainstreaming at scale.

Stakeholders	<ul style="list-style-type: none"> • NASC • FMARD, FMoF, National Assembly • Private seed companies, seed producers, community-based and local seed entrepreneurs, and public seed producers like NARIs and universities.
Catalyst	Consulting firm/organization with knowledge of both the seed sector and government financing mechanisms.
Policy reference	Section 45 of the NASC Act (2019) indicates the establishment of the Seed Fund. The NASC Strategy (2019) proposes that the NASC benchmark its services to channel resources into the NASC Seed Fund and elaborates how the NASC can generate income from a range of services including seed certification.
Proposed two-year horizon	NASC benchmarks fund structures of other industries and countries to establish the Seed Fund; the NASC has defined the binding terms of the Seed Fund and assigned partnership agreements with relevant stakeholders committed to supporting the fund; assessments have been concluded and stakeholders have reached agreement on the way forward with a pilot for modalities of direct payment for quality assurance services.
Proposed five-year horizon	Reform has been concluded, with 50% of the NASC's financing of its seed quality assurance services based on direct remuneration; seed entrepreneurs pay the NASC directly for services; the effectiveness and efficiency of the NASC in seed quality assurance services has increased significantly.
Illustrative examples	Financial structure and modalities in seed quality assurance of KEPHIS (Kenya) (KEPHIS, 2020), and the South African National Seed Organization (SANSOR, 2020).

Financial services & products (SIP-RR2)

<i>Ambitions</i>	Enhanced availability of financial services and products tailored for seed business, and their increased use by seed companies and producers in production and marketing operations (revenue generation & reinvestment ; <i>service provision</i>).
<i>Challenge</i>	The agricultural sector has insufficient access to credit, insurance and other financial services and products. Prohibitively high interest rates and loan requirements are unattractive to borrowers; they function as disincentives for agricultural lending. Due to their current business and financial management practices and capabilities, seed companies and other seed entrepreneurs are not eligible for such financing services and products. Moreover, financial institutions and banks, if active in agriculture, neither have knowledge of the seed sector and its specific demands for finance, nor consider its potential. For example, they do not regard seed as collateral for providing credit for seed production or marketing activities. The policy conditions for the agricultural sector through the FMoF or CBN do not address specific subsectors.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Assess the current market for seed sector tailored finance; assess current formal and informal financial products and services in the sector; assess current and more sector-realistic eligibility criteria; map business models and needs of seed companies and other seed entrepreneurs; assess the seed industry's scope for financial services and products. 2. Engage in capacity building of seed companies and producers in production and financial management, e.g. make sure they are investment ready (e.g. governance, clear and transparent accounting and financial systems, a compelling business planning, legal, tax compliance etc.). 3. Promote scenarios, business models, opportunities and tools for financial services and products, guarantee systems and tailored auditing mechanisms; engage in human capacity development on seed systems with banks and financial institutions. 4. Engage in advocacy among multilateral financial institutions, banks and the government to consider opportunities in the sector. 5. Promote partnerships between financial institutions, commercial banks and seed sector stakeholders for piloting and scaling seed financing services and products.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • Seed companies and seed producers • Commercial bank(s) with a profile in the agricultural sector • Auditing company with a profile in the agricultural sector • FMARD/Agribusiness Department; FMoF; CBN • International development partners and funders • International financial institutions, e.g. International Finance Corporation (IFC)/World Bank, Islamic Corporation for the Development of the Private Sector (ICD)/IsDB.
<i>Catalyst</i>	Consulting firm with knowledge of both the seed and financial sectors that works closely with concerned stakeholders, including the Central Bank of Nigeria and/or the Ministry of Foreign Affairs in partnership with local financial service providers in the landscape.

<i>Policy reference</i>	The APP (2016-2020) aims to enhance availability of multi-year finance as well as seasonal shorter-term finance for agribusiness (which includes seed business) and agro-dealers. In order to achieve this, the APP aims to enhance FMARD capacity in relation to agricultural finance.
<i>Proposed two-year horizon</i>	At least one commercial bank offers seed sector adapted financial products and services; it has at least five seed companies and 100 seed producers in at least three states as clients.
<i>Proposed five-year horizon</i>	At least three commercial banks have an active portfolio of financial products and services, with specific differentiation for seed business in crops such as maize, grain crops, RTBs and vegetables; they have at least 20 seed companies and more than 1,000 seed producers in at least 10 states as clients, each of whom uses at least two different products or services.
<i>Illustrative examples</i>	ISSD Africa (2017) has conducted a study to identify and characterize finance for seed business. It provides the following examples: Cinzana Seed Producer Cooperative in Mali has been able to access credit from BNDA, guaranteed by the AfDB; CORIS Bank has been providing seed producers in Burkina Faso with access to credit as part of rice value chain integration; and seed warehouse receipt system financing in Malawi has been addressing inherent cash flow challenges in seed business.

4.7 Coordination & governance

Sector governance & coordination (SIP-CG1)

<i>Ambitions</i>	Enhanced governance of the seed sector with institutional responsibilities for governance and regulation; a structured and functional National Seed Sector Platform; a collaborative and sector-driven implementation of the NSRM; and improved coordination between public and private stakeholders in seed sector development (coordination & governance).
<i>Challenge</i>	The seed sector is complex with different seed systems and seed value chains and involving a wide range of stakeholders. In its performance, the sector is characterized by limited alignment of stakeholders in their actions and overlapping interventions. The sector is deficient in accountability and has a limited capacity to monitor progress in its development and engage in joint decision-making to tackle its constraints. The promotional and marketing activities of the sector that drive the demand for quality seed of improved varieties is limited. The NASC lacks a structured partnership and associated process, which has created a gap in the sector's management of stakeholder relations and partnerships. The NASC manages Seed Connect, which provides a platform function. However, the Alliance for Seed Industry in West Africa (ASIWA) established a platform that is not functional. Consequently, the sector is characterized as inefficient and ineffective in delivering quality seed of new and improved varieties to farmers. Improved coordination is required to enhance sector governance, but also to increase alignment and communication among research organizations, seed companies and producers, agro-dealer networks, service providers and regulators.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Support and enhance the human capacity of the NASC at systems level, e.g. in taking up its coordinating role, according to its new five-year institutional strategic plan (2020-2024), including platform secretariat functions. 2. Establish a National Seed Sector Platform (or re-adjoin and transform previously established platforms) that brings together key seed sector stakeholders from government, civil society, knowledge institutes and industry; facilitate dialogue; clarify and consolidate roles and responsibilities; support collaboration; foster development and use of a digital information portal; enhance systems and value chain oriented human capacity required for such coordination and platform management; leverage the platform to introduce the Nigerian Seed Week which will include regional seed week seminars and the national Seed Connect Conference organized by the NASC; establish communication channels with industry stakeholders leveraging the NASC website and social media platforms; and convey seed industry insights, newsletters and annual reports of seed sector stakeholders including the NASC and SEEDAN. 3. Based on the NSRM and using a consultative process, develop detailed action plans with budgets on priority topics. 4. In accordance with NASC law and its strategic plan, support the National Seed Sector Platform to consolidate the capacities of institutions in governing the seed sector; provide inputs review amendments to seed policies and legislation; review and monitor their implementation; support the platform to provide inputs but not engage in decision-making. 5. Share new developments and successful innovations and explore their scaling.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • FMARD; NASC and NAQS • SEEDAN, seed companies and other seed entrepreneurs • NARIs, universities and CGIAR Centers

	<ul style="list-style-type: none"> • NGOs working in the seed sector; farmer organizations.
<i>Catalyst</i>	Consulting firm or NGO with experience in guiding multi-stakeholder partnerships for seed sector transformation in close collaboration with the NASC and SEEDAN.
<i>Policy reference</i>	The APP (2016-2020) highlights the lack of communication and coordination in the sector. The NASC strategic plan (2020-2024) provides guidance for the NASC in taking its strategic role in the governance and regulation of the seed sector of Nigeria.
<i>Proposed two-year horizon</i>	The National Seed Sector Platform has been established with a clear structure in which relevant stakeholders participate. Activities linked to the implementation of the NSRM and other developments are discussed, elaborated and monitored, contributing to seed sector transformation.
<i>Proposed five-year horizon</i>	The National Seed Sector Platform is operational; it owns the NSRM, reviews achievements, manages updates and develops new plans. The platform ensures alignment of stakeholders in their actions, reduces overlap of interventions, and increases efficiency and accountability. It contributes to sector governance, reviews and monitors management and implementation of regulations, while also providing inputs to required improvements and decision-making processes. The National Seed Sector Platform is sustainable in its governance and in funding its coordination and other activities.
<i>Illustrative examples</i>	<ul style="list-style-type: none"> • The regional seed sector core groups, as established and supported by ISSD Ethiopia, played a critical role for dialogue and contributed to addressing institutional seed sector challenges, e.g. liberalizing seed marketing, ensuring EGS supply, and promoting innovations in seed quality assurance systems; regionally based universities and a state-run seed company operated as catalyst (WUR, 2020c). • The National Seed Plan for Ghana provides an example of action planning with clear objectives and coordination in activities, envisaged results, budgets and role divisions for strategic areas in the development of the seed sector in Ghana (MOFA, 2015). • The Myanmar Seed Portal provides online seed information to stakeholders and supports its national seed platform (MOALI, 2020).

Seed information (SIP-CG2)

<i>Ambitions</i>	Increased availability and reliability of information on seed and seed business for all stakeholders (coordination and governance); enhanced access to and use by stakeholders of accurate industry and market information, which supports proper production planning (<i>production systems</i>), marketing and promotion of new varieties (<i>market development</i>), EGS forecasting and supply, seed quality assurance and financial services tailored to the seed sector (<i>service provision</i>); increased efficiency and effectiveness of the sector through the use of modern systems for seed information management and sharing (IMS) (<i>revenue generation & reinvestment</i>).
<i>Challenge</i>	The seed sector is constrained in its performance by a limited capacity to collect, manage and share data and other information on seed sector-related subjects such as logistics, manpower, resources and technology. If information is collected and standards are available, they only target major cereals and commercial and formal seed systems. The information available does not cover RTBs, legumes, small grains and vegetables, nor is it applicable to intermediary (CBSP and local entrepreneurs) and informal seed systems. Extension services, agro-dealers and farmers have difficulties in finding information on sources of seed and new varieties. They cannot easily access information, e.g. in a variety catalogue, on variety recommendations per location and agro-ecology, their product profiles and market attractiveness. Moreover, if available, information is often unreliable. This situation impacts, for example, on the effectiveness and efficiency in EGS production, forecasting and supply, as well as on seed quality assurance, production and marketing of quality seed, and access to finance.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Assess the current status and capacity among key stakeholders in data collection, information management and sharing (IMS); identify critical demands for specific types of information (e.g. seed availability and demand; EGS availability and demand; financial information); assess available and existing seed IMS systems. 2. Explore ways for strengthening IMS capacities (including human and technical capacity); design and setup collaborative IMS clusters (e.g. groups of organizations that collaborate in IMS for a specific crop or topic linked with the NASC's seed databank); develop seed demand forecasting systems within crop specific IMS clusters involving all stakeholders; conduct biennial national seed surveys to gather data on key trends in the seed sector, including seed demand and supply dynamics; develop one-stop service portals for the IMS clusters; develop ecosystems and business models for service provision within the IMS clusters, ensuring financial sustainability. 3. Enhance the human (technology and systems focused), technical and operational capacity among critical stakeholders (e.g. the NASC and SEEDAN) in information collection, record keeping, management and sharing; support the setup of IMS clusters. 4. Promote and advance the use of technology in IMS among stakeholders.

	5. Ensure that crops such as legumes, small grains, RTBs and vegetables have standards and are included in the IMS clusters.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • FMARD, NASC, NACGRAB, research organizations, universities and CGIAR Centers, National Bureau of Statistics (NBS) • SEEDAN, seed companies and producers, NGOs, farmer organizations • ICT companies.
<i>Catalyst</i>	Consulting firm with IMS expertise in partnership with the NASC, SEEDAN and a knowledge organization operating in the agricultural and seed sector.
<i>Policy reference</i>	The APP (2016-2020) indicated that information collection and evidence-based reporting in the agricultural sector is weak. The NASC strategic plan (2020-2024) aims to leverage technology and ensure financial sustainability of the seed databank and associated one-stop-shop for sharing seed information.
<i>Proposed two-year horizon</i>	NASC's seed databank and IMS clusters are operational, they contain evidence-based information or reliable data/information; stakeholders in two regions of the country have started to access information through dedicated portals; IMS clusters pilot ways to share information with stakeholders on a partial cost-recovery basis; seed stakeholders have formed IMS clusters through which they work together in IMS and which are not fully subsidized.
<i>Proposed five-year horizon</i>	At a national scale, stakeholders in the seed sector, e.g. seed companies and producers, research organizations, extension agents and farmers, but also policy makers, access and use information within the NASC's seed databank and the established IMS clusters. This information is evidence-based and reliable; they cover a wide diversity of crops and seed systems; the seed databank and IMS clusters have dedicated resources and users pay for accessing information; a significant share of budgets of the seed databank and IMS clusters is generated through cost-based information sharing.
<i>Illustrative examples</i>	<ul style="list-style-type: none"> • AVISA shares information on breeding programmes and seed systems for legumes and small grains with research organizations, seed companies and producers; its aim is to enable the private sector to seize opportunities on the commercialization of these crops (ICRISAT, 2020a). • In Myanmar, a seed demand forecasting system has been developed (MOALI, 2020); it recently gained recognition at the Asia Smart App Awards.

Seed trade association (SIP-CG3)

<i>Ambition</i>	Enhanced structure, functioning and governance of SEEDAN, ensuring coverage and representation of all agricultural zones, crops and business types (coordination & governance).
<i>Challenge</i>	National seed trade associations serve as coordinating bodies for domestic seed entrepreneurs, but also as entry points into the market for foreign seed companies. SEEDAN, the Seed Entrepreneurs Association of Nigeria, aims to: (i) serve as a seed industry forum for promoting sector growth by discussing common interests; (ii) develop operational ethics and guidelines; (iii) support policy formulation; and (iv) serve the seed industry as a reference and speaking point for communications with authorities, institutions, projects and NGOs. 314 seed companies and more than 140 producers are registered with the NASC; 72 seed companies are SEEDAN members. The association has a basic structure, but it has neither regional divisions, nor subgroups organized according to either commodities or different types of seed businesses (such as international and domestic seed companies, seed producers, associations of farmer seed producers, seed traders, agro-dealers). This structure results in a limited representation and capacity to address the demands of a diversity of seed entrepreneurs operating in the country, thereby restricting its legitimacy as a private sector representative. Current members mainly produce, trade and market seed of cereal and legume grain crops of largely public varieties, with limited interest in RTBs and vegetables. In order to become professional, SEEDAN should strengthen its representation to the outside world, enhance its governance and structure, and begin to provide services to its members. These are preconditions for attracting new paying members, strengthening its leadership position in promoting seed industry development, and also enforcing its institutional and financial sustainability.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Conduct a survey among a wide diversity of local, domestic and global seed entrepreneurs, including existing and potential members of SEEDAN, to explore needs and interests in relation to its structure and services. 2. Assess SEEDAN's current organizational structure and governance, identify its institutional strengths and weaknesses, and opportunities in relation to providing services to its members. 3. Support the development of a five-year strategy and two-year workplan to facilitate the further refinement of SEEDAN's organizational structure and governance, in relation to needs of different types of members and those in different regions of the country. 4. Support the development and implementation of modalities, including piloting specific services, facilitating general and specific subchapter activities in which members can meet each other, align needs and opportunities, and work together on topics of interest.

	5. Develop and implement activities for human and operational capacity strengthening of SEEDAN, as well as capacity development programmes targeting its members.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • SEEDAN • Seed entrepreneurs, including local, domestic and international seed companies, seed producers, other seed entrepreneurs and agro-dealers.
<i>Catalyst</i>	NGO or consulting firm with knowledge and expertise in supporting the development of national seed trade associations or other professional membership-based organizations, in partnership with the NASC, and a regional or other national seed trade associations.
<i>Policy reference</i>	The APP (2016-2020) aims to attract investors in the agricultural sector by supporting the development of a conducive business environment. The NASC's strategic plan (2020-2024), identifies the NASC as the key public convener of the seed sector and mentions the importance of SEEDAN's support in the development of the seed sector.
<i>Proposed five-year horizon</i>	Revised organizational structure with subchapters at geography, crop and/or type of business; two new services operational for members; 100 members, which include 5 international seed companies and at least 20 local seed entrepreneurs and/or seed traders; active participation in the African Seed Trade Association (AFSTA) and possibly the International Seed Federation (ISF); involvement in the regional efforts to harmonize seed movement.
<i>Proposed ten-year horizon</i>	SEEDAN recognized within Nigeria and beyond as a well-functioning seed trade association, with 90% of the seed entrepreneurs operating in Nigeria registered as members.
<i>Illustrative examples</i>	<ul style="list-style-type: none"> • SANSOR (2020) is a well-developed, internationally recognized and financially viable seed trade association providing a wide package of services its members. • The Seed Trade Association of Kenya (STAK, 2020) has gone through a process of institutional reform and strengthening over the past five years; it has become financially viable, and is active in advocacy, capacity building, comprehensive information sharing, and seed trade promotion.

Alignment of donor interventions (SIP-CG4)

<i>Ambition</i>	Increased coordination and alignment among donor and development organizations in the seed sector (coordination & governance).
<i>Challenge</i>	Donor and development organizations intervene both directly and indirectly in the seed sector. Direct efforts target systemic aspects of seed sector development; indirect efforts address particularly the demand, production, marketing and dissemination of quality seed for strengthening specific crop value chains in focus states, and/or support the development of agribusiness and private sectors. The Bill & Melinda Gates Foundation (BMGF) is supporting variety development for several crops through IITA, ICRISAT and other CGIAR Research Centers; these programmes often include a seed component. AGRA, with the support of USAID, is addressing EGS supply and is tackling the issue of counterfeit seed in the seed sector; it supports the introduction of plant variety protection (PVP). The Coalition for African Rice Development (CARD) with the support of JICA, is strengthening EGS and quality seed supply for improved rice varieties. The Netherlands is creating awareness and building capacity for PVP, as well as supporting the promotion of improved vegetable varieties. Private sector development projects (World Bank, USAID and GiZ) and value chain development projects (IFAD, World Bank, IsDB and GiZ) create a seed demand and support seed provision; in some cases, they support the production and marketing of quality seed of their target crops. Humanitarian and food security programmes operating especially in the north-eastern region of Nigeria disseminate seed of food security crops. Given agricultural development is high on the agenda of several development partners, they meet regularly in the Agricultural Development Donor Working Group (ADWG), which advises FMARD on agricultural issues. FMARD and donors recognize the group as of formal character. The interactions address high-level aspects, and respective projects and interventions; they do not address in-depth sectorial aspects required for coordination and alignment of their interventions, such as in the seed sector. Coordination and alignment among development partners would enhance the effectiveness, relevance and impact of the individual and collective efforts on the development of the seed sector, while also reducing the potential overlap or duplication of interventions.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Assess and map donor activities directly and indirectly impacting the seed sector within the framework of the NSRM. 2. Engage with the ADWG group to develop and operationalize a mechanism for coordination and alignment among development partners on seed sector issues, and to contribute to the NSRM; collaborate with FMARD, state ministries of agriculture and other relevant seed sector stakeholders in this effort. 3. Regularly monitor and document the impact of both individual and accumulated interventions contributing to NSRM implementation; share impact and lessons learned with the ADWG and primary

	seed sector stakeholders; and provide inputs for a continued alignment and scoping of modalities to achieve other ambitions.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • Development partners and donors in the ADWG • FMARD; state ministries of agriculture • Seed sector stakeholders (e.g. the NASC, SEEDAN, research organizations and CGIAR Centers).
<i>Catalyst</i>	Consulting firm or knowledge organization that provides supports as an executive secretariat to the ADWG; the catalyst is overseen in this function preferably by two ADWG members with a strong profile in the seed sector.
<i>Policy reference</i>	No references.
<i>Proposed two-year horizon</i>	Specific sessions of the ADWG address seed sector development in which the group seeks alignment and coordination of their interventions with the aim to contribute to the development of the seed sector.
<i>Illustrative examples</i>	In Myanmar, 60 key representatives of the public sector, private sector, and development partners, including donors, meet twice per year in a platform meeting to discuss key seed sector issues, and allow for discussions on collaboration and alignment of seed sector interventions (WUR, 2020a).

4.8 Regulation & management

Plant variety protection (SIP-RM1)

<i>Ambitions</i>	Adopted Plant Variety Protection Bill; operational UPOV-PVP system that supports the development of the seed sector (regulation & management ; <i>revenue generation & reinvestment</i>).
<i>Challenge</i>	Plant variety protection (PVP) gives breeders intellectual property rights over a new plant variety, with exclusive rights to commercialize seed and/or propagation material of the variety. PVP promotes the marketing of new varieties and allows breeders to earn back the considerable costs involved in the long process of variety development. A well-functioning PVP system encourages in-country breeding activities; it also attracts foreign companies to introduce high-quality improved varieties, knowing that others cannot easily reproduce and take advantage of their investments in variety development. Nigeria is in the process of passing the PVP Bill. Once passed, the country has to put considerable effort in the development and operationalization of a functional PVP system and work on an appropriate enforcement system. The NASC, breeders and seed companies give high priority to its operationalization. Sector-wide understanding and ownership is crucial for PVP to result in the availability of better varieties for farmers.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Lobby for approval of the Plant Variety Protection Bill. 2. Develop the PVP regulations; design the set-up of a practical, cost-effective, reliable and digitally serviced PVP system, from application to the granting of plant breeders' rights. 3. Support the implementation of the PVP system, including the establishment of a PVP office and facilities for testing for distinctiveness, uniformity and stability (DUS); engage in human and operational capacity development of staff of involved organizations. 4. Create awareness and ensure ownership in PVP with seed sector stakeholders at all levels; address relevant issues such as the benefits of PVP, and the link between PVP, the seed law and variety release modalities. 5. Create a specialized court on infringements of breeders' rights with specialized lawyers.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • NASC; research organizations for DUS testing • FMARD; Ministry of Justice; Ministry of Trade; National Assembly • Research/breeders, both public and private • Seed producers, both public and private • NGOs • Farmers • UPOV.
<i>Catalyst</i>	The NASC, with support from international organizations experienced in guiding the development and operationalization of a functional PVP system.
<i>Policy reference</i>	Reference documents are the Plant Variety Protection Bill, 2019; and the National Agricultural Seeds Council Act, 2019 (Part VIII, section 39).
<i>Proposed five-year horizon</i>	PVP Bill passed; PVP regulations approved; PVP office and DUS testing facilities established and operational; an increased number of varieties registered and protected by Plant Breeders' Rights.
<i>Proposed ten-year horizon</i>	Fully functional PVP system; a significant number of new varieties registered and protected by plant breeders' rights on a yearly basis; significantly increased entry of new plant varieties into the country;

	both public and private domestic breeders protect their varieties; both public organizations and companies gain financial resources for their investments in variety development.
<i>Illustrative examples</i>	<ul style="list-style-type: none"> • Since implementing PVP, Kenya has seen a very positive impact especially on investment in the cut-flower industry (Kimani, 2018). • Vietnam has developed its PVP system (2000-2006) and became a member of UPOV in 2006; PVP has contributed tremendously to the development of the seed industry; an increased number of improved varieties of both food and commercial crops have become available for farmers (Minh, 2019). • Naktuinbouw (Netherlands) has developed a PVP Toolbox, which is used to raise awareness and support the operationalization of PVP in Nigeria and other countries; Naktuinbouw has been engaging with a high-level delegation from Nigeria to explore and guide future steps for PVP implementation in Nigeria.

Variety release (SIP-RM2)

<i>Ambitions</i>	Increased efficiency and transparency in variety release procedures with a more realistic cost-benefit ratio (regulation & management ; <i>service provision</i> ; <i>revenue generation & reinvestment</i>); enforced ECOWAS harmonization on variety release that supports private sector investment (<i>regulation & management</i>).
<i>Challenge</i>	To ensure that only high-performing and well-adapted varieties enter the seed market, a newly developed variety needs to be officially registered and released. This process involves mandatory on-station testing for DUS, multi-location trials for testing their value for cultivation and use (VCU), and multi-location on-farm trials. Based on the results, the National Crop Varieties Livestock Breeds Registration and Release Committee (NCVLBRRC) approves or rejects registration and release of the new variety. The committee should meet twice a year, but due to budgetary constraints and limited applications, it meets just once a year. On average, the process takes 43 months, with costs of the variety trials between US\$2,000 and US\$27,000 (TASAI, 2019). Nigeria does not yet enforce the seed policy provisions of ECOWAS on variety release, which, for example, exempt specific vegetables from trials for testing for value for cultivation and use (VCU). Since the numbers of new varieties as well as turnover of varieties for crops like vegetables are high, foreign companies find the required efforts for variety release to exceed the benefits. They limit the applications for variety release, which results in farmers' limited access to better and market demanded varieties.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Assess the efficiency, transparency and cost-effectiveness of the current system of variety registration and release as compared to other countries and to ECOWAS seed regulations; elaborate and propose a strategy for strengthening and/or simplifying the variety release system, considering an exemption for specific crops (vegetables) and support for third-party variety testing. 2. Support enforcement of the ECOWAS seed regulations; support access to regional markets for Nigerian companies and encourage introduction of new varieties of international companies into Nigeria. 3. Strengthen the infrastructural and human resource capacities of NARIs with crop mandates for variety trial implementation. 4. Ensure easy access to an updated national variety catalogue which also allows farmers to select varieties matching their agro-ecology, farming systems and market demands (through the seed tracker). 5. With the PVP system in place, develop a system in which VCU and DUS testing is combined in one application for both variety release and PVP.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • NCVLBRRC, NACGRAB, NASC • NARIs with mandates for specific crops.
<i>Catalyst</i>	Organization/consultancy firm with experience in the assessment and reform of seed regulations and in the facilitation of institutional development.
<i>Policy reference</i>	The NASC strategic plan (2020-2024) highlights the NASC's task of promoting variety registration and release. The NASC Act (2019) indicates that the NCVLBRRC sets the general rules for variety registration and release, which are further elaborated in the guidelines for registration and release of new crop varieties in Nigeria. NACGRAB publishes the crop variety catalogue (NACGRAB, 2020).
<i>Proposed two-year horizon</i>	Based on an assessment, the opportunities for modernizing and simplifying the variety release system are acknowledged among policy makers and stakeholders involved, and a strategy for such a reform is approved; insights into the benefits of enforcing ECOWAS regulations are available and shared; a decision on its enforcement is made.
<i>Proposed five-year horizon</i>	The procedures and structure for variety release are fast, affordable and transparent; global and domestic companies no longer consider variety release an obstacle for the introduction of new varieties into the country. Research organizations have the capacity to conduct the required trials in a cost-effective and transparent manner.

<i>Illustrative examples</i>	The Common Market for Eastern and Southern Africa (COMESA) (Syngenta Foundation, 2019) and the East African Community (EAC) (EuropeanSeed, 2018) have been instrumental in the harmonization and modernization of variety release among its member countries, thereby promoting the registration of new varieties, allowing their entrance into the seed market.
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Seed import (SIP-RM3)

<i>Ambition</i>	Increased efficiency, predictability and transparency of seed import procedures and conditions at ports and borders, supported by a one-stop digital portal, that enables seed business development (regulation & management; service provision); zero-import tariffs applied to seed of selected crops, similar to other agricultural inputs (<i>revenue generation & reinvestment</i>).
<i>Challenge</i>	Due to the weak alignment in procedures of the NASC, NAQS and Nigeria Customs Services, seed importation is inefficient. Consequently, the import of quality seed of maize hybrids and vegetables by both domestic and international seed companies in Nigeria is difficult. Because of its bulky nature and fragility, seed potato imports are even more affected. Corruption at ports and borders further aggravates this situation. The outcome is that seed companies that depend on the importation of seed and planting materials, such as those active in vegetable seed and seed potatoes, are constrained in their business. This challenge creates a barrier for foreign seed companies to start bringing their seed and varieties to the Nigerian market; it also jeopardizes domestic companies depending on importation (e.g. vegetables). Another challenge is that the zero-import tariffs for agricultural inputs similar to fertilizer and crop protection products are not applicable to seed. This further impacts on business, the seed price and thus seed affordability for and use by farmers.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Assess the impact of the current constraints for seed imports (lack of alignment among agencies, corruption and absence of zero-import tariffs) on the development of the seed industry, crop value chains and farmers, particularly relevant to the importation of quality seed of maize hybrids, vegetables and potatoes; assess and compare differences in prices for imported seed in Nigeria with comparable countries in West Africa. 2. Identify opportunities to address the constraints through ensuring better coordination among public bodies; through intervention from FMARD and FMoF, establish a strong inter-agency collaboration between NASC, NAQS and Nigeria Customs, to harmonize the seed import policy, and enhance efficiency, predictability and transparency. 3. Assess the feasibility and, if positive, support the development of a one-window seed import portal. 4. Engage in advocacy and raise awareness among policy makers and regulatory agencies on the required changes. 5. Design scenarios and elaborate options to apply zero tariffs to seed; engage in advocacy and awareness raising among policy makers, and financial and regulatory agencies; contribute to its effectuation and support its implementation.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • FMARD, FMoF, Nigeria Customs Services, NASC, NAQS • ICT company (portal development) • SEEDAN • Domestic and international seed companies • International regulatory and standards organizations.
<i>Catalyst</i>	Consulting firm with a profile in the seed sector, regulations and IT solutions.
<i>Policy reference</i>	The NASC strategy (2020-2024) outlines that the NASC engages with FMARD to facilitate a cordial inter-agency collaboration between the NASC and NAQS on seed import; it aims to digitalize and increase efficiency and accountability of importation procedures. The NASC Act (2019) regulates the import of seed; it refers to variety registration and release, and seed quality aspects.
<i>Proposed five-year horizon</i>	The one-window seed import portal is operational, companies use it and transaction costs are reduced; efficiency and accountability of seed import at ports and borders has increased. Combined with zero tariffs on seed, this results in a significant increase in imported seed of improved varieties of a wide portfolio of crops, including hybrid maize, vegetables and potato, thereby fostering the development of these value chains.
<i>Illustrative examples</i>	<ul style="list-style-type: none"> • The Indian government has launched a specific seed import and export portal (GOI, 2020). • The Government of Myanmar (MOALI, 2020) has recently launched a seed portal bringing together all information relating to seed sector regulation, including options for on-line application for seed business related permits; a digital seed platform includes a one-stop-shop that can be used by seed companies for electronic applications for all seed regulatory services (including variety registration, business licensing and seed import).

- The ABCs of Seed Importation into Canada is an example of a seed portal that provides importers with an overview of the import process, information on importation documents, answers to frequently asked questions along with information regarding other legislation that may also apply ([CFIA, 2020](#)).

Seed export (SIP-RM4)

<i>Ambition</i>	Membership of the NASC with international bodies like UPOV and the OECD Seed Scheme, established and consolidated, thereby supporting seed export; one-stop portal established for seed export (regulation & management).
<i>Challenge</i>	Despite the significance of their domestic market, national seed companies are constrained in their access to the international markets for the export of seed. The reason is that the NASC is not yet a full member of UPOV and is at the application stage of its membership with the OECD Seed Scheme.
<i>Strategic innovation pathway</i>	<ol style="list-style-type: none"> 1. Explore the requirements and implications for the NASC to advance its membership of UPOV and the OECD Seed Scheme and other international regulatory agencies. 2. Engage in advocacy and raise awareness among policy makers and regulatory agencies on the required changes and facilitate the membership process. 3. Assess the feasibility and, if positive, support the development of a one-window seed export portal.
<i>Stakeholders</i>	<ul style="list-style-type: none"> • FMARD, NASC, Nigeria Customs Service, NAQS, Nigeria Export Promotion Council (NEPC) • UPOV, OECD Seed Scheme, ISTA.
<i>Catalyst</i>	Consulting firm with a strong profile on seed regulatory issues, including knowledge on UPOV and OECD Seed Scheme membership processes; for the portal, collaboration with an ICT company.
<i>Policy reference</i>	The NASC strategy (2020-2024) indicates that the NASC will ensure its laboratories are ISTA accredited, will secure membership with UPOV, and will take part in the OECD Seed Scheme.
<i>Proposed five-year horizon</i>	Nigeria, through the NASC, is a member of UPOV and the OECD Seed Scheme, which enables Nigerian seed companies to operate in the regional market, enhancing their profitability.
<i>Illustrative examples</i>	The French Interprofessional Organisation for Seeds and Plants (GNIS - the French STA) supports various West African countries in the process of applying for membership of the OECD Seed Scheme.

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Wageningen Centre for Development Innovation supports value creation by strengthening capacities for sustainable development. As the international expertise and capacity building institute of Wageningen University & Research we bring knowledge into action, with the aim to explore the potential of nature to improve the quality of life. With approximately 30 locations, 5,000 members of staff and 12,000 students, Wageningen University & Research is a world leader in its domain. An integral way of working, and cooperation between the exact sciences and the technological and social disciplines are key to its approach.

