



Ministry of Foreign Affairs

*Insight into agricultural education in Nigeria:
a scoping study to identify potential areas of NL support*

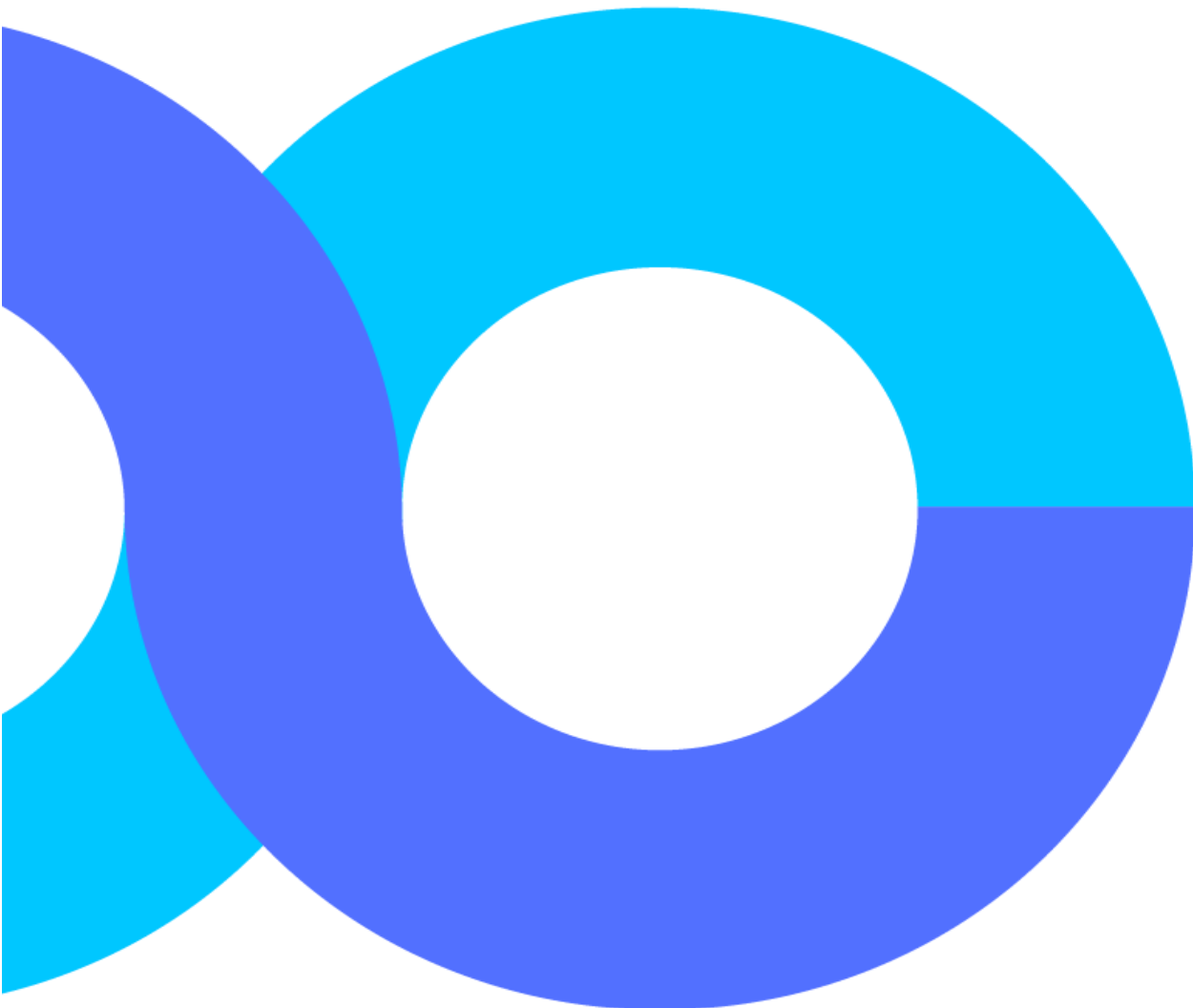
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Insight into agricultural education in Nigeria:

a scoping study to identify
potential areas of NL support

by Richard Hawkins and Olajide Sobukola



June 2020

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Of course, any factual errors, as well as responsibility for all opinions in this report, remain with the authors.

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Acronyms

2SCALE	Toward Sustainable Agribusiness Clusters through Learning in Entrepreneurship (Netherlands-funded, Africa-wide Project)
ABCOA	Audu Bako College of Agriculture, Dambatta
ABP	Anchor Borrowers Programme
ABU	Ahmadu Bello University
ACDI-VOCA	Global Development NGO
ADP	Agricultural Development Programme (State Level)
AET	Agricultural Education and Training
AFC	Agriculture and Finance Consultants
AFSTA	Africa Seed Trade Association
AGRA	Alliance for a Green Revolution in Africa
AGSMEIS	Agri-Business Small, and Medium Enterprises Investment Scheme
AKIS	Agricultural Knowledge and Innovation System
AMEA	Agribusiness Market Ecosystem Alliance
ANBC	Advanced National Business Certificate
ANTC	Advanced National Technical Certificate
APPEALS	Agro-Processing, Productivity Enhancement and Livelihood Improvement Support Project
ARCN	Agricultural Research Council of Nigeria
ARI	Agricultural Research Institute
ARMTI	Agricultural and Rural Management Training Institute
ASTI	Agricultural Science and Technology Indicators
ATA	Agricultural Transformation Agenda
AVBC	Africa Vegetable Breeding Consortium
B. Agric	Bachelor of Agriculture (degree)
BEC	Basic Education Certificate
BMAS	Benchmark Minimum Academic Standards
BMGF	Bill and Melinda Gates Foundation
BUK	Bayero University, Kano
CAADP	Comprehensive Africa Agriculture Development Programme
CBA	Community-Based Advisory Services
CBET	Competency-Based Education and Training
CBO	Community Based Organization
CEADESE	Centre of Excellence in Agricultural Development and Sustainable Environment, FUNAAB
COLEACP	Liaison Committee Europe-Africa-Caribbean-Pacific (Non-profit Association of Companies and Experts in fruit and vegetable trade)
DAC	Division of Agricultural Colleges, Kaduna (also now Kano)
DFID	Department for International Development (UK)

DLEC	Developing Local Extension Capacity Project
EAS	Extension and Advisory Services
EKN	Embassy of the Kingdom of the Netherlands
FAO	Food and Agriculture Organization of the United Nations
FARA	Forum for Agricultural Research in Africa
FBS	Farmer Business Schools
FCA	Federal College of Agriculture
FCAPT	Federal College of Agricultural Produce Technology
FCFM	Federal College of Forestry Management
FCH	Federal College of Horticulture
FDAE	Federal Department of Agricultural Extension
FEPSAN	Fertilizer Suppliers Association of Nigeria
FFVDAN	Fresh Fruit and Vegetables Dealers Association of Nigeria
FGN	Federal Government of Nigeria
FMARD	Federal Ministry of Agriculture & Rural Development
FRIN	Forestry Research Institute of Nigeria
FTE	Full Time Equivalent
FUAM	Federal University of Agriculture Makurdi
FUNAAB	Federal University of Agriculture Abeokuta
FUTMIN	Federal University of Technology, Minna
GAP	Good Agricultural Practices
GBP	Great Britain Pounds
GDP	Gross Domestic Product
GEMS4	Growth and Employment in States Project
GESS	Growth Enhancement Support Scheme
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Development Agency)
GHP	Good Handling Practices
HBO	Hoger beroepsonderwijs (Higher Vocational Education, the Netherlands)
HE	Higher Education
HEI	Higher Education Institute
HND	Higher National Diploma
HORTSON	Horticultural Society of Nigeria
IAR	Institute of Agricultural Research
IFAD	International Fund for Agricultural Development
ICT	Information and Communications Technology
IEI	Innovation Enterprise Institute
IFDC	International Fertilizer Development Corporation
IFPRI	International Food Policy Research Institute
IITA	International Institute for Tropical Agriculture
ILRI	International Livestock Research Institute

ITF	Industrial Training Fund
KADA	Kaduna State Agricultural Development Agency
KIHORT	Kano Institute of Horticulture
KNARDA	Kano Agricultural and Rural Development Authority
KUST	Kano University of Science and Technology
LINKS	Powering Economic Growth in Northern Nigeria Project (UK funded)
LGA	Local Government Authority
MBO	Middelbaar Beroepsonderwijs (Mid-level technical education, the Netherlands)
MinBuZa	Ministry of Foreign Affairs (The Netherlands)
MinLNV	Ministry of Agriculture, Nature and Food Quality (The Netherlands)
MOUUAU	Michael Okpara University of Agriculture, Umudike
MSc	Master of Science (degree)
NABTEB	National Business and Technical Examinations Board
NAERLS	National Agricultural Extension Research and Liaison Services
NACGRAB	National Centre for Genetic Resources and Biotechnology
NASC	National Agricultural Seeds Council
NAQS	Nigeria Agricultural Quarantine Service
NBC	National Business Certificate
NBTE	National Board for Technical Education
NCVLBBRC	National Crop Varieties and Livestock Breeds Registration and Release Committee
NECO	National Examinations Council
NEPAD	New Partnership for Africa's Development
ND	National Diploma (previously also called Ordinary National Diploma)
NGO	Non-governmental Organization
NiCOP	Nigerian Competitiveness Project
NIHORT	National Horticultural Research Institute
NIRSAL	Nigeria Incentive-Based Risk Sharing System for Agricultural Lending
NITDA	National Information Technology Development Agency
NPE	National Policy on Education
NSPRI	Nigerian Stored Products Research Institute
NSQF	National Skills Qualification Framework
NTC	National Technical Certificate
NUC	National Universities Commission
OIP	Open Innovation Platform
OKP	Orange Knowledge Programme (of Nuffic, NL)
PLAN	Plan International (Humanitarian and Development Agency)
Plantum	Dutch Seed Industry Association
PhD	Doctor of Philosophy (degree)
REFILS	Research Extension Farmer Input Linkage System
RVO	Netherlands Enterprise Agency
S4C	Seeds for Change Project

SAFE	Sasakawa Africa Fund for Extension Education
SCA	Samaru College of Agriculture (part of DAC, Kaduna)
SDGP	Sustainable Development Goals Programme (The Netherlands)
SEEDAN	Seed Entrepreneurs Association of Nigeria
SeedNL	Partnership between MinBuZa, MinLNV and Plantum
SG2000	Sasakawa Global 2000
SIWES	Students Industrial Work Experience Scheme
SME	Small and Medium Enterprise
SNV	(Dutch Development Organization)
TAP	Tropical Agriculture Platform
TETFund	Tertiary Education Trust Fund
TMT	Tailor Made Training
TOGAN	Tomato Growers Association of Nigeria
T&V	Training and Visit
TVET	Technical Vocational Education and Training
USD	United States Dollars
UTME	Unified Tertiary Matriculation Examination
VEI	Vocational Enterprise Institution
WAEC	West African Examinations Council
WASSC	West African Senior School Certificate
WOFAN	Women Farmers Advancement Network
WUR	Wageningen University & Research
WVC	World Vegetable Centre

Executive Summary

Context

Nigeria is a new focus country for Netherlands Ministry of Foreign Affairs and the Dutch Ministry of Agriculture, Nature and Food Quality (MinLNV). In 2018, the Netherlands Embassy in Nigeria (EKN) signed a Memorandum of Understanding with the Nigerian government in which agricultural development is a central theme.

The horticulture sector has been identified as one of the focus sectors in the Multi Annual Country Strategy of the Netherlands government in Nigeria, contributing to the Sustainable Development Goals. A number of recent Dutch studies have focused on the Nigerian food system, the seed sector, the vegetable and potato sectors, and projects have been initiated or are planned to support the development of the vegetable sector, with particular focus on Northern Nigeria (especially Kano and Kaduna states).

This current study on Agricultural Education in Nigeria was commissioned by the Netherlands Enterprise Agency (RVO), to provide EKN with a more solid basis for the development of future interventions and institutional collaboration in the field of agricultural education in northern Nigeria (with focus on Kano and Kaduna states), including potential educational support projects under the Orange Knowledge Programme. The outputs of the study therefore include an overview of the Nigerian education system (chapter 2), an overview of the Nigerian “agricultural innovation system”, with specific focus on horticulture and Kano and Kaduna States (chapter 3), an overview of current horticulture skills development in Northern Nigeria (Kano and Kaduna States including both the “formal” and “informal” sectors, and curricula development assessment procedures (chapter 4); and and recommendations for potential areas of intervention by Dutch development programmes (chapter 5).

Information for this report was collected through desk study, questionnaires administered virtually to key agricultural universities and colleges, as well as informal interviews with both HEIs and development agencies in Abuja, Abeokuta, Ibadan, Lagos and mainly in Kano and Kaduna.

The Nigerian Agricultural Innovation System

The Nigerian Agricultural Knowledge and Innovation System (AKIS) is changing rapidly, especially in the provision of skills training and extension activities by a variety of private and NGO actors, often in collaboration with public sector organizations at both Federal and state levels. About half of the estimated 3,000 FTE agricultural researchers are located in the 15 Agricultural Research Institutes (ARIs) under the Agricultural Research Council of Nigeria (ARCN), and half in the 70 or so Federal and State Universities with programmes in agriculture. These include the 4 Federal universities of agriculture, of which only FUNAAB has a separate Department of Horticulture.

At a more vocational educational level, 18 Federal Colleges of Agriculture, 11 of which are linked to the ARIs, and 20 State Colleges of Agriculture offer ND and HND programmes in a range of agricultural subjects including (but not always) Horticulture and Landscape Technology (ND). About 3 Innovation Enterprise Institutes (IEIs) and 4 Vocational Enterprise Institutions offer vocational certificates in Agriculture (including the Leventis Foundation, which has colleges in Kano and Kaduna States as well as 3 other locations in Nigeria). In common with other African countries, Nigeria is beginning to introduce more competency-based education and training under a National Skills Qualifications Framework.

In both Kaduna and now in Kano, many – but not all - colleges of agriculture now come under the administration of Ahmadu Bello and Kano University of Science and technology, respectively, as “Division of Agricultural Colleges” (DAC), assuring close coordination between these universities and

colleges. The linkages between research and extension, and between research and higher education and extension are promoted by the National Agricultural Extension Research & Liaison Services (NAERLS), although funding limits the effectiveness of the regular meetings which go to make up the Research-Extension-Farmer Linkage System (REFILS) established some time ago. The linkages between the public and private actors in the Nigerian AKIS are weaker, due in part to the under-developed and relatively unstructured private sector in agriculture. There are relatively few private sector research organizations, including 4 seed companies which are reported to carry out plant breeding activities in Nigeria.

Much of the “informal” training or farmer extension is carried out by the State Agricultural Development Programmes (ADPs), including the Kano Agriculture and Rural Development Authority (KNARDA) and Kaduna State Agricultural Development Agency (KADA), although again these are relatively underfunded to provide adequate services to farmers. Agencies such as Sasakawa Global 2000, Technoserve support these ADP programmes in particular areas of interest. New projects financed by the World Bank (APPEALS) and DFID (LINKS) should further assist these ADPS.

Funding agricultural development in Nigeria, and agricultural research in particular, remains low compared to other countries within Africa, and compared to internationally agreed targets set by e.g. the Comprehensive Africa Agricultural Development Programme (CAADP). Access to those funds that do exist, inconsistent policies on import duties, credits and loans as well as the lack of enforcement of existing regulations all limit agricultural development.

Opportunities for Dutch Support

Opportunities for Dutch support to Agricultural Education in Nigeria, with particular focus on horticulture skills development in Kano and Kaduna states, include:

1. Strengthen the capacity of staff in key organizations such as NAERLS and the ARCN to develop a new vision and implement structural reform of education, advisory services and innovation systems, in line with broader national and international efforts to reform extension and advisory services and the overall Nigerian AKIS;
2. Support the further development and introduction of Competency-Based Education and Training (CBET) in ND and HND programmes, in collaboration with NBTE and selected colleges and HORTSON as well as the 4 seed companies which are reported to carry out plant breeding activities in Nigeria, thus encouraging industry actors and HEIs to interact more to certify and accredit practical education and professional recognition by the private sector;
3. Support the establishment of new Horticultural Departments in Ahmadu Bello University (ABU) and potentially Landmark University, as well as strengthen the existing Federal College of Horticulture at Dadin Kowa, and the Horticultural Department at the Federal University of Agriculture Abeokuta;
4. Strengthen the capacity of existing research such as the National Horticultural Research Institute (NIHORT), to develop vegetable crops in partnership with the private sector, implement regulation of the vegetable seed sector and establish a functioning plant variety protection regime in line with the UPOV Convention, as well as support the new professional organizations such as Horticultural Society of Nigeria (HORTSON) to better recognize and incentivize professional development in the horticultural sector;
5. Expand on the development and introduction of blended learning platforms and programmes in horticulture, building on the current pilot programme of blended learning, being supported by the Seeds4Change Project;

6. Support student practical plots at relevant universities, colleges and link these to farmer field schools managed by students in the practical year (universities), or as part of ND and HND programmes;
7. Support practical internships (SIWES), involving students from universities and colleges participating as interns (with small stipends) on Dutch supported projects such as HortInclude, with activities by Dutch funded projects to systematize the learning element and assessment of the learning during these internships;
8. Support “incubation programs” similar to that of the IITA Business Incubation Platform and the Technology Incubation Centre Kano (under the National Board for Technology Incubation), thus strengthening agripreneurship within HIs, making agriculture more attractive to youth, and strengthening the link between research and entrepreneurship.
9. Strengthen farmer group organization and management, e.g. with the Federal Cooperative College in Kaduna, and with Agriterra or members of the AMEA network in the Netherlands, thus making providing a framework for the productive sector to interact with agricultural HE;
10. Provide specific and targeted short training programmes, by Dutch green HEIs in collaboration with Nigerian organizations in topics such as: AKIS concepts and approaches, curricula development processes; competency-based education and training concepts, development, delivery and assessment; farmer group/cooperative development and strengthening other specific themes including: good agricultural practices in vegetable production; post-harvest practice and processing; breeding and seed development; value chain concepts and facilitation; agribusiness skills; “soft” or “functional” skills.

Relevant Nigerian organizations identified during the study that could particularly benefit from such interventions and support Dutch development goals in Nigeria include:

- the Federal University with Horticulture Dept. (FUNAAB); the private Landmark University of Agriculture; and the Federal College of Horticulture at Dadin Kowa (at national level);
- Bayero University; Kano State University of Science and Technology at Wudil; the Federal College of Agric. Produce Technology; and Audu Bako College Agriculture at Dambatta (in Kano State);
- Ahmadu Bello University and Division of Agricultural Colleges; the Federal College of Forestry Mechanization; and the Federal Cooperative College (Kaduna State);
- the 2 Leventis Foundation Colleges in Kano and Kaduna states.

Context and Objectives

Nigeria and Nigerian agriculture

The population of Nigeria is currently estimated to be just over 200 million and growing at about 2.6% annually. This population represents about one 7th of Africa's total, and Nigeria is the 7th largest country by population globally. Just over half of the population is urban, and the median age of Nigerians is 18 years¹. With more than 250 different ethnic nationalities, the country consists of 36 states and the Federal Capital Territory, and 744 local governments.

Nigeria is Africa's biggest economy. GDP per capita is estimated at USD 2,400, and annual GDP growth rate is estimated to be about 2% annually, and driven mainly by services, especially telecoms. About half the labour force is unemployed or underemployed. The country is ranked 152 out of 157 countries in the World Bank's Human Capital Index. As the economy is growing more slowly than the population, living standards are expected to worsen^{2,3}.

As Africa's biggest oil exporter and reserves of natural gas, investment in agriculture has been relatively neglected. Productivity is generally low, post-harvest losses are high, and food production has not matched population growth, with rising food imports. Agricultural GDP is about 25% of total GDP, even though it is the largest sector of the economy and employs two-thirds of the national labour force. Public expenditure in agriculture was around 3% of total public expenditure in 2017, considerably less than the CAADP target of 10%, intended to boost agricultural growth to 6% per annum, endorsed in the Maputo and Malabo declarations of 2003 and 2014, respectively. The Agricultural Orientation Index which reflects agriculture's share of spending relative to agriculture's share of the economy, is about 0.15 for Nigeria, showing that agriculture is relatively neglected in terms of public investment^{4,5}.

It is also argued that the agricultural spending that does occur emphasises the provision of tractors to large-scale, wealthier farmers, at the expense of increasing access to cheaper and more appropriate labour-saving technologies for the prevalent small-farm sector⁶. According to FAO women account for 60-79% of the agricultural labour force in Nigeria, but their possibilities in agriculture are hindered by formal and traditional rules. Women are mostly involved in food crop production (rather than export crops), typically involved in farm-level processing (but less in established processing companies), less in transporting and wholesale marketing, but more active in retail markets. Land ownership is dominated by men although variable: it is reported that in some states such as Kano religion apportions 50% of men's inheritance to women. Gender inequalities also hinder women's access to training and inputs, although this is improving where there are externally funded development projects (FAO)⁷.

¹ www.worldometers.info

² <https://tradingeconomics.com/nigeria/gdp-from-agriculture>

³ [The World Bank In Nigeria \(https://www.worldbank.org/en/country/nigeria/overview\)](https://www.worldbank.org/en/country/nigeria/overview)

⁴ Goyal, Aparajita, and John Nash, 2017. [*Reaping Richer Returns: Public Spending Priorities for African Agriculture Productivity Growth*](#). Africa Development Forum series. Washington, DC: World Bank.

⁵ [*Regional Strategic Analysis and Knowledge Support System \(ReSAKSS\)*](#), IFPRI.

⁶ ActionAid, 2013. [*Fair shares: is CAADP working?*](#) May 2013.

⁷ FAO and ECOWAS Commission, 2018. [*National Gender Profile of Agriculture and Rural Livelihoods – Nigeria*](#). Country Gender Assessment Series, Abuja

Netherlands support to Nigeria Agricultural Development

Given its size and economic potential, Nigeria is a new focus country for the Netherlands Ministry of Foreign Affairs (MinBuza; International Enterprise Department and Sustainable Economic Development) and the Dutch Ministry of Agriculture, Nature and Food Quality (MinLNV). In 2018, the Netherlands Embassy in Nigeria (EKN) signed a Memorandum of Understanding with the Nigerian government in which agricultural development is a central theme.

The horticulture sector has been identified as one of the focus sectors in the Multi Annual Country Strategy of the Netherlands government in Nigeria, contributing to the Sustainable Development Goals. Already implemented and foreseen actions within this sector include:

- The [Horticulture Sector Study Nigeria](#)⁸, prepared by Taste for ALTS Consulting, in 2015.
- A study on [“Enhancing the Food Systems in Nigeria: Scope and Perspective for Dutch policy interventions”](#)⁹ by Wageningen University Research (WUR) and the Royal Tropical Institute (KIT), which provided an overview of the Nigerian agri-food system and recommended that the Netherlands focus its trade and investment strategy on a limited number of agricultural sectors.
- A review of the Seed Sector in Nigeria, involving SeedNL (Dutch Partnership led by the Seed Association Plantum), managed by CDI-WUR with input from Nigerian partners (National Agricultural Seeds Council, NASC, and the Seed Entrepreneurs Association of Nigeria (SEEDAN)); resulting in a [National Seed Road Map for Nigeria](#).
- The study “Potato Sector Assessment” (implemented by KIT), resulting in a potato sector development plan (focused on the Jos Plateau).
- A study of [“The vegetable and potato sector in Nigeria: an overview of the present status”](#) by Wageningen Economic Research (with input from KIT, WCDI, SNV)¹⁰.
- The [“Seeds for Change \(S4C\) Project](#), coordinated and implemented by NABC and 6 Dutch companies, Bayero University in Kano, and WUR, and partly funded by the Dutch government. S4C aims for the development of the vegetable sector in Kano by the provision of high- quality vegetable seeds and biological crop protection combined with training of farmers on how to cultivate vegetables with improved inputs.
- The “Transforming Nigeria’s Vegetable Markets” Project, with EUR 2.06m of finance via the RVO SDG Partnership Facility (SDGP), which aims to increase productivity of the domestic vegetable sector by disseminating knowledge and introducing new varieties in rural Nigeria (Kano and Kaduna States). Partners in the Project include East-West Seed, Ahmadu Bello University, FMARD and WUR.
- The [2SCALE project](#), managed by IFDC, SNV and BoP Innovation Center, currently active in 8 African countries, supporting 6 value chain partnerships in Nigeria, including onion in Sokoto.

⁸ van der Waal, 2015. [Horticultural Sector Study for Nigeria](#). Taste, Barendrecht, Netherlands.

⁹ Posthumus, H., Dengerink, J., Dhamankar, M., Plaisier, C., & Baltissen, G., 2018. [Enhancing food systems in Nigeria: Scope and perspective for Dutch policy interventions](#). Wageningen: Wageningen University & Research.

¹⁰ Plaisier, C., Dijkxhoorn, Y., van Rijn, F., Bonnand, J., & Talabi, O., 2019. [The vegetable and potato sector in Nigeria: an overview of the present status](#). Wageningen Economic Research report; No. 2019-119). Wageningen: Wageningen Economic Research

- The HortInclude project, currently (at the time of writing) in preparation, which is expected to be four-year integrated program on vegetable, potato and seed sector development, concentrating in first instance on Kaduna, Kano, and Plateau States, and implemented by a consortium including SNV, IFDC, WUR, and Agriterria.
- A proposed “Tailor-Made Training Plus” (TMT+) project, under the Orange Knowledge Programme (OKP) of the Netherlands Organization for Internationalization in Education (Nuffic), with open call expected in the 2ndQ of 2020.

Objectives of this study

The study was commissioned by the Netherlands Enterprise Agency (RVO), with Terms of Reference as given in Appendix 1, and later modified in the agreed Workplan (Appendix 2).

The purpose of this study is to provide EKN Nigeria, including interests of both the Ministry of Foreign Affairs (MinBuza) and the Ministry of Agriculture, Nature and Food Quality (MinLNV), the basis for the development of future interventions and institutional collaboration in the field of agricultural education in northern Nigeria (with focus on Kano and Kaduna states).

The output of the study includes:

- An overview of the Nigerian education system (chapter 2)
- An overview of the Nigerian “agricultural innovation system”, with specific focus on horticulture and Kano and Kaduna States, and on education and skills development offered by government, non-government (incl. private) entities (chapter 3);
- An overview of current horticulture skills development in Northern Nigeria (Kano and Kaduna States including both the “formal” and “informal” sectors, and curricula development assessment procedures (chapter 4);
- Conclusions regarding horticultural skills development and recommendations for
 - Key elements, strengths and weaknesses of the Nigerian Agricultural Knowledge and Innovation System
 - Opportunities for strengthening horticultural skills development in Nigeria, with focus on Kano and Kaduna States (Chapter 5).

Methodological Approach

The study was conducted in 5 phases, during November 2019-March 2020:

1. Inception Phase, including:
 - Initial “kick-off” meeting with key study stakeholders (RVO, EKNL Nigeria, MinLNV, Nuffic) to refine expected outcomes and outputs;
 - Initial contacts with related actors (e.g. SNV, WUR, IFDC, SeedNL, S4C, EKN Nigeria, COLEACP) to identify relevant development programmes/projects and private sector players for in-depth interviews in stage 3.
2. Desk Study Phase, including:
 - Literature review of Nigerian education system and higher education institutes, and internet search to identify Universities and TVET institutes that offer horticultural programmes in Nigeria (nationally), with focus on Kano/Kaduna states;
 - Literature review of the Nigerian “horticultural innovation system”

3. Stakeholder Survey, including
 - A questionnaire sent to universities and colleges with significant horticultural programmes at national level, and agricultural universities and colleges in Kano/Kaduna.
 - Semi-structured interviews with educational institutes (agricultural colleges, polytechnics and universities), and key development actors in the horticultural sector in Kano and Kaduna states (see Appendix 3 for persons contacted).
4. Validation Meetings, with
 - Selected local stakeholders in Kano (March 9, 2020)
 - Selected local stakeholders in Zaria, Kaduna (March 11, 2020)
 - MinBuza and MinLNV representatives, Lagos (March 13, 2020)
5. Report writing
 - Continuous drafting throughout study.
 - Final report.

Additional details of these activities are given in the detailed work plan in Appendix 2.

The Education System in Nigeria

Overview of the Nigerian education system

The education system in Nigeria, as compared to the Dutch system, has been described by Nuffic (version 6, May 2017), from which the following figure and summary is mostly derived¹¹. A good overview of Technical and Vocational Education and Training in Nigeria was also recently provided by UNESCO in collaboration with NBTE¹².

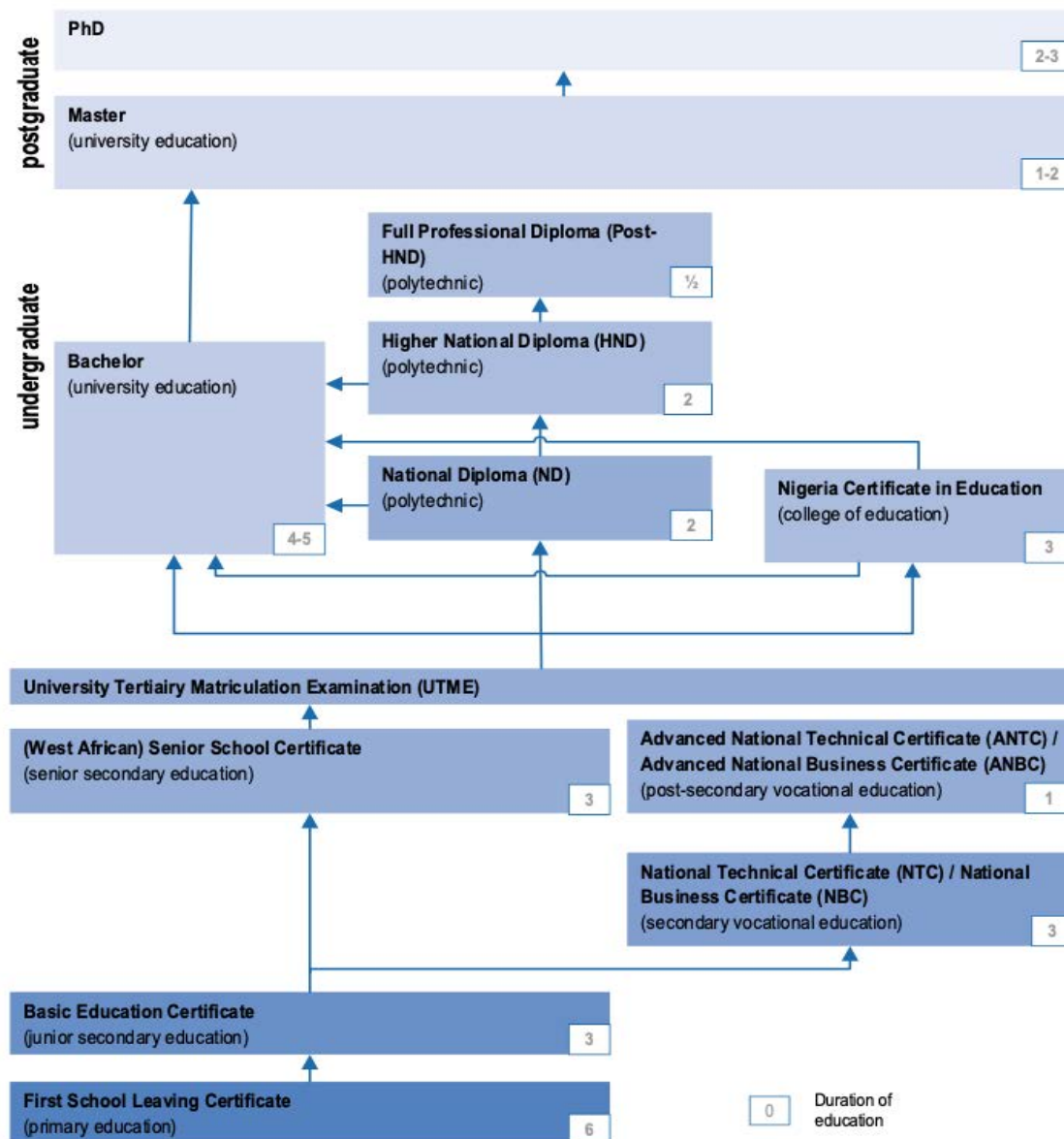


Figure 1 The Nigerian Education System (from Nuffic, 2017)

Under the National Policy on Education (NPE), last revised in 2013, 10 years of basic education, to the age of 15, is compulsory and free for Nigerians. However, among the population aged 15 years old and above, 27% of men and 43% of women have no education. Literacy levels are therefore low:

¹¹ Nuffic, 2017. [Education system Nigeria described and compared with the Dutch system](#).

¹² UNESCO-UNIVOV, 2019. [TVET Country Profile Nigeria](#).

60% for adults and 73% for youths (2015), relatively lower in rural areas, and slightly lower for women. Female literacy rates in rural areas is estimated at about 50%^{13,14,15}.

Basic education consists of one year of pre-primary, followed by an additional 6 years of primary and 3 years of junior secondary education, resulting in the Basic Education Certificate (BEC). However, enrolment at elementary level was only 64% (in 2010) and one quarter of students drop out.

Following the BEC, 3 additional years of senior secondary education is divided into either general secondary education or secondary vocational education. Less than half of secondary school age youths attend school (although up from about 20% in 1990), with males slightly more likely to attend than females.

After general secondary education, students are awarded either the West African Senior School Certificate (WASSC) by the West African Examinations Council (WAEC), or the Senior School Certificate, issued by the National Examinations Council (NECO). Depending on the grade, the WASSC or ANTC/ANBC is broadly comparable to the Dutch HAVO diploma and provides access to higher education via the Unified Tertiary Matriculation Examination (UTME).

If the alternative secondary vocational education route is followed, the 3 years instruction results in a National Vocational Certificate (NVC), National Technical Certificate (NTC), or National Business Certificate (NBC), although this route is less common in practice. NVC, NTC and NBC are equivalent to the Dutch MBO at qualification level 2 or 3 and are intended to prepare graduates for the labour market. After 2 years of relevant work experience, NTC or NBC holders can enrol for an additional 1-year course leading to Advanced NTC or NBC (ANBC/ANTC), which is equivalent to the Dutch MBO at levels 3 or 4. NBC/NTC and ANBC/ANTC qualifications are awarded by the National Business and Technical Examination Board (NABTEB).

Bachelor programmes at Universities have a nominal duration of 4 years, although agriculture takes 5 years and subjects such as law, engineering, technology or medicine, can take up to 6 years, depending on the institution. The 4/5-year bachelor is considered to be equivalent to a Dutch HBO bachelor, or 2 years of Dutch university instruction, depending on study area. Higher degrees include 1-year postgraduate certificate or 2-year diploma; students sometimes enter these programmes if they want to switch to a new career before entering a master's programme. Masters of 2 years are comparable to the HBO master's degree in the Netherlands. A PhD requires a minimum of 2-3 years additional to the master's and comprises a research theses and sometimes additional required coursework.

Study at Polytechnics results in a National Diploma (ND) after 2 years. Following one year of practical experience or industrial training, the ND holder can enrol for a further 2 years to obtain a Higher National Diploma (HND). The ND is comparable to the Dutch MBO level 4, and the HND to the Dutch HBO. Also, holders of ND and HND can also be admitted into the second and third year, respectively, of the university to obtain a BSc degree.

After senior secondary education, UTME candidates with satisfactory grades can also attend a College of Education, where a 3-year programme results in the Nigeria Certificate of Education (NCE), which is the minimum requirement for teaching in primary or junior secondary schools. NCE holders can proceed to obtain a Bachelor of Education (B.Ed) degree in the University but admitted into the second year. B.Ed holders, or regular bachelor's graduates who have a 1-year Postgraduate

¹³ [Education Data Policy Centre](#)

¹⁴ [Education in Nigeria, 2017. World Education News and Reviews.](#)

¹⁵ [UNICEF. Education](#)

Diploma of Education (PGDE) are qualified to teach at senior secondary level. NCE holders can also go on to study for university bachelor's degree in other disciplines.

Technical Teacher's Colleges provide a 3-year teacher-training programme in a technical or vocational subject, resulting in a Nigerian Certificate of Education "technical" or "commercial". Graduates from these programmes typically go on to teach secondary vocational education (to teach at e.g. ND level, an HND qualification is needed, and for HND or BSc., a MSc qualification, etc.)

Universities

The university sector in Nigeria is regulated by the [National Universities Commission \(NUC\)](#). A statutory body since 1974, and a parastatal under the Federal Ministry of Education, its main functions are:

- i. Granting approval for all academic programmes run in Nigerian universities;
- ii. Granting approval for the establishment of all higher educational institutions offering degree programmes in Nigerian universities;
- iii. Ensure quality assurance of all academic programmes offered in Nigerian universities; and
- iv. Channel for all external support to the Nigerian universities.

As with many countries in Africa, the number of universities in Nigeria has increased greatly in recent years and it is not always easy to determine the exact number as new universities are constantly being established. Not all universities which have been registered with the NUC are active (some being recently established and not yet offering courses), and not all have functional websites, making it difficult to assess their status or programmes offered.

Universities in Nigeria are typically classed under three main groups, with the NUC currently listing [43 Federal Universities](#), [48 State Universities](#) and [79 Private Universities](#), making a total of 171. Some 65 of these had information on their websites showing that they had agricultural related faculties, schools or colleges (some more than one).

- Of the 43 Federal Universities, 18 have been established since the year 2000. Thirty of the total Federal Universities have agricultural faculties, schools or colleges (see list in Appendix 4 and Figure 2 below). Funded by the Federal Government of Nigeria (FGN), Federal universities generally have subsidized and hence lower fees than state or private universities, although they are considered to be more prestigious, with higher admission requirements, better qualified teaching staff and more facilities in some cases. They typically draw students from across Nigeria and hence have a higher diversity of culture and religion.
- Of the 52 State Universities listed by NUC, 36 of these were established since the year 2000, and not all are yet operational. Of these, 28 had information on their websites indicating that they had agricultural faculties, schools or colleges (see Appendix 4). The level of funding from the different states is more variable, although generally the level of subsidies is less, and hence fees are higher, than for Federal Universities. Science-based courses tend to be more expensive, due to facilities required.
- Of the 79 Private Universities listed by NUC, all are recorded as having been established since 1999 - and 28 of these since 2015. Of these 79 private universities, 7 for which more information could be gained from their web presence as having agricultural faculties, schools or colleges are listed in Appendix 4. Figure 2 also shows that these 7 private universities with agriculture programmes are mostly located in the Southern part of the country. Private universities are generally run on a commercial basis, and hence fees are higher and very variable.

The NUC also lists [11 approved Distance Learning Centres](#) for higher education at university level (including the University of Ibadan and Ahmadu Bello University).

[The National Open University of Nigeria \(NOUN\)](#), also currently has 78 Study Centres spread across Nigeria and a total student population of over five hundred thousand. It has a Faculty of Agriculture, located in Kaduna, offering a 5-year B. Agriculture Programme, and it offers a post graduate distance learning programme in agricultural extension management.

Vocational Training

The vocational training sector in Nigeria is regulated by the [National Board for Technical Education \(NBTE\)](#). Established in 1977, and later modified by Federal Acts in 1985 and 1993, its functions include accreditation of academic programmes in all Technical and Vocational Education Institutions, as well as recommendations concerning the establishment of private Polytechnics and Monotechnics in Nigeria. The NBTE currently (in March, 2020) lists:

- [29 Federal Polytechnics](#)
- [48 State Polytechnics](#)
- [57 Private Polytechnics](#)
- [33 Colleges of Agriculture \(19 Federal, and 14 State owned\)](#)
- [31 Specialized Institutions](#) (including 4 with Business Studies, 2 Federal Cooperative Colleges)
- [158 \(mostly Private\) Innovation Enterprise Institutions \(IEIs\)](#), which offer National Innovative Diploma (NID) Programmes, (mostly in ICT, but of which 3 offer NID programmes in “Innovative Agriculture”, including the FCFM Afaka Entrepreneurship Centre in Kaduna)
- [78 \(4 Federal, 74 Private\) Vocational Enterprise Institutions or \(VEIs\)](#), offering National Vocational Certificate (NVC) programmes. Five of these Institutions offer NVC in agriculture, including the FCFM Afaka Entrepreneurship Centre).
- [123 Technical Colleges \(19 Federal; 101 State; and 3 Private\)](#). These Technical Colleges mostly offer training in technical crafts, and do not generally offer programmes in agriculture.

Colleges of Agriculture and polytechnics offering programmes in horticulture are listed in Appendix 4, and show in Figure 2 below, and those more relevant to Kano Kaduna will be described in more detail in Section 4.

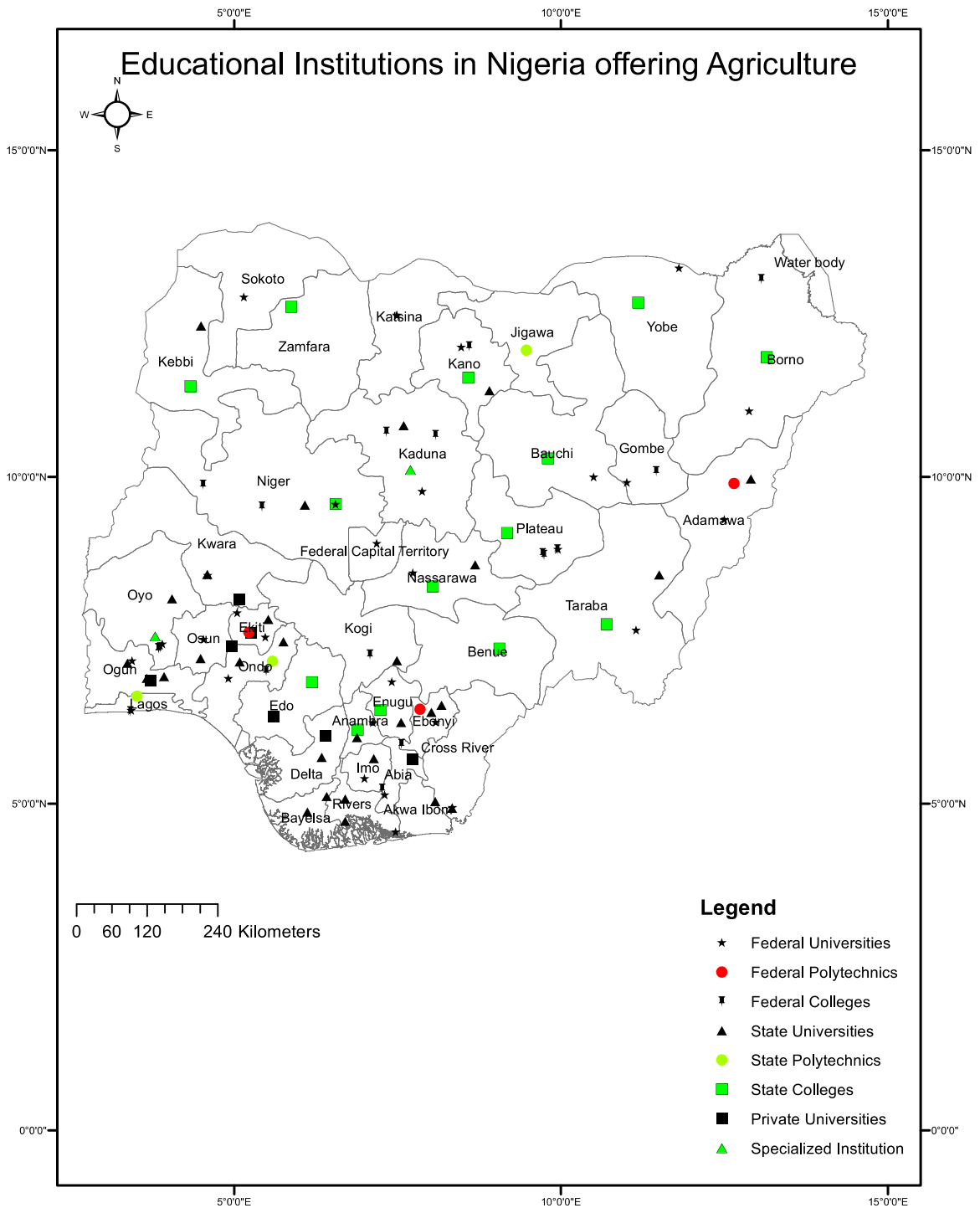


Figure 2 Universities and Colleges offering significant agricultural programmes (source: the authors)

Nigerian Agricultural Innovation System

Conceptual Framework

There are many definitions and schematic representations of an “Agricultural Innovation System”. The one depicted in Figure 3 is that used by the Tropical Agriculture Platform¹⁶:

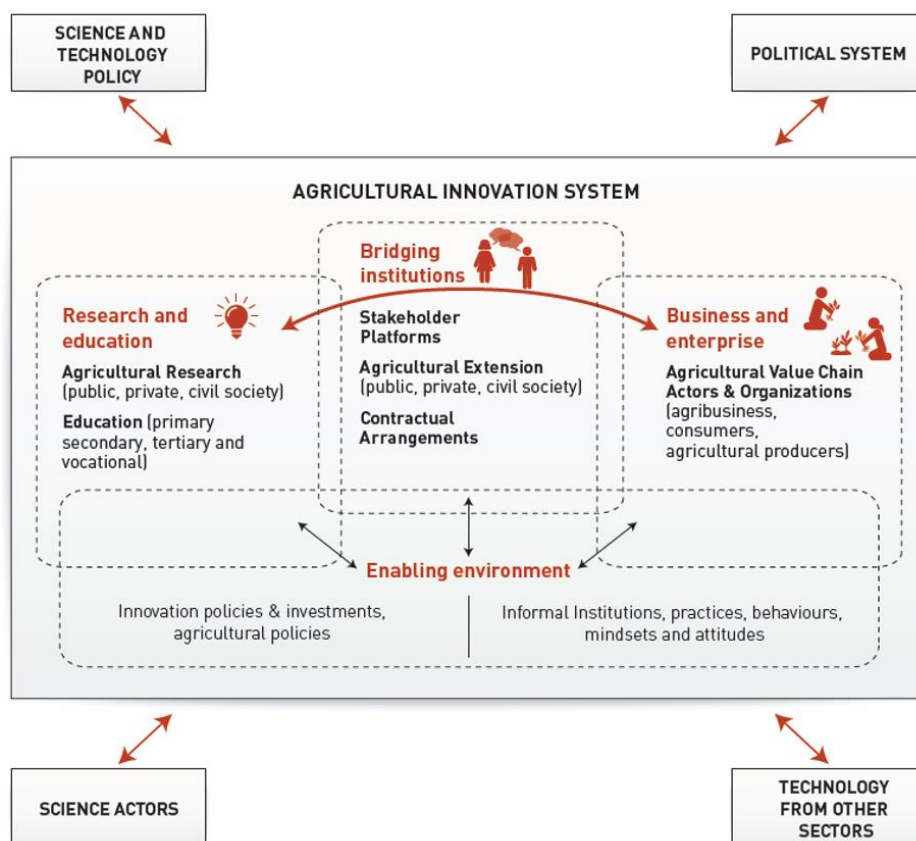


Figure 3 General conceptual framework of an “Agricultural Innovation System” (from TAP, 2016)

This conceptual framework will be used to orient the following description of key elements to the Nigerian Agricultural Knowledge System in the following sections.

Knowledge Organizations

Research

The Agricultural Science and Technology Indicators (ASTI), compiled by the International Food Policy Research Institute (IFPRI), showed that agricultural research spending in Nigeria in 2014 was approximately 433 million dollars (at constant 2011 prices), representing about 0.22% of Agricultural GDP¹⁷. This represents a steady decline from about 0.4% in 2008, and considerably below the typical percentage intensities of Africa in general (about 0.6% in 2000), or high-income countries (over 2%),

¹⁶ Tropical Agriculture Platform, 2016 [Common Framework on Capacity Development for Agricultural Innovation Systems: Conceptual Background](#). CAB International, Wallingford, UK.

¹⁷ Nienke Beintema, Abdullahi Mohammed Nasir and Lango Gao, 2017. [Agricultural R&D Indicators Factsheet Nigeria](#). ASTI, IFPRI

and less than the NEPAD target of 1%. This is in spite of the many studies that show agricultural research gives an internal rate of return of 43% in large African countries such as Nigeria.

The Nigerian agricultural research spending of some 13b Naira (2014) is almost entirely provided by the government, with donors and other sources constituting only a very small share of the total amount (1.2 percent per year on average during 2009–2014). Agricultural research is beset by numerous challenges, including the lack of stable, predictable and adequate funds to the research institutes, poor equipment, high research staff turnover and weak linkages between the various institutes.

The number of full time equivalent (FTE) agricultural researchers in Nigeria in 2014 was reported by ASTI as 2,975. Of these, about half, or 1,473 came from some 120 Higher Education Institutes. Of the 1,502 in the government sector, 356 had PhDs (20% female), 638 had MSc (30% female), and 508 (35% female) had BSc qualifications. Seven percent of these government agency researchers were estimated to be working in horticulture.

[The Agricultural Research Council of Nigeria \(ARCN\)](#), under the Federal Ministry of Agriculture and Rural Development was established in 2006 with a mandate to coordinate, supervise, and regulate agricultural research, training, and extension in Nigeria. It became the apex organization for 15 of the 18 Agricultural Research Institutes (ARIs) and 11 of the 17 Federal Colleges of Agriculture (FCAs) in the country. The FCAs are commodity or thematically focused and come under the direction of the Agricultural Extension and Socioeconomics Dept of the respective commodity/thematically based ARI. The ARCN does not have the power to allocate financial resources to these ARIs and colleges, although proposals by IFPRI for the reform of the ARCN would address organizational strategy, capacity strengthening, funding, and integration of research, extension and education¹⁸. Although nominally under the research institutes and hence the ARCN, the curricula of the FCAs is determined and regulated by the National Board for Technical Education (NBTE). According to ARCN staff interviewed, it has established a joint committee with the NBTE, and with support from GIZ, to review curricula at the FCAs.

The Agricultural Research Institutes are mostly oriented towards certain commodity sectors (cocoa & coffee, oil palm, rubber, cereals, root crops livestock, freshwater fisheries, marine, veterinary), etc. The more relevant institutes to the horticulture sector include:

- The [National Horticultural Research Institute \(NIHORT\)](#), headquartered in Ibadan. Established in 1975, with the assistance of UNDP and FAO as a fruit and vegetable research and demonstration centre, it has 2 substations, one in Imo State and the other at Baguada in Kano state. With research and improvement programmes on citrus, fruits, vegetable, spices, floriculture, as well as programmes in product development programme, extension and farming systems research, NIHORT has a vegetable programme (and Seed Unit) that includes work on varietal selection, cultural practices, production of breeders' seed, integrated pest management, etc., with some work on cayenne pepper. Most vegetable seed development is oriented towards open pollinated varieties: some Nigerian Scientists view imported hybrid seed as risky, or possibly leading to dependency. Product development at NIHORT is more oriented towards fruits. Extension research includes identification of constraints and opportunities; packaging of information into usable forms for different stakeholders, surveys, adoption studies, training (e.g. of staff of the Agricultural Development Programmes) demonstrations, etc. NIHORT supervises the Federal College of Horticulture at Dadin-Kowa, Gombe State. NIHORT staff recognize that they have a major skill gap in

¹⁸ Babu, S.C., Oyedipe, E.O., Ajakaiye, O. and K. Ajoni, 2017. [Strategies for restructuring the Agricultural Research Council of Nigeria](#). IFPRI Working Paper 41.

breeding technology, and that there is a generally low awareness about horticultural crops/products as there is a general misconception of horticulture as being limited to flowers and ornamental crops. They argue that government agricultural programs focus more on field crops like maize and cassava, with less than adequate attention for horticultural commodities, and especially to value addition of horticulture products, leading to huge post-harvest losses.

- [The Nigerian Stored Products Research Institute \(NSPRI\)](#) headquartered in Kwara State also has an outstation in Kano (as well as 5 other states). Its Perishable Crops Research Department includes research on roots and tubers, fruits and vegetables (including tomato, pepper, citrus, etc.). It has developed technologies for storage and processing (baskets, bags, silos, tins, crates, shelves etc.), which are promoted at industrial scale, at local markets/supermarkets, and at household levels. Nevertheless, NSPRI staff recognize that more effective methods are needed to promote adoption of these technologies, and that it needs more capacity on more advanced technologies such as cold chain technology that could be adapted to local conditions (e.g. where electricity supply is a challenge). The staff also recognize that stronger links with value chain actors are needed. NSPRI supervises the Federal College of Agricultural Produce Technology (FCAPT) at Kano, and also offers training, consultancy and laboratory services, and training of produce and pest control inspectors, farmers, industrialists, as well as training of trainers and advisory services (Agricultural Development Programmes, extension officers). FCAPT trained some 500 farmers in 2019, from several states.
- [The Institute for Agricultural Research \(IAR\)](#), at Zaria in Kaduna State was originally established in 1922, and has been affiliated with Ahmadu Bello University (ABU) since 1975, staff of IAR and ABU interchanging roles and interacting strongly (similar to the WUR model), even though ABU falls under the Federal Ministry of Education, and IAR under FMARD. IAR and ABU have a combined technical staff of around 5,000. ABU also manages the “Division of Agricultural Colleges” or DAC (see chapter 4). With a focus on crops in the savannah region (Sokoto, Kebbi, Zamfara, Kaduna, Kano, Kastina and Jigawa states), it uses an Integrated Agricultural Research for Development approach, with focus across the value chain, with programmes in cereals, cotton, oilseeds and legumes, fibres. It also has programmes in mechanization, irrigation, farming systems research, biotechnology and product development, as well as services in (field crop) seed production and extension. The Artemisia Research Programme also includes research in horticultural crops for the Northwest zone, with selection of varieties of tomato, pepper, onions and okra. IAR collaborates with the Federal Ministry of Agriculture, NGOs- HOPE project, East-West Seed, AATF (African Agricultural Technology Foundation), Syngenta, OFRA (Optimizing Fertilization Recommendation for Africa) and the [Transforming Irrigation Management in Nigeria \(TRIMING\) project](#) (funded by World Bank, [implemented by ACDI-VOCA](#) and with collaboration with NAERLS, [IFDC](#)). It also had a mandate for seed production, before this was moved to NIHORT.
- The [Agricultural & Rural Management Training Institute \(ARMTI\)](#) at Ilorin in the North-Central Zone of Nigeria is a parastatal and thus not under ARCN. ARMTI aims to be the centre of excellence in agricultural and rural development management training, and provides management training, consultancy and advisory services and the dissemination of agricultural and rural information. The Institute also conducts applied management research and contributes to policy development.

In addition to national research institutes, several international agricultural research centres operate in Nigeria. The major ones include:

[The International Institute for Tropical Agriculture \(IITA\)](#) with headquarters in Ibadan. [The Knowledge Centre of IITA](#) offers access to a large body of information resources, and the Capacity Development Office supports formal and informal, short-term and long-term courses (some of which are now accredited by the NBTE) and group training, internships in technical and agribusiness topics. IITA has also introduced e-extension services and promotes uptake of technologies developed through research by its “[Business Incubation Platform](#)”.

The [World Vegetable Centre](#) has regional offices in Mali (for dry regions) and Benin (for humid regions), and a local office in Kano. The WVC coordinates the Africa Vegetable Breeding Consortium (AVBC), which was established in 2018 as a joint initiative of WVC and the African Seed Trade Association (AFSTA). The AVBC aims to strengthen the capacity of all seed companies in Africa by providing them with varieties, inbred lines and hybrids that meet local market demand.

Other international organizations present in Nigeria include the [International Crops Research Institute for Semi-Arid Tropics \(ICRISAT\)](#), which works mostly on grains and legumes; the [International Livestock Research Institute \(ILRI\)](#), and the [Africa Rice Centre](#).

Bridging Institutions and informal training

Government Extension

The USAID “Developing Local Extension Capacity” (DLEC) Project has recently published an in-depth assessment of extension and advisory services in Nigeria¹⁹, as well as a review of opportunities to strengthen private sector extension and advisory services in Nigeria and other focus countries²⁰. Much of the general information in this section is taken from these reports.

The Federal Department of Agricultural Extension was formed in 2012 and is now working on Nigeria’s first legislated extension policy with the assistance of IFAD²¹. The goal of this new extension policy is to develop the private sector to provide services and the public sector to ensure quality control. The focus is therefore on promoting pluralistic delivery, and ensuring that extension services are demand-led, incorporate market needs, and target farmers who do not have access to markets today.

Public extension is mainly routed through the Agricultural Development Programmes (ADPs) in each state, which were initiated in 1975 and developed through the 1980s following a “Training and Visit” (T&V) methodology, developed in the 1970s²², but which has since been criticised for its lack of effectiveness in practice in Nigeria, given typical resource constraints, etc²³

ADPs had autonomous project management units, an adaptive research component, an input delivery system, a rural infrastructure component for rural feeder roads and water supply, and a systematic extension delivery strategy. However, they have declined somewhat since the World

¹⁹ Sarah Huber, Kristin Davis and Karin Lion, 2017. [Nigeria: In-depth Assessment of Extension and Advisory Services. Developing Local Extension Capacity \(DLEC\) Project](#). USAID, digitalGREEN, CARE and IFPRI.

²⁰ Developing Local Extension Capacity Project, 2019. [Strengthening Private Sector Extension and Advisory Services Portfolio Review](#). Developing Local Extension Capacity Project. USAID, Washington D.C.

²¹ The authors were unable to ascertain the status of this national extension strategy by the time of writing this report. The above DLEC 2019 report states that it is pending Federal Government approval.

²² Daniel Benor and James Harrison, 1977. [Agricultural Extension: The Training and Visit System](#) Word Bank.

²³ See, for example, [The Limitations and implications of Training and Visit \(T&V\) Extension System in Nigeria](#), by Yulier Núñez Musa, E. Aboki, Ibrahim Audu

Bank withdrew funding in 1975. According to NAERLS²⁴ in 2018, only 3 states (Katsina, Lagos and Abia) recorded over 50% of their target fund, with most states less than 20%, and according to FMARD, only Kaduna and Anambra are now funding their ADPs, while the rest rely on donor projects. Some states have gone 30 years without training their ADP extension agents and 25-30 years without new recruitment. According to Action Aid the federal government allocated a tiny 0.6% of its agriculture budget to extension services during 2007-11. This results in only 1.3% of Nigerian farmers having access to extension services²⁵.

The public extension workforce is estimated at some 7,000 persons (of which 28% female - in the northern predominantly Muslim part of the country, women cannot meet with male extension agents).

The general problems of the ADPs notwithstanding, Kano and Kaduna States have active ADPs:

- KNARDA, the [Kano Agricultural and Rural Development Authority](#), reportedly has some 1400 full-time extension workers (estimated 30% of whom are women), according to interviewed sources, who are supported through fortnightly or monthly trainings. According to NAERLS²⁶, KNARDA reached 1.6m farm families in 2018, mostly using Management Training Plots, with 1118 village extension agents, each extension agent attending to some 1,000 farmers. Only a minority of these staff have formal agricultural qualifications, according to interviewed sources. KNARDA collaborates with GIZ (training in contract farming), SASSAKAWA Global 2000 (maize production), ICRISAT, IITA, and OCP (Morocco). Work is organized into 4 “extension blocks”
- KADA, the Kaduna State Agriculture Development Agency, has a total staff of 334, including approximately 185 extension workers, active in 23 local governments of Kaduna State. According to the NAERLS Agricultural Performance Survey, 218 extension agents 2018 each attended over 5,000 farm families. Each of the 255 wards in Kaduna state is expected to have at least an extension worker but due to the inadequate number of extension workers, lead farmers are chosen in places where they lack extension worker. Monthly Technical Review Meetings (MTRMs) are used for training of the staff or extension worker, and fortnightly trainings using Farmers Field School (FFS) for farmers.
- KADA partners with a number of external organizations train farmers in a variety of topics: e.g. BMGF, GIZ (contract farming); FAO (agrochemical use), etc. KADA is currently developing the [“Agro-Processing, Productivity Enhancement and Livelihood Improvement Support” – \(APPEALS\)](#), a six-year project developed by FMARD in collaboration with the World Bank and other stakeholders, expected to focus on 11 value chains in 6 states, mostly field crops, but including tomatoes and ginger.

To alleviate the overall shortage of extension services in the country, the [N-Power Agro scheme](#), part of the general [N-Power scheme](#), intends to create a cadre of 100,000 youth volunteers (ages 18-35, with NTC, ANTC or BSc qualifications, to receive a stipend of NGN 30,000/month), who will provide advisory services to farmers across the country by disseminating knowledge aggregated by the Federal Ministry of Agriculture and Rural Development in the area of extension services. The training curricula for N Power Agro is developed by SASSAKAWA, NAERLS, agricultural universities and research institutes.

²⁴ Agricultural Performance Survey of 2018 Wet Season in Nigeria, National Report, NAERLS.

²⁵ ActionAid, 2013. [Fair shares: is CAADP working?](#) May 2013.

²⁶ Agricultural Performance Survey of 2018 Wet Season in Nigeria, National Report, NAERLS.

NAERLS

The [National Agricultural Extension Research & Liaison Services](#) (NAERLS) is administratively one of the ARIs under the ARCN and FMARD, although it has a specific mandate for promoting extension and linkages between research and extension, as well as conducting agricultural performance surveys, building the capacity and skills of key actors in the extension service, reviewing and supporting the extension activities of ARIs, and packaging and disseminating agricultural technologies.

With headquarters in the ABU complex in Zaria, it has 6 zonal offices, located in sister research institutes, and a total overall staff of over 900, including 12 Professors, 33 Ph.D. holders, several MSc. and BSc degree holders, and HND holders. The organization is responsible for development, collation, evaluation and dissemination of proven agricultural innovations and to research on extension methodologies and policy. It has research programmes in agricultural communication, extension (e.g. adoption studies) and policy, as well as in training and outreach (which includes a skills acquisition and development centre), and information management. It produces extension publications, electronic media packages, and trainings. As with other government agencies, funding for activities has been a limiting factor, as the Federal Government does not allow NAERLS to charge for its activities.

Originally based on the Training and Visit approach promoted by the World Bank in 1992-97, NAERLS liaises with each ARI (the respective extension departments), and organizes bi-weekly or monthly meetings and training sessions for State level ADP staff, using trainers mainly from ARIs, universities and colleges, or from externally supported programmes NGOs such as AGRA, with which it promotes Community Based Advisory services (CBA), under which it has trained some 360,000 farmers in Kaduna and Niger States over two years.

NAERLS operates the Research- Extension-Farmer-Input-Linkage-System (REFILS), which is intended to bring together research, extension, the private sector and farmers to make sure new research is used and to guide the course of future public research. For this purpose, REFILS activities include quarterly review meetings in each zone, an annual review meeting and feedback on the Agricultural Performance Survey that forecasts crop production for the wet and dry seasons at headquarters, and some in-house reviews hosted by research institutes. However, meetings are said to suffer from low participation of extension agents, farmers and private-sector representatives. Extension agents usually do not have funding to travel for the meetings. NAERLS uses radio and television as part of their information outreach. There are 14 NAERLS programs broadcast in different radio stations across the country, in a variety of languages. A NAERLS-run Farmer Helpline uses an interactive voice response system. Another NAERLS programme used “adopted villages”, in which Information Resource Centers were set up with a television, DVD player, audiovisual materials, publications and posters.

Private Sector Advisory Services

Although the number of private agents is difficult to estimate, the private sector is increasingly supplying extension and advisory services, either as stand-alone paid business services, or as corporate services bundled with input provision or produce offtake – when the costs of the service are embedded in the product.

Private service providers include, for example:

- [Sahel Consulting](#) undertakes tailored, innovative and market-based research, strategic advisory services, training and project implementation. In 2017 it established a Corporate Shared Value (CSV) program involving agriculture/ nutrition undergraduates in Nigerian universities; now in 7 universities (including FUNAAB, ABU and others) in which it promotes conferences, interactions between successful agricultural entrepreneurs and internship opportunities for students. It also

has a programme for building capacity of seed companies, communicates through newsletters and newspaper/magazine articles, etc.

- [Dizengoff Nigeria](#), mainly providing equipment across the agricultural sector (greenhouse technology, seeds, irrigation, agro-chemicals, etc), but also providing training and agro-support to small holder farmers, in partnership with other companies, governments, donors, NGOs, foundations, finance and micro-finance institutions, schools, institutions of higher learning and research bodies.
- [BabbanGona](#), a farmer membership organization, which provides financial services, agricultural inputs, marketing services, as well as training and development to establish strong democratic farmers groups in Northern Nigeria.
- [BIC Farms Concepts](#) an agribusiness consulting firm, which aims to help people establish a sustainable agri-business and which organizes a variety of short courses (3 days-2 weeks) for undergraduate students, staff members, SMEs, interns, extension agents and farmers in technical and agribusiness topics such as hydroponics, greenhouse and vegetable production (tomatoes, pepper, leafy vegetables), aquaculture, etc. Mostly operating from Abeokuta, Abuja and Lagos, BIC Farms Concepts also partners with a number of organizations such as the Landmark University Green House Technology Centre (LUGHTEC), Leventis, Afe Babalola University Ado Ekiti (ABUAD), the Woman Farmers Association of Nigeria in Kano (on rice production), and others. Currently, BIC Farm Concepts employs 10 persons, with a projected increase to 20, as well as using outsourced employees. Most of these employees were not trained in agriculture, so they need additional basic skills (workplace, managerial, soft/life), to improve communication and productivity, proper documentation and adherence to standard operating procedures or protocols.
- [Micro Development Consulting Limited \(MDCL\)](#), which in 2016 and in collaboration with Kaduna State Ministry of Agriculture and Forestry, trained some 16,000 farmers in Kaduna state in entrepreneurship, book-keeping, financial planning, and crop production (cited by DLEC)
- Independent consultants and consultancies trained by organizations such as [iCRA](#), which has been providing services in Nigeria through its iCRA Group based in the North and South of Nigeria, and [COLEACP](#), a membership organization including companies producing fruit and vegetables for mainly national markets. These organizations cooperate with NL programmes such as 2SCALE to train service providers and trainers in e.g. fertilizer use, business development, pesticides and food safety, etc. iCRA provides [training programs](#) (funded by Nuffic) in inclusive agribusiness and innovation systems development. COLEACP maintains an [online learning programme](#), which can be used by HEIs to support their courses and training programmes.

Other corporate private sector actors include input suppliers (e.g. Syngenta), offtakers and farmer cooperatives. However, and according to the DLEC report, it is hard to assess the overall level of such service provision, as these efforts are relatively uncoordinated and the private sector tends not to participate in e.g. NAERLS activities (such as the Annual Extension Review and Planning Meetings organized under REFILS, and Annual Performance Survey). The DLEC report suggests that for NAERLS to have robust engagements with the private sector, it may require a revision of its mandate.

Prominent in Kaduna and Kano in horticulture skills development is:

- [East-West Seed](#), a Dutch founded tropical seed company which places considerable emphasis on research, knowledge transfer and training farmers in vegetable production to catalyze innovation at farm level and develop the sector. As well as its commercial activities (selling of hybrid seeds), it also conducts research and development and knowledge transfer activities. The main objective of the Knowledge Transfer Department is to increase productivity of farmers using simple techniques and readily available resources through base line surveys to establish

needs and subsequent training, market surveys to provide price information for farmers. Farmers generally have poor knowledge of hybrid seeds, water conservation, mulching and pest and disease management, and rely on agro-dealers for knowledge of varieties. East-West Seed has demonstration plots in Kaduna (Achukum, Jaji, Kudon, Sooban, Markafi and Unkunyi), and is initiating similar activities in Kano. It organizes a 4-6-month practical training programme for its own recruited staff, mainly using trainers from its technical working group in Thailand, and currently has 12 technical field staff in N. Nigeria.

East-West Seed has 18 full time staff in Kaduna and Kano: 12 technical field officers, 1 manager, 1 project coordinator, 1 technical working group specialist, recruiting B.Sc., PGD., M.Sc. and PhD students from several countries (Tanzania, Uganda and Thailand). Although they are all agriculture graduates, they often lack basic skills needed for job productivity and poor data management. A four to six months Crop Advisory Training programme is therefore organised for newly recruited staff, using a technical working group from Thailand. They practice on learning sites and allowed to handle a demonstration plot and a mentor is then attached to each staff.

East-West Seed is also a key partner in the "[Seeds for Change \(S4C\) Project](#)" implemented by NABC and 6 Dutch companies (including East-West Seed), in partnership with Bayero University in Kano, and WUR. This partnership trains farmers, extension agents, SMEs, agro-input dealers, government agency and higher education bodies through workshops, as well as organizing farmers into cooperatives/clusters to aid their accessibility to finance and market access. A key activity is implemented by WUR, which is to train 25 master trainers over a period of 18 months through 4-6 hours/week distance learning plus 4 face-to-face sessions who will then train leader farmers who can themselves train other farmers, etc. It also partners with ABU, KADA and the NGO Solidaridad in an SDGP programme, to train Subject Matter specialists and extension officers.

Other examples of public-private partnerships, which mainly offer financial services but also some degree of technical services include:

- The [Anchor Borrowers Programme \(ABP\)](#), initiated by the Central Bank of Nigeria, which provides financing (at 9%) and extension services for farmers producing crops for certain private sector off-takers. In Kaduna, the programme has benefitted mainly cotton farmers. In Kano, the programme has benefitted rice growers and also the Tomato Growers Association of Nigeria (TOGAN - Kano Chapter), with 10,000 tomato growers in 44 LGAs (on 10,000 hectares) said to receive loans, seedlings and inputs in 2019. Under the ABP, farmers have also received training. However, some actors report that ABP has suffered a high level of defaults, and loans not effectively reaching small holder farmers.
- The [Growth Enhancement Support Scheme \(GESS\)](#). Introduced in 2012, the scheme links about 20m farmers to private input suppliers using an e-Wallet system managed by [Cellulant](#), thus taking the government out of direct input provision as previously.
- The [Nigeria Incentive-Based Risk Sharing System for Agricultural Lending](#) (NIRSAL Plc.) is a US\$500million Non-Bank Financial Institution, wholly-owned by the Central Bank of Nigeria (CBN) created to share credit risks, develop innovative insurance products, rate lenders, and build capacity of financial institutions and agricultural value chain actors.

Non-Government Organizations

A number of NGOs are active in agricultural service provision in Nigeria.

Prominent among these is

- [Sasakawa Global 2000 \(SG2000\)](#). Working closely with FMARD and ADPs, SG2000 has trained some 2,000 extension agents and one million smallholder farmers in eight states of the north (including Kano and Kaduna – the SG2000 office is located in Kano). It conducts these trainings of government extension agents three to five times per year on various technical topics related to agricultural production, mostly using demonstration plots with field crops (wheat, maize, rice, cowpea, soybean, groundnut, millet, sorghum, sesame, cassava). The Sasakawa Africa Association (Sasakawa) has piloted an Open Innovation Platform (OIP), a series of networking sessions set up between farmers, local governments, research institutes and private sector companies. These sessions are being conducted in 10 LGAs in Kano and 10 in Kaduna. The intention is that LGAs will take over management of these OIP sessions. The [Sasakawa Africa Fund for Extension Education \(SAFE\)](#) also provides an opportunity for mid-career extensionists to obtain BSc degrees, and (by 2017) some 400 extensionists had participated in SAFE programmes at ABU and 3 other Nigerian Universities.
- [Technoserve](#), which has more than a decade of experience designing and implementing market-led interventions in most of Nigeria’s 36 states, and which has targeted the maize, rice, cashew, tomato, cassava, soy, and poultry value chains. Technoserve has 224 extension agents - "Local Community Trainers" (LCTs), each of whom trains 150-200 farmers. Under the "[Yieldwise](#)" programme, (2017-2021), active in Kaduna, Kano, Katsina, Jigawa, and Plateau states, TechnoServe and Syngenta have partnered with the Rockefeller Foundation to increase the incomes of 25,000 tomato and rice farmers through training in best agricultural and post-harvest practices (home-based processing) and connecting them with input suppliers and networks. The project’s goal was to work with 45,000 farmers over three years to reduce post-harvest losses by 50 percent and increase incomes by the same amount (e.g. through “zero energy cooling chambers”). With East-West Seed, Technoserve has piloted “Farmer Service Centres”, which offer extension services, inputs, market access, learning and demo plots, etc.
- ACIDI-VOCA has launched its "[Alliance Agriculture](#)" initiative to give farmer groups access to centre-pivot irrigation, inputs and technical assistance. Primarily private sector led (with financing from NIRSAL), ACIDI-VOCA has worked with some 130,000 farmers in groups of 25, in four rehabilitated irrigation schemes in Northern Nigeria, including the Kano River Irrigation Scheme.

Externally supported extension and development

The German GIZ uses its "[Green Innovation Centre](#)" approach to support farmers and processing companies in seven of the country’s 36 states. Its cadre of 340 agricultural extension officers are training 200,000 rice, cassava, maize and potato farmers, using a curriculum developed by the Centre from information from international and national research centres, etc. Smartphones and tablets are also used to disseminate information on production, post- harvest and agro-business to around 400,000 farmers.

The EU and BMZ-sponsored [Nigerian Competitiveness Project \(NiCOP\)](#), implemented by GIZ and Agriculture and Finance Consultants (AFC), aims to development value chains including leather and textiles, tomato/pepper, and ginger. Interventions will mainly be at the production and processing level in Kano, Kaduna, Plateau, Ogun, Oyo, Lagos and Abia states. The project intends to link major large-scale processors with small-scale tomato farmers through outgrowing and contract farming schemes, while improving quality and productivity through entrepreneurial training in Farmer Business Schools (FBS) and Good Agricultural Practice (GAP) trainings. AFC has offices in Kaduna and Abeokuta.

The [GEMS4 project](#), supported by DFID, was implemented in the period 2012-2017. Employing a “Making Markets Work for the Poor (M4P)” approach to link farmers to markets, it worked with the Fresh Fruit and Vegetables Dealers Association of Nigeria (FFVDAN) and the ADPs of Kano, Kaduna

and Lagos states to train master trainers of Good Handling Practices (GHP) for perishable produce. As a result of this activity, more than 50,000 people subsequently increased their incomes. As part of the GEMS4 project, 619 tomato clusters in N. Nigeria, covering 170,000 hectares were mapped, to provide information to plan and organize subsequent development interventions. The follow-on British DFID Programme “[LINKS - Powering Economic Growth in Northern Nigeria](#)”, with timeframe 2018-2026 and a budget of GBP 2.5m (30% of which on agriculture), has a focus on Kano and Kaduna. It intends to raise the incomes of at least 3m people in northern Nigeria involved in pro-poor value chains. These include “high value crops”, and support may build on the previous GEMS4 project support to companies such as Dangote and its tomato processing facility.

[IFAD loans to Nigeria](#) have supported agricultural development in Nigeria since 1985. The current 2 major projects are value chain development of cassava and rice; and climate change adaptation and agribusiness in the Savannah belt. Neither of these projects are active in Kano and Kaduna states.

The USAID [Feed the Future Programme in Nigeria](#) also supports smallholder farmers and small to medium enterprises improve their competitiveness in selected value chains, through increased access to finance, improved agricultural inputs and technologies, and extension services. It does not focus on horticultural value chains or Kano, Kaduna states, however.

ICT enabled training, services

A recent FARA research report on “[Digitalization in Agriculture, Food and Nutrition - A Case Study of Nigeria](#)”²⁷ gives an overview of digital services as used in Agriculture in Nigeria. According to this report, by March 2016, there were over 92m internet subscribers in Nigeria, 99% of which by mobile networks as broadband penetration remains low. Initiatives such as the [Agri-Business Small, and Medium Enterprises Investment Scheme \(AGSMEIS\)](#) target start-ups and students of higher institutions engaged in software development.

A number of companies were cited with digital operations in the agricultural sector, including “[Hello Tractor](#)” (linking users to tractor hire services), “[Cellulant](#)” (linking farmers, agro-dealers, offtakers, financial institutions, governments, development partners, using blockchain technology), “[Kitovu](#)” (providing a variety of information and services to farmer groups), among others (although few appear to be active in N. Nigeria). Although preliminary evidence from these case studies described in the FARA report indicate that farmers using ICT services show increased production (although this presumably does not necessarily reflect cause-and-effect, and further evidence is needed), a conclusion was that smallholder farmers are still reluctant to pay for services, and hence many digital service providers remain unprofitable, and the number of farmers reached remains relatively low.

Other examples of digital services for farmers include:

- The [National e-Agriculture Web Portal](#), a strategic initiative of the National Information Technology Development Agency (NITDA) in collaboration with the Federal Ministry of Agriculture and Rural Development (FMARD), to showcase the essential features and key aspects of the food and agriculture industry in Nigeria. It currently has a relatively limited set of training/learning resources.
- [RiceAdvice](#), an Android based decision support tool developed by AfricaRice, used in Nigeria as well as other African countries.

²⁷ Phillip D and Ndirpaya Y.D, 2020. [Digitalization in Agriculture, Food and Nutrition - A Case Study of Nigeria](#). FARA Research Report 5 (10). FARA, Accra.

Business and Enterprise (Private Sector)

Production

According to the FAO²⁸ and also to CGAP²⁹, around 88% of Nigerian farmers are considered small family farms, 72% of whom live below the poverty line of USD 1.9 a day. With an average farm size of 0.5 hectares, of which only 2% is irrigated, they depend on a diverse range of crops, livestock and fish, selling only 26 percent of their agricultural products. The average household has 6 household members, with an educational attainment of the household head of 5 years. In about 90% of households, men have the decision-making power, and only around 13% of households are female headed. Only 6 percent of the households receive agricultural extension services in form of knowledge and information transfer. About 35% of the adult population has an account with a financial institution.

A recent report by WUR describes in detail the [Vegetable and Potato Sector of Nigeria](#)³⁰, showing estimates that the country produces about 7m tonnes of fresh vegetables 4m tonnes of tomatoes, 4m tonnes of sweet potato, 2m tonnes of okra, 1.2m tonnes of (Irish) potato, 1m tonnes of onion, and 0.75m tonnes of peppers and chillies. Most of the tomatoes, and about half of the onions are produced in Kaduna and Kano states. “Informal” markets account for 95-99% of produce, with only a relatively small amount sold via supermarkets. Distance to these markets is about 1000km, in the case of N. Nigeria, implying a travel time of over 8 hours and which is, in turn, related to production incentives and a low ratio – about 10% - of actual to potential production in Sub-Saharan Africa³¹. Use of purchased inputs such as seed, fertilizers and pesticides is therefore minimal. Post-harvest losses in vegetable chains between are estimated at between 30% - 60%.

As noted in the previous sections of this report, coverage of technical advisory services in N. Nigeria is scarce. Literacy rates in rural areas of Nigeria are low, less than 50%, and any technical advisory services that do exist need to be in local languages and presented in verbal or pictorial manner. Most knowledge transfer to farmers comes from other farmers, rather than any formal agricultural knowledge and innovation system.

As representatives of the “private sector”, it is obviously difficult for research, development or educational organizations to work with thousands of individual farmers scattered across a large area. Farmer organization is therefore key to the channelling of agricultural knowledge by advisory services, as well as financial services, material inputs, marketing, etc. Studies show that membership of farmers’ organizations leads to higher productivity and income³². While it is beyond the scope of this report to adequately assess farmer organization in N. Nigeria, the lack of existing or low performing farmers organizations was identified as a weakness of the vegetable sector in Nigeria³³.

²⁸ FAO, n.d. [Small family farms country factsheet: Nigeria](#). FAO, Rome.

²⁹ CGAP, 2017. [National Survey and Segmentation of Smallholder Households in Nigeria](#).

³⁰ Plaisier, C., Dijkxhoorn, Y., van Rijn, F., Bonnand, J., & Talabi, O., 2019. [The vegetable and potato sector in Nigeria: an overview of the present status](#). Wageningen Economic Research report; No. 2019-119). Wageningen: Wageningen Economic Research

³¹ Keith Fuglie, Madhur Gautam, Aparajita Goyal, and William F. Maloney. 2020. [Harvesting Prosperity: Technology and Productivity Growth in Agriculture](#). World Bank.

³² A. Adekunle, 2018. [Effect of Membership of Group-Farming Cooperatives on Farmers Food Production and Poverty Status in Nigeria](#). International Association of Agricultural Economists.

³³ Posthumus, H., Dengerink, J., Dhamankar, M., Plaisier, C., & Baltissen, G., 2018. [Enhancing food systems in Nigeria: Scope and perspective for Dutch policy interventions](#). Wageningen: Wageningen University & Research

One relevant example of farmer's organization in the tomato industry is the "Tomato Growers Association of Nigeria" (TOGAN), which has a chapter and a membership of at least 30 cooperative groups in Kano and provides a mechanism to link farmers to processors such as Dangote. Unfortunately, this study was unable to obtain more information on the structure and activities of TOGAN.

Another notable example of a farmer organization is the [Women Farmers Advancement Network, WOFAN](#), incorporated with the Kano state Government as a community Development Association. With over 1500 women, men and youth groups located in many local government areas (LGAs) across 5 Northern States and organized in working groups of 20-30 members, WOFAN works with other cooperatives, CBOS, the private sectors, research institutions towards achieving a holistic development of the people. It organizes training in leadership development, advocacy, business management, agriculture, value chain & food processing, preservation, water and soil conservation, sustainable environment & climate change adaptation, improved agricultural technology, HIV/AIDS & health awareness programmes, childcare development, civic and political participation.

Input dealers and Professional Associations

According to the [National Agricultural Seeds Council \(NASC\)](#), cited in the recent "National Seed Road Map" by NASC and the Seed Entrepreneurs Association of Nigeria (SEEDAN)³⁴ there are currently 314 registered seed companies in Nigeria, with the majority producing fewer than 1000 metric tonnes of seed annually. According to further information cited in the WUR report, of 24 benchmarked seed companies in Nigeria, 10 have testing locations, 6 have seed production activities, 5 have processing facilities in the country 4 have breeding activities in the country. Only 9 companies, accompany their sales activities with extension services.

The National Seed Road Map cited describes the relationship between key stakeholders in the seed system. The Seed Entrepreneurs Association of Nigeria (SEEDAN), with 72 registered members, brings together seed companies and other key private sector players in the industry; the NASC is the government entity responsible for seed regulation, the Nigeria Agricultural Quarantine Service (NAQS) for phytosanitary aspects, 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 capacity of these different agencies and their coordination hampers efficient knowledge transfer between them and to farmers. The National Seed Road Map provides a vision to address these issues.

Tomatoes make up about one fifth of the average daily consumption of vegetables in Nigerian homes. Nigeria is the leading tomato producer in Sub-Sahara Africa and the 14th globally with an estimated annual production of 1.56 million tonnes. Even so, Nigeria still imports processed tomato paste. Production is mainly located in the Northern States. There is usually a glut of fresh tomatoes during its short production season with low price and high postharvest losses. Postharvest losses of tomato fruit in Nigeria are said to be around 50%, and usually occur as a result of poor handling practices, lack of adequate storage facilities, transportation facilities and ability to process and add value to tomato in order to preserve and extend its shelf life. About 95% of the market is for fresh produce, but there is no cold chain. Nearly all tomatoes are sold in local markets: supermarkets represent only limited demand.

³⁴ Thijssen, M. H. 2020. [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 \(September 2019 – February 2020\)](#). Report WCDI; No. 20-099. Wageningen: Wageningen Centre for Development Innovation, Wageningen University & Research.

The [Fertilizer Suppliers Association of Nigeria \(FEPSAN\)](#) has 24 registered members and more than registered distributors and offtakers as associate members. As part of its mandate to improve fertilizer supply in Nigeria, it has the goal to “provide for the business development of its members through education, training, and enlightenment”. As such it conducts some training on fertilizer use in partnership with FMARD and the ADPs, although the extent of this training is difficult to quantify.

The [Horticultural Society of Nigeria \(HORTSON\)](#), which has approximately 6,000 members, has as main goal to professionalize and/or establish improved professional recognition for horticulturalists. It has established a “Committee for Regulation” (COREHORT), with the intention that agricultural and/or horticultural graduates register, receive additional training (including a theory training of 1-2 months, followed by practical attachments and a period of mentoring) to become “associate members” who can apply for full membership as “professional horticulturalist” after a period of 5 years. It is interested to explore “competency-based training” (CBT) for this purpose.

Processing and marketing

According to NASC and FMARD, cited in the WUR report, there are 8 tomato processing plants in Nigeria, with a range in capacity from 7 tonnes – 1200 tonnes per day. According to the study carried out by Ugonna et al., 2015, and cited in the PLAN report, only 5 tomato processors are functioning (Erisco Foods Ltd. Lagos; Tropical General Investment Nig. Ltd, Lagos; Perfect Integrated Foods, Ondo State; Cadbury Nigeria Limited; and Dangote, Kano). Even these face sourcing and operating challenges. The (largest) Dangote processing plant, which is intended to operate at a capacity of 1200 metric tons daily and potentially providing a market outlet for some 5,000 farmers, has, according to sources interviewed, operated at only a fraction of full capacity due to initial technical issues (machinery, appropriate varieties of tomato) and sourcing problems from farmers.

In Northern Nigeria, considerable amounts of tomato are sundried at household or cottage industry level, on perforated mesh or raised platforms, mostly by men and/or with family labour, for local markets and for transport to the main cities in the South³⁵. Most of those involved have only a Quranic education, and it is said to take several years to perfect processing skills. Buyers are said to number over 100 (each selling about 10t/month), and even traders are said to require an apprenticeship of 2 years. Traders also take dried tomato to neighbouring countries of Ghana, Benin. While the production of dried tomato is not expensive, it is still not nationally utilized due to lack of knowledge in processing, packaging, potential markets and inadequate facilities as well as unavailability of dried tomato products to consumers. It seems clear from the PLAN study that there is considerable potential for improving the dried tomato industry among smallholders. Organizations such as Technoserve have begun to introduce solar driers which can dehydrate 6000 kg in 6 hours at an approximate cost per dryer of about NGN 3.5m.

Similarly, potato processing is limited to restaurants and a few small-scale processors. The main type of potato processing takes place in restaurants, where fresh potatoes are made into chips. Other than that, there is virtually no potato processing in Nigeria. Good quality potato seed is not available in the market and there are no policies or enabling environment for seed import. Farmers recycle their own seed, or buy similar recycled seed in the market³⁶

³⁵ GAIN Postharvest Loss Alliance for Nutrition (PLAN) and Rockefeller Foundation Yield Wise Program, 2017. *Report of landscape analysis on dried tomato production and market in Nigeria*.

³⁶ P. Gildemacher and J. Belt, 2019. *Potato sector development in Nigeria*. Royal Tropical Institute, Amsterdam.

Higher Education

Universities and Colleges in Nigeria with significant horticultural programmes, or those with strong agricultural programmes in Kano and Kaduna states, are described in more detail in chapter 5.

Enabling Environment

As noted in various points of this report, the overall “enabling environment” for knowledge and innovation development is weak in Nigeria.

Spending on agricultural research and development is low, compared to international goals such as that represented by CADDP. The lack of stable, predictable and adequate funds are limitations to knowledge development, transfer and innovation.

As noted by studies already undertaken in the seed sector, and the vegetable and potato sector, and reiterated by many of the stakeholders interviewed during this current study, government policies, including access to government funding, import duties, policies on credits and loans and the targeting/ management of these, development and enforcement of regulations (e.g. on seed quality, food safety), further inter-agency collaboration and general bureaucracy are seen as inconsistent or poorly implemented, and hence limiting the development of the agricultural sector.

In the agricultural HE sector, policy development is complicated by the involvement of different ministries, at both Federal and State levels. While the universities are generally financed via the Federal or State Ministries of Education, the Federal Colleges of Agriculture are financed via FMARD.

Policies that further encourage, certify and accredit practical education and training, such as competency-based education and training (CBET) are seen as desirable. Policies which encourage industry actors and HEIs to interact further, e.g. through further development of apprenticeships and internships, and to encourage more business-oriented education and professional recognition were all seen as needed – particularly by the private sector.

Current skills development in the Horticulture Sector

Degree programmes

National level

Horticulture is an interdisciplinary science which focusses on the production and handling of fruits, vegetables and ornamentals. The initial goal of developing horticulture in Nigeria was to redress food insecurity, malnutrition and promote job creation. Of the forty-three (43) Federal Universities in Nigeria, including the conventional and specialised ones such as Universities of Technologies and Agriculture, only the Federal University of Agriculture, Abeokuta (FUNAAB) has a fully-fledged Department of Horticulture (awarding a B. Agriculture degree with specialization in Horticulture) , although some other universities also offer specialised and elective courses in horticulture, mainly in the fifth year of study.

FUNAAB

[The Federal University of Agriculture, Abeokuta, \(FUNAAB\)](#) is one of the four Federal Universities of Agriculture in Nigeria established in 1988, and for about two decades has been the only University in Nigeria involved in the training of skilled manpower in horticulture at both undergraduate and postgraduate levels. FUNAAB now consists of 10 disciplinary Colleges, 5 specialised interdisciplinary Centres, and 2 interdisciplinary Institutes. Located within the [College of Plant Science and Crop Protection](#), (one of the 10 Colleges of FUNAAB), the [Dept. of Horticulture](#) commenced undergraduate programmes in 1992/93, and the postgraduate programmes commenced in 1993/94. At the time of writing this report, the College had 80 technical staff (47 males, 33 females; 58 of whom with PhD), of which, 13 were located in the Horticulture Department (8 males, 2 females; of which 10 had PhD). The Department had 301 students studying at BSc level (of which 101 women), 49 at MSc level (of which 27 female), and 25 at PhD level (of whom 12 female).

The FUNAAB programme was designed to be the HEI centre of excellence in horticultural sciences in the West Africa sub-region, and the first choice for applicants seeking professional training in tropical horticulture at the postgraduate level. The Department also aims to be a leader in public private partnerships in the sub-region. In order to pursue these goals, the Department is increasing its collaboration with other stakeholders to increase employability of its graduates by encouraging entrepreneurship and developing market-driven skills. Horticulture students undertake a number of specialized courses in Year 5 (see Appendix 5) and partake in programmes offered by other FUNAAB Centres, including the 9-week skill acquisition programme (SAPS), offered by the FUNAAB [Centre for Entrepreneurial Studies \(CENTS\)](#), and short term skill acquisition courses offered by the [Centre of Excellence in Agricultural Development and Sustainable Environment \(CEADESE\)](#), and the [Centre for Community-Based Farming Scheme \(COBFAS\)](#) which is designed to expose students to practical farming service (i.e. to improve upon the standard Year 4 practical year), and the [Work, Learn and Earn Programme \(WELP\)](#) for developing entrepreneurship in organic agriculture in Nigeria, organized by the Organic Agriculture Project in Tertiary Institutions in Nigeria.

Students of horticulture are exposed to practical courses in olericulture (vegetable and spice crops production and processing), pomology (fruit and industry tree crops production and processing), floriculture (cultivation and management of ornamentals, flowering and shade plants), landscape horticulture and postharvest handling of horticultural produce during the fourth year of their study. In the final year, students have the opportunity to choose project topics based on their preference.

The Department of Horticulture at FUNAAB has access to about 100 hectares of land, of which 25 ha is cultivated and 5 ha is with channel irrigation. Facilities available for training include tractor, boom sprayer, disc plough, harrow, small vehicles, analytical laboratory, drawing studio, green house,

screen house, research farm laboratory and evaporative coolant structures among others. The Department also has ICT facilities such as internet and laptops but with the attendant challenges of irregular power supply (although backup generators are available). The Department offers advisory services to smallholder farmers, institutional farmers and agro-based SMEs. Short courses offered are usually done on the farm in conjunction with other University units such as the Institute of Food Security, Environmental Resources and Agricultural Research (IFSERAR), and Agriculture Media Resources and Extension Centre (AMREC). Labour market assessment of the graduates of the Horticulture Department showed that about 50% of its graduates are employed by agencies of both Federal and State governments. Most of the funding for research activities as well as infrastructural developments are from the [Tertiary Education Trust Fund \(TETFund\)](#), a Federal government intervention agency established in 2011 to manage, disburse and monitor the 2% Education Tax imposed on registered companies in Nigeria.

Landmark University

[Landmark University](#) in Kwara State, established by the Living Faith Church Worldwide, is one of the private universities in Nigeria with a significant agriculture programme. The College of Agricultural Sciences at Landmark University being one of 3 Colleges and commencing operations in 2011. It has no department of horticulture, but students take horticulture-based courses domiciled in the Department of Crop and Soil Science. The College has 36 technical faculty staff, 21 of whom are men, and 24 of whom with PhD degrees, and 157 students on BSc agriculture (including fisheries, food science & nutrition, programmes).

The university has over 500 hectares of land, 258 of which cultivated, and 35 with drip irrigation. It has seventy-eight (78) functional tractors – which is more than all those available to Federal Universities of Agriculture. Almost 90% of the students were reported to have personal computers, considerably more than students attending government institutions. Functional electricity is available for 98% of the time and there are also standby generators in-case of power fluctuation. About 74% of the graduates are employed by private sectors, according to university records. The university receives funding from International agencies like International Foundation for Science (IFS) and Bill and Melinda Gates Foundation (BMGF).

Business Schools

Although not investigated in depth in this study, a number of more general business schools in Nigeria also offer specialised programmes in agribusiness, including the University of Nigeria Nsukka, which has [Executive Master of Business Administration in Agri-Business](#), and the Rome Business School Nigeria, which also offers a [Master in Agribusiness Management](#). Courses at the [Institute of Agribusiness Management Nigeria](#), which include an MBA in International Agribusiness as well as a PGD in Agribusiness and Food Chain Management, among others, have been suspended pending accreditation from the NUC³⁷

Kano State

Kano state has one Federal University, [Bayero University \(BUK\)](#) and one State University, [Kano University of Science and Technology, \(KUST\)](#). There are no privately-owned universities in the state.

Both BUK and KUST started their Agricultural programmes in 2001, but until now, neither has a Department of Horticulture - despite the fact that the State ranks among the largest producer of horticultural crops in the country. BUK offers specialization in horticulture in its B. Agric degree, hosted by the Department of Agronomy, while KUST does the same from its Department of Crop Science.

³⁷ Information from RVO/ EKNL Nigeria.

Eighteen faculty members have PhD or MSc degrees, of which 16 are male, with just one in female staff member in each Department. The two Universities have a similar programme structure in their BSc Agric. Programmes; although they don't have departments of horticulture, courses such as principles of horticulture are taken in the 2nd year (see Appendix 5 for an outline of the B. Agric programme), while more elective courses such as horticultural crop production, principles of landscape horticulture and postharvest physiology, processing and storage are taken in the final year. At the postgraduate level, students take courses such as advanced crop production II: vegetables, fruits and plantation crop, postharvest technology of horticultural crops and landscape gardening and floriculture. However, it should be noted that these courses at the postgraduate level are practical based, in particular Advanced Crop Production II, which is 100% practical. At KUST there is less access to internet facilities by both staff and students and about 50% of the students have personal computers for academic activities. Neither of the two institutions currently have facilities for e-learning, although efforts have been made to provide internet facilities for use of staff and students, and BUK provision has plans to initiate distance learning at the University level. Typically, adequate supply of electricity is a major hinderance, although there is usually supply of electricity between 8am and 6pm, so activities are usually restricted to these hours.

Apart from respective funding from Federal and State governments, both BUK and KUST get additional support from the TETFund and well as NEEDS Assessment (an initiative of the Academic Staff Union of Universities, funded by Federal Government based on identified special needs). These funds helped provision of infrastructure and training of middle level academic and non-teaching staff. However, BUK seems to have more external linkages with various foreign government organizations, including collaborations such those with East-West Seed and Seed4Change, among others. BUK also implements the practically oriented SAFE programme for mid-career extensionists to upgrade from HND to BSc, funded by the Sasakawa Foundation. Both universities are involved in training of farmers, extension agents, agro-processors etc. in short programmes ranging from a few days to two weeks. Although no formal qualification is issued for these trainings, participants receive a certificate of participation. A major challenge with the graduates of both universities was that most of them do not go on to work in the agriculture sector, as they find this not as lucrative as other sectors of the economy.

Recently, it was reported that the Kano State Government has directed that all non-certificate awarding Agricultural Training Institutes owned by the State Government should now be upgraded and brought under the supervision of Faculty of Agriculture of KUST, resembling the more established Division of Agricultural Colleges (DAC) structure in Kaduna State.

Kaduna State

The only Federal Government owned university in Kaduna state is [Ahmadu Bello University](#) (ABU) in Zaria, which is one of the first-generation universities in Nigeria established in 1962. One of 15 faculties, the [Faculty of Agriculture](#) has 9 departments, one of which being the [Department of Agronomy](#) which was established in 1970. This Department consists of 4 sections, including Horticulture (with 7 Academic staff), Field Crops, Crop Physiology and Weed Science, offering both undergraduate and postgraduate programmes. The University has plans to separate and develop the Horticulture Section as a formal Department, offering a more specialised horticultural BSc programme.

Most of the faculty members in Agronomy Department of ABU are PhD holders (28 Male; 2 Female), with 3 Male; 2 Female MSc holders. Similar to other Universities without a specialised department of horticulture, some courses in Horticulture are taken by both undergraduate and postgraduate students. However, these courses have about 20% of practical components, and are very broad based, covering principles of horticulture and landscaping, post-harvest technology and horticultural crop production. Postgraduate students take courses such as ornamental horticulture and landscape, fruit and vegetable production, advanced vegetable and fruit production, and post-harvest

technology of horticultural crops. All these courses are in line with the Benchmark Minimum Academic Standards (BMAS) as issued by the regulating agency (NUC), in terms of content and assessment. According to figures supplied by ABU, 35% of agricultural graduates are employed in the government sector, 20% in the private sector, 25% are self-employed, and 20% remain unemployed.

The Agriculture Faculty at ABU uses the [moodle open source learning platform](#) to provide online support for learning, and efforts are being made to develop this further into online courses. The Department of Agronomy at ABU has access to 100 hectares of land of which 30 hectares is cultivated. Ten hectares of this cultivated land is irrigated using surface irrigation methods. ICT facilities are available at the faculty and about 5% of the student population have personal computers. Power supply is dependent on the grid, and there is no provision for standby generators or solar power as an alternative source. The Department also carries out extension services through the provision of training for smallholder and industrial farmers, among others.

The ABU Faculty of Agriculture is integrated with the [Institute of Agricultural Research \(IAR\)](#), which is based at the same location. Originally established in 1922, it was incorporated into ABU in 1962, although formally, it still comes under the direction of the ARCN and has its own administrative structure. The IAR has about 3,000 technical staff which combined with the ABU Faculty of Agriculture makes it the main national centre for agricultural research and education (see section 3 for more information on IAR).

ND/HND programmes

National level

Despite the large number of polytechnics in Nigeria, only seven (3 Federal, 3 state owned and 1 private), were found by this study to have agricultural programmes. However, the Colleges of Agriculture, at both state and federal levels were established for the purpose of enhancing agricultural development particularly in the area of location and surrounding states. Most of these colleges are nominally supervised by the Agricultural Research Council of Nigeria (ARCN), in turn under the Federal Ministry of Agriculture and Rural Development (FMARD).

One of these FCA is the Federal College of Horticulture (FCH), at Dadin Kowa in Gombe State, which is affiliated to NIHORT and is mandated to conduct academic training for extension agents and technicians to National Diploma (ND) and Higher National Diploma (HND) in Horticultural Technology and related disciplines. It also conducts short-term training activities in vocational skills acquisition for farmers, processors and other agro-allied groups; training of youth and vulnerable groups in horticultural enterprises, imparting appropriate technologies to farmers, and multiplying improved seed and seedlings for distribution to farmers. It has no provision for e-learning facilities nor distance learning.

The FCH has about 189 technical staff, 3 PhD, 44 MSc, 69 BSc, 50 HND or equivalent and 22 with ND or equivalent; only 11 of these are women. It has some 315 students, about 200 at ND level, and 115 at HND level, including ND programmes in horticultural technology, agricultural technology, crop production, and agricultural and bioenvironmental engineering technology. HND programmes include horticultural technology and agricultural extension. FCH estimates that about 50% of their graduates go into self-employment, with 20% employed in the private sector, 15% in the government sector, and 15% unemployed. It has relatively little in the way of external collaboration.

The College has 1192 hectares of land, 983 of which is cultivated, and 109 hectares irrigated, equipment including tractors, vehicles and buses, as well as laboratories for agronomic, entomology, post-harvest and soil science practicals. It is one of the very few colleges that can boast of 24 hrs supply of electricity due to closeness to a major power dam in the country apart from solar powered electric facilities.

Kano State

Two main colleges of agriculture operate in Kano state: The Federal College of Agricultural Produce Technology (FCAPT), and the State owned Audu Bako College of Agriculture (ABCOA).

The [Federal College of Agricultural Produce Technology \(FCAPT\)](#) is supervised by the Nigerian Stored Produce Research Institute (NSPRI), a parastatal under the FMARD, being first established in 1975 as a sub-station of NSPRI and becoming a diploma awarding institute in 2008. It offers ND programmes in Agricultural Technology, Horticultural Technology, Science Laboratory Technology, Food Technology, Computer Science, Statistics, Animal Health and Production Technology; HND programmes in Computer Science, Agricultural Extension and Management, Pest Management Technologies; as well as a broad range of diploma and certificate programmes (including produce inspection, food storage, agribusiness management, etc.).

[Audu Bako College of Agriculture](#) was established as the Audu Bako School of Agriculture in 1978 by the Kano State Ministry of Agriculture and Natural Resources (KMANR), merged with with four other tertiary Institutions belonging to the Kano State Government to form the Kano State Polytechnic (KSP), and then in 2002 again became autonomous as Audu Bako College of Agriculture (ABCOA), Dambatta.

Based on their status as a diploma-awarding colleges, most of the faculty members in both colleges are MSc and BSc holders although many are at various level of completing their staff development programmes for additional qualifications. In both FCAPT and ABCOA almost 90% of their faculty members are male, which can be attributed to customs and traditions in that part of the country.

Their programmes consist of practicals (50%), classroom lectures (30%), thesis (10%), online study (2%), offline study (3%) and off campus internships (5%), which is perhaps an improvement compared to other similar colleges. Programme content is regulated by NBTE and may be responsible for the similarity in the structure and content of the two schools. Diploma and certificate programmes are institutionally regulated and not nationally recognized. Neither school has facilities for distance learning, but outreach programmes are normally organised for different stakeholders based on the need and location. ABCOA sits on 80 hectares of land, of which about 50% is cultivated and 3.5 hectares is surface irrigated. FCAPT has 17 hectares, 12 cultivated hectares with no facilities for any form of irrigation.

FCAPT programmes include a compulsory four months internship with organizations like IITA, [Teratiga Company](#) (a feed company and importer of animal feed concentrates from Koudijs Animal Nutrition B.V. in the Netherlands), and [Technology Incubation Centre Kano](#) (under the [National Board for Technology Incubation](#)) after the first year while one year of internship is done after completion of the ND programme. During the academic session, the students have practical sessions every Thursday. According to information from FCAPT, 31% of their graduate are self-employed while 25% are employed by government. The college trained 500 farmers in 2019 in various aspects of horticulture and other areas of agriculture, in its Federally mandated areas of Kano, Bauchi, Gombe, Jigawa and Katsina. As an example, one of the trainings was titled 'Commercial Drying of Fruits and vegetables for Export' for farmer clusters at Sokoto for farmers in Sokoto, Kebbi, and Zamfara and another at Nasarawa for farmers in Nasarawa, Plateau, Kogi and Benue.

In terms of availability of ICT facilities, both colleges have adequate number computers for the students while about 17% and 30% of the students at AUDU and FCAPT, respectively, have personal computers. Electricity is available about 50% of the time at AUDU, and about 40% at FCAPT. Short courses are offered for farmers, private sector businesses, government agencies as the need arises. In some cases, political leaders usually make request for such short courses for their constituencies as a political move particularly during electioneering period.

Kaduna State

ABU (see above) administers the [Division of Agricultural Colleges](#), established in 1977 with own Board of Governing Council and Academic Board. The Division is now under the National Universities Commission (NUC) as an Inter-university Centre while its Academic programmes are regulated by the National Board for Technical Education (NBTE) and funded annually by the national budget. The DAC includes 3 Federal Colleges of Agriculture:

- [Samaru College of Agriculture \(SCA\)](#), located on the same campus as ABU and IAR, which currently offers 3 ND programmes (Agricultural Technology, Agriculture and Bio-Environmental Engineering Technology, Home and Rural Economics) and 6 HND programmes (Agricultural Extension and Management; Agricultural Engineering Technology; Agricultural Engineering Technology; Pest Management Technology; Pasture and Range Management; Home and Rural Economics), as well as the pre-ND programme in Science and Technology. SAC currently has 119 academic staff (19 PhD, 39 MSc; 11 BSc) and 39 are women.
- [Kabba College of Agriculture \(KCA\)](#), located in Kogi State, with some 27 academic staff and 300 students taking ND programmes in Agricultural Technology and Horticultural Technology), and HND programmes in Agricultural Extension and Management, Crop Production Technology, Horticultural and Landscape Technology.
- [The College of Agriculture and Animal Sciences](#), (CAAS) located near Kaduna, with 45 academic staff, offering the ND programme in Animal Health and Production Technology, and HND programmes in Animal Production Technology and Animal Health Technology.

Apart from SCA and CAAS, the only Federally funded college in Kaduna state is the

[The Federal College of Forestry Mechanization, FCFM](#) Afaka, in Kaduna. FCFM was one of the first four colleges under the Forestry Research Institute of Nigeria (FRIN) before the establishment of four new ones to make a total of eight colleges. FCFM offers a broad range of ND, HND, NID and basic science across 6 academic departments, including Agricultural Engineering Technology, Agricultural Extension Management, Agriculture Technology, Crop Production Technology, Forestry Technology and Horticulture and Landscape Technology.

The Department of Horticulture and Landscape Technology at FCFM was established in 2001 and now offers the 2 NBTE accredited programmes of ND-Horticultural Technology and HND Horticultural and Landscaping Technology.

There are about 123 academic staff in the FCFM, with 12 of these in the Dept. of Horticulture and Landscape Technology, with qualifications ranging from HND to PhD, and approximately twice as many men as women. From the evidence available, the college assess students on a competency basis (40%) while the balance is by examination. About 60% of instruction takes place in the classroom, 30% through practicals and 10% during the internship. There is no facility for e-learning but the college is actively involved in distant learning to accommodate other interest outside its catchment area. The college sits on 2700 hectares of land of which more than 90% (2,663 hectares) is cultivated for both teaching and experimental farms. However, there is no provision for any form of irrigation in the school. The college has provision for computers for academic activities and about 35% of the students that have their own personal computers. Public supply of electricity is usually available for about six hours each working day, which hampers academic activities. Research activities are usually government sponsored and the themes are student and faculty generated. The college also engage in extension activities especially for smallholder farmers and industrial farmers based on need. Short courses are mounted for different category of stakeholders including farmers, private sector businesses, government extension agents etc. The college assesses labour market needs and also traces graduate employment. The College has little in the way of external cooperation.

Short-term training (non-accredited)

National level

Apart from the government approved HEI, there are numerous private initiatives that contribute to the development of agriculture/horticulture. Many of these initiatives have the primary aim of developing capacity of the numerous youth who are unable to access study at government approved institutes. Most of these initiatives have their inherent structures based on the founder or agency. A number of these are described in Section 3 (private sector advisory services).

Other examples of skills training in Nigeria include the [Agricultural Skills Acquisition Programme of the recently founded FarmAgric Foundation](#) in partnership with GIZ, which intends to train 500 young persons in contemporary agricultural techniques, using global standard training modules, create awareness on standardized farming practices and make financial aid available to outstanding trainees.

A further notable example of skills training is a parastatal managed by the Federal Government, the [Industrial Training Fund \(ITF\)](#), established in 1971, and which currently has 38 Area Offices (including ones in Kano, Kaduna, Jos), 4 Skills Training Centres (one in Kano, another in Jos), and a Centre for Industrial Training Excellence based in Abuja. The [ITF 2020 training brochure](#) shows a great variety of 2-5 day courses on general and practical “life”, administrative, team building, ICT, management, organizational performance, etc. While these are not agriculturally focussed, they are skills which many employers in the agricultural and horticultural sector say are important and are typically lacking in many graduates. The ITF, however, is not without [critics of its effectiveness](#).

Short agribusiness courses in Nigeria are offered by a variety of providers. [iCRA, in collaboration with IITA](#), offers a 2-week programme to develop sustainable agribusiness relationships. [The Lagos Business School](#) has a 5-month agribusiness management programme. [Sahel Consulting](#) organises training programmes and educational seminars for SMEs and emerging entrepreneurs interested in learning more about the opportunities in agriculture, including training on agribusiness, value chains, policy analysis.

Kano and Kaduna States

The [Leventis Foundation](#), established in 1988, has 6 agricultural schools in Nigeria (and 3 in Ghana), including schools at [Dogon Dawa in Kaduna State](#), and Panda village in [Albasu LGA in Kano State](#).

The Leventis Foundation is a charitable company dedicated to training of farmers in modern and sustainable agricultural practices and rational use of natural resources. Their core activity is to train farmers in more efficient farm management, including the maintenance and repair of simple agricultural tools and equipment; improving soil fertility on a sustainable basis, adopting appropriate high yielding and tolerant crop varieties and efficient livestock production practices; valid alternatives to the practice of shifting cultivation and in making the permanent cultivation of farmland possible by the adoption of proper crop-rotation. They are also involved in training in agro-forestry and modern tillage practices; processing, value addition and marketing of finished agricultural products; healthy nutrition practices, family planning, first aid techniques and handling textiles; to appreciate civic responsibilities, good governance and democracy and business-related activities.

The schools in Kano and Kaduna have departments covering: Crop Production and Agroforestry (tomatoes, okra, wheat, rice, onions, and maize etc.; oil palm, orchard crops in Kaduna; date palm in Kano), Livestock Production (poultry, ruminants, fish, rabbits), and Rural Enterprises Development (agribusiness, farm management, extension), and Engineering (simple tool fabrication). The main training programme is a specialised non-accredited (NBTE) course of one year, free to participants, who get a certificate on completion. These programmes are highly practical (estimated 70% practical time).

Both Kano and Kaduna schools each have about 150 hectares of land, 10 of which irrigated in Kano, and about 130 employees with qualifications ranging from OND to PhD. The schools also offer an extension service, whereby their graduates who serve as extension agents are mentored and receive short-term training to update their skills.

The Leventis Foundation Head Office organizes trainings in the form of Training of Trainers (TOT) seminars for subject matter specialists according to needs assessment. Also, the Head Office sends advertisement to schools for short training programme/courses for members of staff to apply and get trained. The Foundation works with collaborating state governments, partner organisations like the International Institute of Tropical Agriculture (IITA), Society for Family Health (SFH), Pronatura International (PNI), etc.

Curricula development and accreditation

In general, the universities and their programmes are regulated by the National Universities Commission (NUC), and the colleges and their programmes by the National Board for Technical Education (NBTE).

The [National Universities Commission](#) was set up by the Federal Government of Nigeria to attain a stable and crisis-free university system, and to work with Nigerian Universities to achieve full accreditation status for at least 80% of the academic programmes. It is also responsible for upgrading and maintaining physical facilities in the Nigerian university system for the delivery of quality university education, match university graduate output with national manpower needs, and to foster partnerships between the Nigerian university system and the private sector. In carrying out its mandate, NUC regulates the curricula for different academic programmes in all Nigerian Universities and also conducts spot checks of human and materials resources necessary to accredit universities every five years irrespective of the field of study.

The requirements for accreditation of academic programmes are outlined in the NUC documents called The Benchmark Minimum Academic Standards, BMAS (the BMAS for the Bachelor of Agriculture is given in Appendix 5). The Bachelor of Agriculture with specialization in Horticulture was designed to give a more practical and functional training in the discipline. Contained in the BMAS is the philosophy and objectives of each discipline, basic admission requirements depending on the entry point, expected duration of the programme, and required courses and their subject matter. Specifications are also provided for entry qualifications as well as graduation requirements. Included in the BMAS is the classification of degrees upon graduation, as well as status those who are unable to graduate.

The appropriate course evaluation methods are part of the contents of the BMAS. In order for proper assessment of their graduates, the documents also give information on the mode of liaising with employers of labour. To maintain quality, NUC also requires the appropriate staff student ratio for each programme as well as the procedure and need for staff development programme in this very competitive world.

The functions of the [National Board for Technical Education \(NBTE\)](#) as contained in its enabling Decree 9 of 1977 include advising the Federal Government on, and co-ordinating all aspects of technical and vocational education falling outside the universities, and to determine, after consultation with such other bodies, the skilled manpower needs of the country in the industrial, commercial and other relevant fields. It is also responsible for preparing periodic master plans for the balanced and coordinated development of polytechnics and colleges in order to maximize the use of available facilities and avoid unnecessary duplication; as well as recommend the establishment and location of new polytechnics. Recently, the act was extended to include the establishment and maintenance of minimum standards in polytechnics and other technical institutions in the Federation and accreditation of academic programmes in all technical and vocational education (TVE) institutions for the purpose of award of national certificates and diplomas and other similar awards.

NBTE is also responsible for developing curricula, and providing the BMAS for accredited programmes at HD, HND level (see Appendix 7 for description and mandated courses). Curricula are usually developed at a national level with consultants (e.g. from UNESCO) and stakeholders (including instructors, industry, private sector). ND and HND programmes are each for a period of two academic years, with a mandatory one-year internship period after the ND and prior to the HND programme. These programmes are intended to consist of 50% lectures and 50% practical. Assessment is 40% competency based while the balance is 60% as highlighted in the guidelines for such programmes by NBTE.

Other international agencies such as GIZ are now supporting the recent development of Competency Based Education and Training (CBET) curricula under the [“National Skills Qualification Framework” \(NSQF\)](#), which has levels 1-6 (level 4 being equivalent to ND; 5 to HND/BSc; 6 to MSc). National occupational standards have been developed and classified in several sectors of the Nigerian economy, including agro-processing (rice milling), and an NSQ Code of Practice and Operational Manual have been developed and approved. GIZ is training on how to develop and implement such curricula. To date, a horticulture CBET curricula has been developed to level 2, and although it is not yet offered by colleges/technical institutes it is expected to be soon available to suitable and interested agencies (including even e.g. roadside nurseries). ... For such levels based NSQF training, there are no examinations as entry requirements (i.e. it is also open to less literate persons).

Conclusions and Recommendations

The Nigerian AKIS

AKIS actors

The main “agricultural knowledge organizations” in the agricultural sector in Nigeria include mainly:

- 15 mainly commodity-focused Agricultural Research Institutes (ARIs), under the coordination of the Agricultural Research Council of Nigeria (ARCN), including the National Horticultural Institute (NIHORT), and the National Stored Products Research Institute (NSPRI).
- 11 Federal Colleges of Agriculture linked to these ARIs (and hence mostly with a commodity focus, including the Federal College of Horticulture, which comes under NIHORT, and the Federal College of Agricultural Produce Technology, FCAPT, at Kano). Of the 4 specialized Federal Universities of Agriculture (FUNAAB, FUAM, MOUAU – and the Federal University of Agriculture, FUA, which is expected to result from the upgrading of the current Agricultural College in 2020) and the Federal University of Technology (FUTMINNA), only FUNAAB has a dedicated Department of Horticulture.
- About 70 universities (34 Federal; 28 State; 7 private) with significant agricultural programmes (faculties, schools, colleges). Most of these offer general B. Agric programmes, few with specialized programmes in horticulture.
- About 20 State Colleges of Agriculture, mostly offering ND and HND programmes in a range of agricultural subjects; few in horticulture.
- Relatively few (about 3) Innovation Enterprise Institutes (IEIs) with agricultural programmes, and about 4 Vocational Enterprise Institutions offering vocational certificates in Agriculture (including the Leventis Foundation, which has colleges in both Kano and Kaduna States).
- International research institutes, prominent of which is the International Institute for Tropical Agriculture (IITA), with headquarters in Ibadan.

- Relatively few private sector research organizations, including 4 seed companies which are reported to carry out plant breeding activities in Nigeria.

The educational landscape, in particular, is changing rapidly, particularly with the recent rapid growth of private universities (although few of these offer agriculture), and new organizations are newly accredited and/or change status (e.g. from colleges to universities).

Agricultural research is underfunded, compared to other countries globally and even within Africa, at about 0.2% of agricultural GDP. Almost all agricultural research is domestically financed, with relatively little support from outside. About half of the estimated 3,000 FTE researchers are located in ARIs, and half in the Universities.

The main “bridging organizations”, involved in linking farmers and value chain actors to new agricultural knowledge, include the National Agricultural Extension and Research Liaison Services (NAERLS) and the State Agricultural Development Programmes (ADPs). Relative to other States, the ADPs in Kano and Kaduna (KNARDA and KADA, respectively) are quite active, again, funding levels are generally very low, at about 0.6% of agricultural GDP, and hence very few farmers have access to new information via technical services. The REFILS (research-extension-farmer-input linkage) system employed by NAERLS, consisting of regular meetings to jointly analyse farmer constraints, promote new technology, and train extension agents, is hampered by lack of resources. The underlying “training and visit” extension paradigm used by ADPs, promoted by the World Bank in the 1970s and 80s, has now been superseded in many other countries by more systemic or (multi-actor) innovation approaches.

International NGOs such as Sasakawa Global 2000 and Technoserve have been important actors in N. Nigeria, providing both technical advisory services and training (SG2000 mainly in field crops; Technoserve in rice and tomatoes). Both work closely with ADPs. Of international development partners, GIZ has supported training in contract farming, DFID (UK) is starting a new project phase (LINKS), which will likely include support to the horticultural sector, and the World Bank APPEALS project also is currently in initiation.

The private sector in agriculture in N. Nigeria is not well developed. It consists mainly of the many small farmers who produce crops mainly for household consumption, and who have little access to technical, financial information or production inputs. To effectively “link” knowledge organizations such as education and research with these farmers therefore requires emphasis on developing and strengthening farmers organizations who can adequately represent them. Input dealers (seed, fertilizer companies) appear to conduct only limited research or extension activities – with a few exceptions such as East-West Seed, Syngenta and other companies participating in the Seeds4Change initiative. Large-scale processing companies or offtakers also have only limited information services and appear to be operating at considerably less than capacity in some cases. New private sector actor providing information to farmers and extension agents via ICT services, including information on good agricultural practices and also on prospective markets, are still not very widespread in practice, being constrained by the ability of users to pay for such services.

Enabling Environment

The overall “enabling environment” for knowledge and innovation development in Nigeria is also not favourable for efficient and effective innovation in the horticulture sector. Distance to major markets in the South of the country is considerable, limiting incentives. Spending on agricultural research and development is low, compared to international goals and guidelines such as that represented by CADDP, hence limiting innovation in the sector. Stakeholders interviewed cite unfavourable government policies, including access to government funding, import duties, policies on credits and loans and the targeting/ management of these, but also especially the lack of enforcement of existing regulations (e.g. on seed quality, food safety). Finance for the small holder farming sector is not well developed.

In terms of specific policies for skills development in the horticulture sector, development of competency-based education and training (CBET) is not yet developed. Policies to encourage (the limited number of) industry actors and HEIs to interact further, e.g. through further development of apprenticeships and internships, and to encourage more business-oriented education and professional recognition are needed.

AKIS Linkages

The strength of an “Agricultural Knowledge and Innovation System” depends on the extent and effectiveness of the linkages between the organizational actors in that system, as much as the capacity of the individual organizations themselves. Here, the linkages between some of the main actors in the Nigerian agriculture AKIS are briefly considered.

The linkages between universities and colleges of agriculture, with focus on the states of Kano and Kaduna appear to be strong. The newly formed “Division of Agricultural Colleges” (DAC) in both Kano and Kaduna States, under the leadership of KUST-Wudil and Ahmadu Bello, respectively, assure close coordination of the activities of these universities and colleges in these respective states.

The linkages between research – extension and higher education are also generally good – although better in theory than practice. The key element to these linkages is the National Agricultural Extension Research & Liaison Services (NAERLS), which – in theory - brings together researchers (including those of HEI, which conducts about half of the publicly funded research in the country), and extensionists/advisory services. However, the lack of adequate funding (e.g. for attending the regular scheduled meetings) limits the effectiveness of this mechanism.

The linkages between the public and private sectors is acknowledged by many of those interviewed to be weak. Although the need for improving these linkages - especially to involve the private sector more in educational programmes - was recognized by many of those interviewed, the incentive structures to encourage these linkages appears to be limiting. An exception to this generalization is perhaps the growing interest in private service provision, using e-platforms. Even then, linkage with farmers - the main production component of the private sector – will depend on improved farmer organization.

Although a more in-depth study of the linkages between Nigerian and external HEIs in agriculture is not possible here, these appear to be weaker than other countries in the region. One example of this is the relative lack of support to strengthen the agricultural HEI sector and introduce competency-based education and training, compared to other countries in Africa supported, for example, via the [AUDA-NEPAD programme for Agricultural Technical and Vocational Education and Training \(ATVET\)](#), which is supported by [GIZ to develop teaching and instructional materials in a range of value chains](#), for example.

Skills development

There is a broad array of “formal” and “informal” programmes of skills development in the agriculture/ horticulture sectors. Formal programmes include secondary vocational education, national and higher national diplomas (ND/HND) offered mainly by agricultural colleges regulated by the NBTE, and degree programmes (B.Agric., MSc, PhD) programmes offered by universities and regulated by the NUC. Short training programmes, from a few days to a few months in duration and mostly unaccredited, are organized by ADPs, NGOs, dealers such as seed companies, specialised advisory companies, colleges, universities and others, often working in partnership.

The more formal 2-year ND, 4-year HND, and especially 5-year B.Agric. programmes are regarded by many actors in the commercial sector as being too academic, lacking in practical technical skills, as well as entrepreneurship/business skills and general workplace/ “life”/ “soft” skills. Many employers in the agricultural sector find graduates from non-agricultural disciplines just as employable,

preferring to supplement with in-house training programmes as needed. University and sometimes college programmes are traditionally academic and are delivered with emphasis on theoretical concepts and principles, more than the practical, work related skill needs or the priorities of industry actors.

In discussions with representatives of universities, colleges and ADPs, there was recognition of the need to improve various skills in formal education programmes, although there was little consensus about which of these (e.g. technical, agribusiness, life/ management/ communication skills) was of greatest priority, possibly because academicians/teachers remain unaware of the main kinds of practical, work-place skills that their ex-students often lack, when they enter the world of work.

The national B. Agriculture programme – which follows the standard NUC approved BMAS - is very general, with opportunities for practice (on campus plots, internships) mainly concentrated in the 4th “practical” year, and opportunities for specialization (e.g. in horticulture or particular crops) mainly limited to elected research projects in the 5th year. There was some indication that universities have increased the inclusion of agribusiness skills in their agricultural programmes in the last few years, although not to the degree comparable with specialised business schools, or to the degree needed by employers.

ND and HND programmes offer more opportunities to specialize – there being a greater variety of accredited programmes and scope for adaptation to local conditions – and graduates of these programmes are more appreciated by employers, these programmes are still largely theory and not skills based/assessed. The NBTE is currently looking into the possibilities of introducing competency-based training and education – as is happening in other African countries, often with external support - this concept is still unfamiliar to many in the agricultural colleges and universities and is not yet formally offered at any accredited colleges.

Although some universities offer distance learning programmes in agriculture, these are not yet predominantly “e-based” or online. “Blended learning” programmes, such as that being trialled for training of trainers by WUR, were not known in the universities visited in N. Nigeria. There are a small number of e-learning or virtual knowledge platforms being developed by private companies in Nigeria to provide farmers with technical, financial and market information, but these are not yet widespread due to the inability or reluctance of farmers to pay for such commercial services.

System-wide improvements

The AET system

The inadequacies of the Agricultural Education and Training (AET) system to support agricultural development have also long been recognized in Africa³⁸. The “Jinja Consensus” of 2003 called for the creation of an African agricultural university which could build “a cadre of agricultural graduates who go on to become entrepreneurs and wealth creators, rather than cogs in the wheels of existing agricultural education, research and extension organizations”³⁹. The privately funded [EARTH university in Costa Rica](#) is often mentioned as a model for such a university, and the [Regional Universities Forum \(RUFORUM\)](#) has also championed reform in tertiary agricultural education at continental level.

³⁸ Chakeredza S., Temu A.B., Saka J.D.K., . Munthali D.C., Muir-Leresche K., Akinnifesi F.K., , Ajayi O.C., and G. Sileshi, 2008. [Tailoring tertiary agricultural education for sustainable development in Sub-Saharan Africa: Opportunities and challenges](#). Scientific Research and Essay Vol.3 (8), pp. 326-332.

³⁹ Spielman D.J., Ekboir J., Kristin Davis K., and Ochieng C.M.O., 2008. [An innovation systems perspective on strengthening agricultural education and training in sub-Saharan Africa](#). Agricultural Systems 98 (2008) 1–9

A broader look at AET systems to support agricultural innovation systems in 2012 was given by Charles Maguire in the World Bank Investment Sourcebook on Agricultural Systems⁴⁰. He also recognized that past neglect and low levels of investment had left graduates poorly prepared for the needs of modern agriculture and noted that employers increasingly demand “soft” skills, such as leadership, communication, negotiation, facilitation, and organizational capabilities, skills which foster active participation in agricultural innovation systems. According to Maguire, the major need for AET reform is to develop a policy framework and policy management capacity to guide AET, based on closing the gap between stakeholder expectations and current academic programmes, and developing lifelong learning. This will require more sustainable funding, less political interference in university administration, improved governance, and a favourable investment environment. All of these observations apply to the Nigerian AET. And as Maguire also noted, such comprehensive reforms typically take 10-20 years.

Minor changes of content in college and university programmes can be accommodated within existing curricula. More major changes or new programmes need Nigerian universities and colleges contacted update curricula about every 5 years. Significant and structural changes of emphasis in Nigerian curricula towards more soft skills, more systemic, business-oriented value chain approaches in agricultural education, will need liaison with the regulatory agencies; NUC in the case of universities (BSc programmes), and the NBTE in the case of colleges (OND/HND programmes). As these regulatory agencies are within the Ministry of Education, close liaison with stakeholders from the agricultural sector are required if new curricula are to meet sectoral needs. While any such changes in curricula can be useful, they need to be accompanied with changes of pedagogy, focus on skills rather than just knowledge (e.g. through a competency-based approach, especially at vocational level), increased opportunities for developing practical skills on campus and in the workplace (attachments, apprenticeships) greater involvement of industry in determining educational outcomes (e.g. through greater involvement governance of educational organisations). Ultimately, many of these more structural changes will require changes in legislation, and hence political will at high levels.

The rapid development of private universities and colleges in Nigeria, albeit to a lesser extent in agriculture, is likely to promote many of these needed reforms. In the shorter term, therefore, efforts to support those relatively few private agricultural colleges (such as Leventis) and universities (such as Landmark) are likely to find changes easier to achieve than in organizations under state and federal government. Ultimately, however, deeper transformation of the national AET system will be needed to have the significant impact required on the wider agricultural knowledge and innovation system.

The EAS system

As the DLEC report of 2019⁴¹ notes, “The idea of EAS [extension and advisory services] as solely the purview of a government extension agency is now history”. EAS providers include public agencies, agribusinesses (input suppliers, product buyers, financial agencies), producer organizations, NGOs, civil society interest groups, mass media, and private farm advisors. Together, these providers form what can be called a national EAS system, the effectiveness and efficiency of which depends on how well they are linked, motivated, and coordinated.

⁴⁰ Maguire, C. 2012. Agricultural Education and Training to Support Agricultural Innovation Systems. In: [Agricultural Innovation Systems: An Investment Sourcebook](#). The World Bank, Washington.

⁴¹ Developing Local Extension Capacity Project, 2019. [Strengthening Private Sector Extension and Advisory Services Portfolio Review](#). DLEC Project. USAID, Washington D.C.

As a system, separate elements are necessary to provide different services to different client groups with different needs and capabilities, with the different service providers working separately or collaboratively. There follows that there is no one “best” EAS model; each country or state needs to develop its own “best-fit” EAS programme, comprising both public and private provision, depending on the needs and capabilities of clients, provider capacities, and incentives for service provision^{42 43}.

Private EAS providers include both for-profit and non-profit entities. For profit entities typically include input suppliers, produce buyers, or dedicated service providers. The strengths of such private EAS include in-house expertise of the provider and the development of long-term business relationships. However, the costs must be recovered directly or indirectly by the provider. The interests of for-profit providers are not inevitably in the interest of society at large of the farmer, and there may be conflicts of interest – real or perceived. While EAS provision by input dealers such as seed companies will undoubtedly be a component of higher value chains such as horticulture, they can be expected to provide only a limited range of services. Fee for service provision is less likely to be viable in production systems involving small farmers in Nigeria in the near future, and donor-funded programmes that support such services are likely to be short-term and unsustainable. Private service providers are less likely to target groups key to inclusive development, such as women, youth or the more resource-poor farmers. In Nigeria, and in programmes supported by the Netherlands government, a mix of public and private EAS will be necessary.

Policy makers and donors typically naturally want to evaluate the outcomes of investments in EAS. Nevertheless, and while evaluations of (mostly public) investments in agricultural extension in the 1980s and 1990s often gave economic returns in the range 10-80%⁴⁴, evaluation of EAS is complex and comparing different advisory services within pluralistic advisory systems raises formidable methodological questions⁴⁵. It is therefore not possible to say whether private or public advisory services are more effective, or which offer the best returns to investment.

The weaknesses of the Nigerian EAS system are well recognized, both in the DLEC reports and elsewhere. Major challenges include a frequent policy changes, inadequate funding, poor leadership, low participation by the private sector, weak linkages, and ineffective approaches⁴⁶. The system is further complicated by the interventions of different international organizations, including the World Bank, IFAD, USAID, FAO, as well as bilateral programmes and a range of implementing agencies (Sasakawa Global 2000, GIZ, Technoserve, etc.). According to the recent (2019) DLEC report, a national extension strategy that promotes demand-driven and all-inclusive extension services has been finalized and is pending approval by the Federal Government; however, the current status of this report is unknown to the authors. Nevertheless, any Netherlands initiative to strengthen elements of the overall EAS system should be consistent with that strategy. One such area where the

⁴² Birner, R. K. Davis, J. Pender, E. Nkonya, P. Anandajayasekeram, J. Ekboir, A. Mbabu, D. Spielman, D. Horna, and S. Benin, 2009. [From Best Practice to Best Fit: A Framework for Analyzing Agricultural Advisory Services Worldwide](#). Journal of Agricultural Extension and Education 15(4): 341-355.

⁴³ Faure, G., Davis, K.E., Ragasa, C., Franzel, S. and S. C. Babu, 2016. [Framework to Assess Performance and Impact of Pluralistic Agricultural Extension Systems: The Best-fit Framework Revisited](#). IFPRI Discussion Paper 01567

⁴⁴ McNamara, P.E., 2014. [A review of sustainable financing of extension services in developing countries](#). MEAS discussion paper series on good practices and best fit approaches in extension and advisory service provision. University of Illinois at Urbana Champaign, USA.

⁴⁵ Faure *et al*, 2016 (ibid).

⁴⁶ Chibuzo, I., Chikerenma, A., 2015. [Redefining the Nigerian Agricultural Extension System for Effective Agricultural Transformation](#). Developing Country Studies, 5, pp 11-15.

Netherlands could focus individual organizational and individual capacity strengthening is at the level of NAERLS.

NAERLS

To improve the coherence and efficient functioning of the EAS and the Nigerian AKIS, strong, identifiable and recognized organizations and mechanisms are needed which can bring the different actors together. While the Federal Department of Agricultural Extension (FDAE) is charged with system coordination, at an operational level, the organization with the nearest mandate and capacity to do this is NAERLS.

NAERLS has several current strengths. It has a mandate for linking knowledge generation (research) and application (extension) and a key role in training of agricultural advisory services. It has strong linkages with the state ADPs, national research organizations, universities and colleges of agriculture. As well as its headquarters located at Amadu Bello University in Zaria, it has offices in the 6 agro-ecological zones, giving it a broad geographic coverage throughout Nigeria.

However, NAERLS would benefit from organizational reform and strengthening in several aspects. First, its vision is still largely based on the “training and visit” approach to agricultural extension. Even World Bank, which promoted this approach in the 1980s, acknowledged its deficiencies about 2 decades ago. A more modern and effective approach needs to acknowledge the pluralistic nature of rural advisory services and develop the NAERLS role of facilitating linkages within the knowledge and innovation systems operating paradigm. Key to this role will be to develop stronger partnerships between the government, NGO and private sectors, which in turn will require focus on policy development, capacity strengthening, quality control of advisory services, etc. It will also require a stronger, more qualitative focus on monitoring and evaluation for learning, to balance the current, largely quantitative focus on performance surveys and accountability. In this work, it should liaise closely with the [Agricultural Extension Society of Nigeria \(AESON\)](#) and a [Nigeria Forum for Agricultural Advisory Services \(NIFAAS\)](#), which is in turn linked to the [Global Forum for Rural Advisory Services](#), among others.

While some capacity strengthening in innovation systems approaches would be useful to nudge NAERLS in the right direction (and the Netherlands is well placed to offer such capacity strengthening), a more substantial revision of the NAERLS strategy is needed. As the DLEC report suggests, for NAERLS to have more robust engagements with the private sector, a revision of governance, performance management, accountability mechanisms, mandate and legal framework will probably be required. And as NAERLS forms an integral part of the ARCN “system”, any such changes will need to be linked to the ongoing policy and strategic review of the overall NARC “system”.

AKIS coordination and supervision

Recognition of the problems with the Nigerian AKIS such as those noted in this report is not new, with the World Bank producing its “Report on Strategic Options for Revamping Agricultural Research and Extension Systems in 2004, for example⁴⁷. The Agricultural Research Council of Nigeria (ARCN) was then established in 2006 with a mandate to coordinate, supervise, and regulate agricultural research, training, and extension in Nigeria –in effect, the Nigerian AKIS.

Over the years, the ARCN underwent several reorganizations, but remained ineffective for four main reasons: ineffective governance, lack of funding, low human capacity and poor communication⁴⁸.

⁴⁷ As cited in Babu et al, 2017.

⁴⁸ Ibid.

Reform of the ARCN was seen as required to better support the [Agricultural Transformation Agenda \(ATA\)](#), which aims at transforming agriculture into an efficient sector of the national economy. This reform has been extensively addressed by the IFPRI report “Strategies for Restructuring the Agricultural Research Council of Nigeria: Process, Opportunities and Lessons⁴⁹”, following a process starting in 2015, although it has yet to be legislated and implemented.

The comprehensive proposals outlined in the IFPRI report address organizational strategy and structure, human resources and capacity strengthening, funding and fund utilization, the integration of research, extension and education, the role of federal colleges of agriculture, mechanisms for IPR, private sector participation, governance and the regulatory mandate of the ARCN as the main oversight body of the Nigerian AKIS. The reforms proposed promote a results-based framework for effective priority setting, resource mobilization, focused implementation of research programs, enhanced and timely delivery of results, monitoring and evaluation (M&E), impact assessment, and improved networking among partners domestically and internationally.

In relation to the agricultural education sector, the report recommends a series of actions to promote collaboration and synergy between the research organizations and universities. Recognizing that the relationship between the ARCN and the FCAs is currently administrative, and that there is no interaction on technical matters, the report proposes to more properly domicile supervision of the FCAs within the ARCN and address the funding needs of the FCAs. It also recognizes the need to better harmonize ATVET curricula – currently regulated by the NBTE, under the Federal Ministry of Education – with national agricultural policies and strategies, although it is less clear on how to do this.

To address the current underinvestment and bring research expenditure more in line with CAADP guidelines, the IFPRI report proposes the establishment of a National Agricultural Research and Extension Fund to be financed through a levy on imported agricultural commodities, as well as seek access to national and international competitive grants, commissioned research from farmers organizations and the private sector, etc. As a means to encourage the currently low investment in research by the private sector, it also suggests that ARCN should provide matching funds to such private research investments.

Finally, the IFPRI report outlines modifications to the to the ARCN act that will be required to effect the above changes.

This current report can do little more than endorse the proposals of the IFPRI report and ongoing ARCN reform process, as the main way of addressing the weaknesses noted in the Nigerian AKIS. Substantial involvement in the ARCN reform is likely to be beyond the current scope of Netherlands intervention in Nigeria, but the EKNL should be aware of this process and support related activities where possible.

Opportunities for Netherlands support

Previous studies mentioned in Section 1 have already identified areas for Dutch support to Nigerian food systems in general, and particularly the seed and vegetable sectors in Northern Nigeria. The opportunities identified here are intended to build on those recommendations, especially in the area of support to HEI and skills development in the horticultural sector.

1. Strengthen the capacity to develop a new vision and structural reform of education, extension and advisory services. Future strengthening of the AET and EAS systems in Nigeria will require both capacity strengthening of individual service providers from both private and

⁴⁹ Babu, S.C., Oyedipe, E.O., Ajakaiye, O. and K. Ajoni, 2017. [Strategies for restructuring the Agricultural Research Council of Nigeria](#). IFPRI Working Paper 41.

public entities, as well as mechanisms to assure quality, objectivity and accountability of these services. Field level staff will require improvement of knowledge and skills in organizing farmers for collective action, and linking farmer groups to the input services and markets they require⁵⁰

While playing a lead role in the reform of the AET, EAS and AKIS systems is probably beyond the scope of Dutch involvement in Nigeria, selective capacity strengthening of key staff in NAERLS could provide an impetus to review NAERLS strategy, approaches and activities as part of the ongoing strategic reforms of extension services in Nigeria, and support the overall reform process of the ARCN. The Netherlands has strong leadership in the conceptual development of agriculture innovation systems and food and nutrition systems, which is also needed in key Nigerian organizations such as NAERLS and the ARCN.

2. Support the further development and introduction of Competency-Based Education and Training (CBET) in ND and HND programmes. This should be done in collaboration with NBTE and selected colleges, and ideally in collaboration with GIZ and aligned with the ATVET CAADP Project. This would be necessarily be a longer-term endeavor (5 years or more), as it would involve policy changes, accreditation procedures, training of instructors in the new approach, as well as development of training materials and student assessment procedures. Promotion of a CBET strategy will also encourage industry actors and HEIs to interact more, through e.g. the development of relevant occupational standards, development of training materials, location of apprenticeships, etc.
3. Support the establishment of new Horticultural Departments in Ahmadu Bello University (ABU) and the Federal University of Technology (FUTMINNA), as well as strengthen the existing Federal College of Horticulture at Dadin Kowa, and the Horticultural Department at the Federal University of Agriculture at Abeokuta. Support to ABU appears especially opportune and timely, because of its location in N. Nigeria, current plans to separate a new Horticulture Dept. from the existing Agronomy Dept., and also its leadership of the “Division of Agricultural Colleges” (DAC) in Kaduna.

In Kano state, the Kano University of Science and Technology (KUST-Wudil), which coordinates the Kano Division of Agricultural Colleges (DAC), including the Kano State Institute of Horticulture (KIHORT) at Bagauda (not yet accredited by NBTE but developing a ND programme) are also potential candidates for support.

In both Kaduna and Kano, efforts to support these universities – and hence the associated agricultural colleges – could include development of curriculum (where this fits into existing curricula review processes), especially in the case of the new Horticultural Department at ABU. Shorter term measures - more likely to fit with the current OKP schedule - could also include changes in teaching methods and the scaling up/out of the blended learning methods and training materials already being introduced by Dutch partners (see recommendation 4, below).

4. Strengthen existing horticultural research and professional organizations: The National Horticultural Research Institute (NIHORT) is currently the main public organization involved in breeding horticultural crops. In addition, NIHORT supervises the Federal College of Horticulture (FCH). Staff interviewed indicated a need to further improve techniques in breeding and development of vegetable crops and improve regulation of the seed sector.

⁵⁰ Courses on building such business relationships include iCRA’s own courses on “[Making Agribusiness Work](#)”, which are offered in Nigeria and elsewhere.

Dutch companies, such as East-West seed already have links with NIHORT, and this collaboration should be encouraged and strengthened as a potential model for public-private partnerships in varietal development. In line with recent recommendations and proposals included in the [National Seed Road Map for Nigeria](#), the Netherlands can strengthen the infrastructure and technical capacity of NIHORT and the FCH to develop and implement the regulatory functions that are needed for Nigeria to implement a functioning plant variety protection system (e.g. in line with the [UPOV convention](#)).

Support to the Horticultural Society of Nigeria (HORTSON), to enable private sector recognition of professional development in the horticultural sector, identify and coordinate opportunities for internships, improve postgraduate skills in vegetable production, would also bring long-term benefits.

5. Expand on the development and introduction of blended learning platforms and programmes in horticulture. The current pilot programme of blended learning, being supported by the Seeds4Change Project, and currently involving both ABU and Bayero universities, offers possibilities for continued scaling out to other interested training organizations in N. Nigeria and embedding in more academic programmes. In the longer term, a blended learning platform such as that proposed in the recent WUR publication "[Capacity building for seed and vegetable sector developments](#)⁵¹" could provide a strong basis for broad support to the sector in Nigeria as well as opportunities to share experience with other similar initiatives elsewhere⁵².
6. Support student practical plots at universities, colleges and link these to farmer field schools managed by students in the practical year (universities), or as part of ND and HND programmes. All universities are mandated by BMAS standards to provide 0.5 hectare per student; the 4th year of the B. Agric. Programme offers good opportunities for interested students to learn how to manage practical vegetable plots. Experience with HortiLife in Ethiopia shows that introducing practical student plots and FFS is an effective way to introduce new technology to small holder farmers.
7. Provide support for practical internships (SIWES) for students from universities and colleges through Dutch supported projects such as HortInclude. One of the biggest limitations to practical horticultural skills development within academic programmes is the lack of suitable opportunities (and financing) for internships in the vegetable sector. Provision of financing for student attachment stipends, at approx. EUR 50/month, would also be an effective way of supporting practical and workplace skills development. Activities by Dutch funded projects to systematize the learning element and assessment of this learning during internships, would also be valuable.
8. Provide support to "incubation programs" similar to that of the IITA [Business Incubation Platform](#) and the [Technology Incubation Centre Kano](#) (under the [National Board for Technology Incubation](#)), with application of ICT. This would strengthen agripreneurship within HIs, making agriculture more attractive for youth. It would also strengthen the link between research and entrepreneurship (valorisation).

⁵¹ Mulerrins, J. L., Thijssen, M. H., Subedi, A., van Koesveld, M. J., & Vermue, A. 2020. *Capacity building for seed and vegetable sector development: Blended learning for food system professionals*. (WCDI-20-102). Wageningen Centre for Development Innovation, Wageningen University & Research.

⁵² The Corona pandemic came just as this current study was being completed. While it is therefore beyond the scope of this report to analyse implications of this crisis for agricultural education in Nigeria and Dutch support, it is very likely that it will give fresh impetus to efforts to expand online and blended learning.

9. Strengthen farmer group organization and management, e.g. with the [Federal Cooperative College in Kaduna](#), and with [Agriterra](#) or members of the [AMEA network](#) in the Netherlands. The aim here would be to provide colleges and universities with more representative and operational partners from the private sector with whom they could develop linkages and hence ultimately improve the relevance of their educational programmes.
10. Provide specific and targeted short training programmes, by Dutch green HEIs in collaboration with Nigerian organizations in topics such as:
 - Concepts and approaches to strengthening agricultural innovation systems, and extension advisory services;
 - Curricula development processes (including how to effectively include private sector and stakeholder interests), with NBTE and selected universities, colleges;
 - Competency-based education and training in agriculture (concepts, development, delivery, assessment), with NBTE and selected universities, colleges;
 - Farmer Group/Cooperative development and strengthening (e.g. with the Federal Cooperative College in Kaduna, and with Agriterra or members of the AMEA network in the Netherlands);
 - Other specific themes including:
 - Good agricultural practices in vegetable production (e.g. with NIHORT, KIHORT, ABU, BUK, Leventis);
 - Post-harvest practice and processing (FCAPT);
 - Breeding, seed development and seed systems regulation (NIHORT, Audu Bako CA, ABU);
 - Value chain concepts and facilitation (ABU, BUK, Audu Bako CA, NAERLS);
 - Agribusiness skills (Leventis Foundation, FCAPT, ABU, BUK, KNARDA, KADA, NAERLS);
 - “Soft” or “Functional” skills: facilitation of farmer groups and value chain/stakeholder linkages, adult learning, etc. (NAERLS, KNARDA, KADA, ABU, BUK).

Key Entry Points for support to HE in Horticulture

For strengthening formal higher education (at ND, HND, BSc level), and also short courses to develop practical skills in horticulture (with emphasis on the vegetable sector), the following organizations were identified as a result of the study:

- At National level:
 - Federal University of Agriculture at Abeokuta (FUNAAB, now under FMARD), NUC accredited
 - Federal College of Horticulture, Dadin Kowa, Gombe State (under NIHORT – ARCN-FMARD; but NBTE accredited)
- In Kano State:
 - Kano State University of Science and Technology at Wudil (KUST, NUC accredited) and Division of Agricultural Colleges (DAC), including Kano Institute for Horticulture (KIHORT)

- Federal College of Agric. Produce Technology (FCAPT – Under NISPRI-ARCN; NBTE accredited)
- Audo Bako College Agriculture at Dambatta (State College of Agriculture; NBTE accredited)
- Bayero University (Fed. University; NUC accredited)
- In Kaduna State:
 - Ahmadu Bello University and Division of Agricultural Colleges (ABU - Federal University, NUC and NBTE accredited)
 - Federal College of Forestry Mechanisation (FCFM, under Forestry Research Institute, FRIN -ARCN- FMARD; NBTE accredited)
 - Federal Cooperative College, (FCC Kaduna), Kaduna; offering NBTE accredited ND programmes In Cooperative Economics and Management.
- Kano/Kaduna
 - Leventis Foundation Colleges (Private Foundation, Non-accredited programmes)

Appendix 1 - Terms of Reference

Terms of Reference: Agricultural Education Scoping Nigeria	
Country	Nigeria
Sector	Agri & Food
Start	1-10-2019
Project duration	4 months
Project information	
Project purpose	This project maps the formal agricultural education system in Nigeria as well as the formal and informal agricultural knowledge and information structures and activities in the states of Kaduna and Kano. The provided information will be used as basis for the development of interventions and institutional cooperation in the field of agro-education in northern Nigeria.
Strategic embedding	<p>Nigeria is a new priority country for both the Dutch Ministry of Foreign Affairs (MoFA) and the Dutch Ministry of Agriculture. The MoFA has recently signed an MoU with the Nigerian government in which agricultural development and cooperation is a central theme.</p> <p>The horticulture sector is identified as one of the focus sectors in the Multi Annual Country Strategy (MLS) of the EKN in Nigeria. The development of the seed sector directly contributes to SDG 2 (Zero hunger), 8 (Decent work and economic growth) and 17 (Partnerships for the goals) and indirectly to SGD 4 (Quality education) and 5 (Gender equality).</p> <p>SNV, in cooperation with the MoFA, the Dutch Ministry of Agriculture and SeedNL i.o., is currently developing a four-year integrated program on vegetable, potato and seed sector development, concentrating in first instance on Kaduna and Kano. In addition Nuffic is exploring the opportunities in Nigeria for institutional cooperation (making Nigeria an A-status country). Education, training and knowledge exchange are vital for agricultural development. This study will form the basis for the development of interventions and institutional cooperation in the field of agro-education.</p> <p>This study will be implemented in close cooperation with SNV, Nuffic and in parallel and in collaboration with the Nigeria Seed Sector Review.</p>
Institutional setting	<p>Horticulture programme/Scoping mission SeedNL</p> <p>From the 24th to the 29th of March a mixed cluster of organisations (government, private sector, NGOs and knowledge institutes) visited Nigeria (Lagos, Abuja and Kaduna) to explore the opportunities for a Dutch Nigerian collaboration for vegetable and seed sector development. After the mission the Dutch Ministry of Agriculture and the Ministry of Foreign Affairs have decided to develop and fund a combined public-private programme on vegetable, potato and seed sector development in close collaboration with Plantum (Dutch private sector) and the Nigerian Central and Regional governments and the local private sector. During the mission the Nigerian Minister of Agriculture welcomed the Dutch initiative on seed, vegetable and potato sector development. This programme is currently being developed. See strategic embedding for more info.</p> <p>Seeds 4 Change Impact Cluster</p> <p>The overall objective of this project is to further develop the vegetable sector (five crops: tomato, onion, cabbage, watermelon and pepper) in the Kano region (Nigeria) by the provision of quality input materials (hybrid seeds, crop protection and fertilizers) adjusted</p>

	<p>to local circumstances. This will be supported through capacity building activities focused on crop management and good agricultural practices.</p> <p>Bayero University (Kano)</p> <p>Bayero University is already cooperating with the S4C Impact Cluster. The S4C trial site set-up and execution will be supported by students from Bayero University. In this way students learn via practical assignments about how to run variety trails and GAPs and at the same time support the S4C companies. The idea is to include (students of) Bayero in more S4C activities so that the S4C knowledge will be adopted by the next generations of agronomists at Bayero university.</p> <p>Kano State Agricultural Rural Development Authority (KNARDA)</p> <p>KNARDA is a public institution concerned with agricultural development. Amongst others KNARDA offers extension services to farmers. However, their knowledge regarding horticulture is still very limited since their focus was on other crop types.</p> <p>Amadu Bello University</p> <p>The Amadu Bello University is the most prominent university within Kaduna state. Agricultural research and development is one of their focus areas. The institute for Agricultural Research has a seed unit and an extension unit. There are also plant breeders within the university. The development of the farming system is an important mandate. Their research is focused on variety development, variety testing and the dissemination of technologies. Other important research areas are the development of climate smart technologies, irrigation and the development of fertilizers. There is a high demand for certified seed produced by the university. However, the university has a limited mandate: e.g. cowpea, cotton and sorghum are among the mandate crops. Vegetables are currently not a focus area although they are now working on tomato too. The university does not have a horticulture curriculum, neither a seed curriculum. They are willing to cooperate with the Netherlands in the development of the horticultural sector.</p> <p>National Board of Vocational Training Education</p> <p>Its mission is to promote the production of skilled technical and professional manpower for the development and sustenance of the national economy by executing the following tasks:</p> <ul style="list-style-type: none"> • To expand facilities for education aimed at equalizing individual access to education throughout the country; • To reform the content of general education to make it more responsive to the socio-economic needs of the country; • To make an impact in the areas of technological education so as to meet the growing needs of the economy; • To consolidate and develop the nation's system of higher education in response to the economy's manpower needs; • To streamline and strengthen the machinery for educational development in the country; and • To rationalize the financing of education with a view to making the educational system more adequate and efficient. <p>National Agricultural Extension and Research Liaison Services</p> <p>This national authority is in charge of the planning and coordination of agricultural extension services in Nigeria and of research and development of agricultural extension methodologies. In addition it is promoting the dissemination of agricultural research results and technologies. This authority is also monitoring national agricultural performance to provide input for policy and feedback to research.</p>
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	<p>The Nigerian Ministry of Agriculture</p> <p>Since the oil prices dropped dramatically in 2014 followed by an economic crisis, the Nigerian government became aware of the negative effects of the oil-based economy. Therefore, the new strategy of the federal government is focused on the diversification of the Nigerian economy. The focus sector within this strategy is agriculture. Therefore, the MoFA and the Nigerian government have recently signed an MoU in which agricultural cooperation is a central theme.</p> <p>The National Horticulture Research Institute (NIHORT)</p> <p>NIHORT has the mandate to conduct research on genetic improvement, production, processing, storage, utilization and marketing of tropical fruits, vegetables, spices and ornamental plants of both nutritional and economic importance. NIHORT is breeding OPVs, generally based on materials from the World Vegetable Centre. If a company wants to introduce a new variety NIHORT has to monitor the variety trails and assess if the new varieties outperform the already released varieties. NIHORT faces capacity shortage, there are very few well educated breeders. NIHORT also produces certified seed, but with the small quantities produced can only reach few farmers (also for training).</p> <p>Kaduna State Government / Ministry of Agriculture and Forestry</p> <p>Kaduna state is located north of Abuja state and its economy is based on agriculture. Nevertheless, agricultural development is poor. The Governor and the commissioner of Kaduna indicated that access to and use of quality seed and fertilizer is vital for agricultural development and therefore they are very willing to cooperate with the Netherlands.</p> <p>Nuffic (OKP)</p> <p>This programme aims to contribute to a society's sustainable and inclusive development by offering access to education and training to professionals and organisations. Nuffic is currently exploring the opportunities in Nigeria for institutional cooperation (making Nigeria an A-status country). Education, training and knowledge exchange are vital for agricultural development.</p> <p>SDGP horticulture programme</p> <p>The SDGP programme is a cooperation between East West Seed, Wageningen UR, Solidaridad, Amadu Bello University Zaria and the Kaduna Ministry of Agriculture. The SDGP project in Nigeria organizes knowledge transfer to smallholder farmers in Kaduna and Kano state by demonstrating improved cultivation practices in farmer communities and involves the extension service of the Ministry of Agriculture and deploys extension officers in the communities to reach out to more than 100,000 farmers over 5 years.</p> <p>AACE food</p> <p>AACE Foods is an indigenous Nigerian company established in November 2009. They process, package and distribute nutritious and tasty food made from the best of West Africa's fruits, herbs, vegetables and cereals. Their product line consists of spices, spreads, sauces and complementary food that excite and satisfy institutional, commercial and retail customers. AACE Foods has partnered with key international development agencies since 2010 to develop a local supply chain sourcing produce from over 10,000 farmers. It is a member of the 2-SCALE Network. They train, facilitate microfinance and provide farmer clusters with storage technology.</p>
Problem analysis	<p>General context</p> <p>Nigeria is the largest economy of Africa and one of the fastest growing population in the world, with a population of almost 200 million, estimated to grow to 400 million in 2050. This brings demographic challenges in terms of food security, urbanization and employment. There is a government drive for economic diversification away from (only) oil revenue. The</p>

	<p>agricultural sector, which represents 25% of the GDP, is being promoted. Smallholder farmers are the backbone of the agricultural production supplying 95% of all food production in Nigeria. In total, 82 million hectares of Nigeria's 92.4 million hectares is arable land and there are suitable agro-climatic zones (PWC, 2017)⁵³. However, Nigeria relies heavily on food imports to feed its people. Only 50% of the arable land is under cultivation and the land produces low yields.</p> <p>The agriculture sector earned USD 1.4 billion in 2016, and in the same year food imports stood at USD 5.3 billion. The top 5 agriculture imports were in descending order⁵⁴:</p> <ol style="list-style-type: none"> 1. fish; 2. wheat; 3. sugar, molasses and honey; 4. milk, cream and milk products; 5. mixed vegetables, fat and oil. <p>In addition, in the rural areas there are limited opportunities for economic development, which is (particularly) affecting the youth. Agriculture is the main source of income in these rural areas, but due to low income generation it is currently not an interesting future perspective for youth. Most of the farmers are therefore 50 years and older, threatening the continuity in farming and the food security of Nigeria.</p> <p>In Nigeria food security is still critical issue and therefore food production will continue to be a major focus of agricultural education and training institutions for some time to come. There are some trends in Nigerian agriculture that have great impact on food security, such as an agricultural productivity decline as a result of the absence of appropriate technologies, input materials and know-how, followed by high rural-urban migration. Excessive population growth and its problematic distribution pose one of the greatest challenges to successfully tackling food and agricultural problems in Nigeria.</p> <p>In addition, environmental constraints and climate change are already posing serious limitations to food security (availability and accessibility of food) in several states, particularly in areas where population densities are increasing rapidly. Agricultural education should therefore not only focus on increasing agricultural productivity but also on the impact of demographics, rural-urban migration and environmental challenges such as climate change and land degradation and its effects on agricultural development and food security.</p> <p>Agricultural education and knowledge</p> <p>The poor development and the slow growth of the Nigerian agricultural sector – as explained above – is for a large extent caused by the absence of a functioning agricultural knowledge and information system and a lack of governance focused on the effective dissemination of agricultural know-how and technologies.</p> <p>Agricultural educational institutions in Nigeria face several limitations in addressing the critical issues mentioned above. Some of the problems include low enrollment of students, lack of funding for vocational agricultural education and limited interest in and quality of agricultural research. Others include insufficient and poorly qualified personnel and poor education facilities in vocational agricultural education in Nigeria. Good quality education</p>
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⁵³ <https://www.pwc.com/ng/en/assets/pdf/transforming-nigeria-s-agric-value-chain.pdf>

⁵⁴ Source: World Bank, NBS (Nigeria Bureau of Statistics), FMARD (Federal Ministry of Agriculture and Rural Development), UNCTAD (United Nations Conference on Trade and Development), CBN (Central Bank of Nigeria).

	<p>and qualified lecturers are prerequisites for the development of the agricultural sector as a whole. There is need for the institutions to urgently train qualified teachers – and maintain refresher courses occasionally – in order to improve the condition of agricultural education institutes in Nigeria.⁵⁵</p> <p>In addition the dissemination of agricultural knowledge is unorganized. Some universities and research institutes have extension services, but the quality of these services vary greatly and exchange of knowledge is mostly on an incidental basis. Also the (state) governments offer extension services, but these services are mostly poor, outdated and there is little capacity available. The wider impact of successful initiatives – by NGO’s or international organizations – that aim to disseminate knowledge is mostly limited since there is no functioning system to spread knowledge.</p> <p>As being said, agricultural cooperation with Nigeria is on the top of the bilateral agenda and part of the bilateral MoU. The Netherlands is already implementing (or preparing to implement) a number of interventions in the agriculture sector such as SDGP, 2SCALE, the S4C Impact Cluster, SeedNL and the SNV horticulture programme. Furthermore, Nuffic is interested to start institutional cooperation with Nigerian knowledge institutions. Education, training and knowledge dissemination are vital for the success of these initiatives and, more importantly, for agricultural development in Nigeria in general.</p> <p>Therefore, a scoping study is needed to map the agricultural education, knowledge and information structures and existing activities, so that informed decisions can be made on education and training programmes that have a lasting effect on the Nigerian agricultural development.</p> <p>In addition, for the development of the Nigerian agriculture sector the systematic dissemination of knowledge and best practices is of vital importance. Therefore, also policy recommendations need to be formulated to make the first steps towards a functioning agricultural knowledge and information system in Nigeria.</p>
Results	<p>A document of maximum 30 pages (excluding Appendixs) that provides a comprehensive overview of the present status of the formal Nigerian agricultural knowledge and education system. The following results should follow from the report:</p> <ol style="list-style-type: none"> 1. A comprehensive overview of the formal agricultural education system of Nigeria (federal level) has been provided for both public and private education, including data on output and possible an indication of the job careers of alumni; 2. For Kaduna and Kano state both the formal and informal agriculture education, knowledge and information structures and activities have been mapped; 3. Identified entry points and pathways (recommendations) for cooperation in the field of agro-education as input for the horticulture development programme and for Nuffic interventions/institutional cooperation via the Orange Knowledge Platform (OKP); 4. Policy recommendations for the Federal government and the Kano and Kaduna state governments towards a better functioning agricultural knowledge and information system.
Activities	<p><u>Result 1:</u></p> <ol style="list-style-type: none"> 1. Desk research, including: <ol style="list-style-type: none"> a) Analysis of the core characteristics and features of the Nigerian agricultural education system;

⁵⁵ Amadi, N. S., & Lazarus, S. T. 2017. Current Issues in Agricultural Education in Tertiary Institutions in Nigeria. *Int. J. Agric. Earth Sci*, 3(1), 13-18.

	<p>b) Mapping based on a beforehand agreed conceptual/analytical framework of the formal agricultural education system of Nigeria (federal level) for both public and private education, including:</p> <ol style="list-style-type: none"> i. TVET; ii. Agricultural colleges; iii. Higher education and universities; iv. Regulatory/institutional context. <p>2. Validation of the information above during a validation mission or by a local consultant to validate and adjust the analysis of the data collected in the desk study.</p> <p><u>Results 2, 3 and 4:</u></p> <ol style="list-style-type: none"> 1. A preparatory desk research on the formal and informal agricultural education, knowledge and information structures and activities in Kano and Kaduna state; 2. A scoping mission to both Kano and Kaduna state to conduct a mapping of the formal and informal agricultural education, knowledge and information structures and activities, including: <ol style="list-style-type: none"> a) An assessment of the present agricultural knowledge and information structures, educational supply and activities in Kano and Kaduna state (both formal and informal), including: <ol style="list-style-type: none"> i. (Higher) education, technical training (TVET), research and data collection; ii. Knowledge dissemination through networks, such as extension services; iii. Agro-entrepreneurship and the valorisation of (new) agricultural knowledge: link between research and agri-business; iv. Regulatory/institutional context; v. (Informal) structures of knowledge sharing between farmers and (within) farmer cooperatives; b) An assessment of the skills gap in Kano and Kaduna – gap between the skill required by the agricultural sector and the education supply; c) An overview of the activities of NGO's, Dutch and international organisations and donors in the field of practical agricultural education in Kano and Kaduna; 1. Writing a draft report based on the findings of the scoping mission; 2. Validation of the information above and collection of missing information during a validation mission to both Kano and Kaduna state to validate and adjust the previously collected data. <ol style="list-style-type: none"> a. At the end of the validation mission the relevant (preliminary) results will be presented to the Nigerian stakeholders during a stakeholder meeting with relevant knowledge institutions and government representatives, including Bayero University, Amadu Bello University, Kano State Government, Kaduna State Government, Federal Ministry of Agriculture. <p><u>Results 1-4:</u></p> <ol style="list-style-type: none"> 3. Writing a final report in which the abovementioned is described and which contains suggestions for focused interventions and policy recommendations; 4. Presentation of the results during a stakeholder meeting in the Netherlands, including: BZ, RVO, MinLNV, WUR, Nuffic, East West Seeds, NABC and SNV.
Indicator(s) to be used by implementing team	<ol style="list-style-type: none"> 1. 2 stakeholder meetings will be organized, one in Nigeria and one in the Netherlands. During these meetings the findings of the study will be presented to the stakeholders. Total participants: minimum of 10 in Nigeria and 10 in NL; 2. At least 5 bottlenecks of the agro-education system will be identified and recommendations for improvement will be made.

Communication	<ol style="list-style-type: none"> 1. 2 stakeholder meetings will be organized, one in Nigeria and one in the Netherlands. During these meetings the findings of the study will be presented to the relevant stakeholders.
Observations for further development	<p>This scoping study is servicing three programmes in particular:</p> <ol style="list-style-type: none"> 1. The new SNV horticulture development programme in Kaduna and Kano; 2. The Orange Knowledge Programme managed by Nuffic; 3. SeedNL. <p>Via these programmes follow up activities will be formulated within the framework of the concerning programme. Nuffic is currently exploring Nigeria and is looking into putting Nigeria on the A-status list, meaning that institutional cooperation will be possible. This report will provide Nuffic with the necessary information to make this decision and it will help them in the formulation of activities.</p> <p>SNV is currently writing a proposal for a 4 year programme focused on horticulture development. The training of farmers and the dissemination of agricultural knowledge is an essential part of this programme. This report will provide SNV with the necessary information for the formulation of more effective training and knowledge programmes.</p> <p>In addition the information will also be used by RVO (PSD Toolkit & SDGP) and forwarded to the WUR so they can use the information for current activities (like the SDGP on vegetable seeds and the S4C Impact Cluster) or for further the development of new activities in Nigeria.</p>

Appendix 2 – Workplan

Study Objectives

The following objectives were revised on the basis of the “kick-off meeting” held at RVO on 16 October, 2019.

Purpose:

Provide EKN Nigeria (incl. agricultural council) the basis for the development of future interventions and institutional collaboration in the field of agricultural education in northern Nigeria.

Output:

30-page (+ annexes) report with:

1. A brief overview of the Nigerian “agricultural knowledge and innovation system” (AKIS), with specific focus on the horticultural sector in Kano and Kaduna States, and on education and skills development offered by government, non-government (incl. private) entities;
2. A basic assessment of the skills development needed by horticultural labour market, including technological (production, processing), entrepreneurial (business development, marketing), “functional” (soft/life skills) and policy development skills;
3. A basic assessment of the relevant and current skills development programmes by: a) the “formal” sector (higher education institutes or HEIs, comprising universities, agricultural colleges, polytechnics and specialised organizations (federal, state and private); and b) the “informal” sector (professional, on-the job training and short courses, by government, NGOs, service and input providers and advisory services, etc.);
4. Recommendations for
 - a. Strengthening horticultural skills development by Netherlands actors (including Nuffic, SNV, SeedNL and related companies, etc) involved in current and potential future development actions in Kano, Kaduna;
 - b. Opportunities for strengthening horticultural skills development and agriprenuership at Nigerian HEIs (e.g. through institutional collaboration with, or targeted training by NL counterparts, including dissemination of knowledge and the use of blended or “e learning”).

Revised Workplan

Phase	Activities	Outputs	Expected Input (days)	Timeframe (completion)
1 Inception Phase	<ul style="list-style-type: none"> Initial “kick-off meeting” with key study stakeholders (NL) Initial contacts with other key actors (NL) 	<ul style="list-style-type: none"> Revised workplan and timeframe (this document) Preliminary list of actors to interview in Stage 3 	iCRA (1.5) iCRA (3)	Oct. 30, 2019 Nov. 15, 2019
2 Desk Study	<ul style="list-style-type: none"> Literature review of the Nigerian “agricultural knowledge and innovation system” (NL) Literature / internet search to identify HEIs offering programmes relevant to development of horticultural sector (Nigeria) 	<ul style="list-style-type: none"> (Draft) description of the national AKIS, with focus on the horticulture innovation system in Kaduna/Kano (main actors, interactions, enabling environment, etc); list of e.g. 20 organizational actors to interview in more depth in phase 3. List and basic description of (estimated 40) HEIs with educational offer relevant to horticultural sector in Nigeria (focus on Kaduna, Kano); short list (e.g. 15) of HEIs to interview in more depth in phase 3. Revised questionnaire guide and analytical framework for phase 3. 	iCRA (6) CEADESE (5) iCRA (1) CEADESE (1)	Nov 15, 2019 Nov 15, 2019 Nov 15, 2019
3 Stakeholder Survey	<ul style="list-style-type: none"> Virtual (national) and/or face-to-face (Kano, Kaduna), semi-structured interviews with approx. 20 key actors in horticultural sector and informal skills development, including, e.g. <ul style="list-style-type: none"> National government organizations (e.g. ARCN, NIHORT, NBTE, NAERLS, NSPRI); State level agricultural development associations (e.g. KNARDA, KADA) and Ministries of Agriculture - Extension Departments; Relevant International/ National Programmes/Projects (e.g. Feed the Future, NiCOP, PAIRED, DFID-LINKS, etc. Relevant NL projects (e.g. HortInclude, s4C, K2K, 2SCALE); 	<ul style="list-style-type: none"> Information on (e.g.): <ul style="list-style-type: none"> organizational mandates (objectives), relevant activities; collaborative relationships and networks, current projected workforce size, educational levels; labour market needs; in-house training programmes; individual, organizational and institutional capacity development needs; etc. 	CEADESE (10) iCRA (3)	Jan 30, 2020

	<ul style="list-style-type: none"> Private sector: Horticultural Producers, Processors/exporters, NL and Nigerian seed companies (to be identified) Virtual and/or face-to-face, semi-structured interviews with approx. 10-15 relevant HEIs, including <ul style="list-style-type: none"> Universities (federal, state and/or private) with significant horticultural education (and research/outreach) programmes relevant to horticulture in Kano, Kaduna Agricultural Colleges, Polytechnics, Specilised Institutions (federal, state and/or private), with programmes relevant to horticulture in Kano, Kaduna. 	<ul style="list-style-type: none"> Information on: <ul style="list-style-type: none"> offer of current educational programmes relevant to labour market needs (technical, agri-business development, “functional” skills) at different levels (NTC, ANTC, HND, BSc, MSc, PhD) Research and outreach activities (linkage of education with practice) Infrastructure facilities and requirements (land, irrigated and protected cultivation areas, processing/diagnostic laboratories) Future expansion/development plans 	CEADESE (10) iCRA (3)	February 28, 2010
4 Validation Meetings	<ul style="list-style-type: none"> Kaduna (expected 4-5 participants, including NL projects and key government, non-government and private sector actors based in State) Kano (idem) Abuja/Lagos – t.b.d. (EKN and relevant NL and national stakeholders) Netherlands (RVO, SNV, SeedNL, etc) 	<ul style="list-style-type: none"> Presentation of main findings and conclusions/recommendations. Discussion. Revised and validated findings. 	iCRA (7) CEADESE (7)	March 1-15
5 Report writing	Continuous drafting,		iCRA (5) CEADESE (5)	Submission: - March 30, 2020.

Risks and Mitigating Measures

Risk	Mitigating Measure
Study results are too broad, with insufficient depth on labour market demands and skills gaps, leading to insufficient actionable information for potential users (EKNL, SNV, SeedNL, Nuffic)	Focus on horticultural sector, and Kano, Kaduna states, while including information from relevant national-level institutes (as refined and agreed at initial “kick-off” meeting). Close contact with EKN, SNV, etc, at intermediate stages and outputs, to check intended outputs Possible extension of scope-of-work, budget.
Poor communication between implementing partners, and fragmented/disorganized information	Regular (e.g. weekly) contact via skype to mutually update information and understanding
Unavailability of key informants	Flexible use of pre-arranged virtual (phone, skype) and face-to-face interviews
Excessive cost of larger stakeholder meetings in Nigeria (e.g. for interstate travel, per diems, etc.)	Individual “validation” meetings in Kano, Kaduna, Abuja (or Lagos) and Nigeria
Individuals may request non-official payment for provision of data, information, or to support project actions.	A policy of zero tolerance for corruption will be applied by the project implementors. iCRA’s sub-contract with FUNAAB-CEADESE includes an appropriate “integrity” clause. Information gathering will be “triangulated”, making reliance on any one person less critical.
Personal Security	Avoid travel to “red” areas (check with MinBuza reisadvies) and avoid driving long distances (inter-state), using air travel where available.

Appendix 3 - Stakeholders interviewed

Organization	Persons Contacted
ABU	Babaji Bashir
Audu Bako College of Agriculture, Kano	Shehu Abduljalal Datijo
ARCN	Yarama Ndirpaya, Kidda Dajuma, and 14 other senior members of staff
Bayero University	Halima Muhammad Isa
Benue State University	I.I. Yarkwan
BIC Farm Concepts, Nigeria	Debo Onafowara
COLEACP, Belgium	Marie-Hélène Kestemont, Bénédicte Werner, Programme Wester Schepers
East-West Seed, Kano	Ruth Ardzard
EKNL	Ewout de Wit; Temitayo Akinbiyi; Brian Udoh; Abel Neering
FCAPT, Kano	Bashir Barau; Oni Oluwayatayo Olatunde
FCFM	Akintunde Sodimu; Amos Kako
FCH	Abubakar Wakili
FUNAAB	O.O. Olubode
IAR, Zaria	Abdul Lazeez; A.S. Isah
IFDC	Mohammed Selassie
IITA	Zaina Sougrinoma; Stanley Nwachukwu
KADA	Ya'u Kassimu
KNARDA	Sadi Ibrahim; Abba Akkasim
KUST	Munir Abba Dandago; M.A. Dandago
Landmark University	T.M.A. Olayanju
Leventis Foundation, Kano	Raji Babatunde
NABC, Netherlands	Anitra v.d. Kraan
NAERLS	Y.A. Sani; I.E. Ikani; Musa Mohammed; M.M. Jaliya
NBTE	Rufai Ibrahim
NIHORT	Adelani-Adebisi Olujemisi; Olajide-Taiwo
NSPRI	A.O Ajani; K.O. Zaka; P.I. Oriowo; Alimi John Praise
Sahel Consulting	Falaq Tidjani; Temitope Adegoroye
Samaru College	Usman Ibrahim
Seeds4Change, Kano	Kabir Ademoh
SNV, Netherlands	Wim Spieringhs
Technoserve	Oloruntoyin Olorunfemi
University of Ibaden	Adejoke Akinyele; Fred Yakubu
WUR, Netherlands	Flip van Koesveld; Marja Thijssen; Herman Putter;

Appendix 4 - Agricultural Higher Education Organizations in Nigeria⁵⁶

List of Universities (Federal, State, Private)

	University	Faculty/School	Departments
1	Federal Abubakar Tafawa Balewa University, Bauchi	Agriculture and Agricultural Technology	Crop Production; Soil Science; Animal Production, Agricultural Economics and Extension
2	Federal Ahmadu Bello University, Zaria	Agriculture	Agricultural Economics; Agricultural Extension And Rural; Agronomy; Animal Science; Crop Protection; Plant Science; Soil Science.
3	Federal Bayero University, Kano	Agriculture	Agronomy; Soil and environmental Sciences; Animal science; Agricultural Economics and extension
4	Federal Federal University Gashua (FUGASHUA)	Agriculture	Agriculture Economics and extension; Fisheries and aquaculture; forestry and wildlife management; agronomy; animal science; home science and management
5	Federal Federal University of Technology, Akure	School of Agriculture & Agricultural Technology	Agricultural and Resource Economics; Agricultural Extension and Communication Technology; Animal Production and Health; Crop, soil and pest management; Ecotourism and wildlife management; fisheries and aquaculture; food science and technology; forestry and wood technology; teaching and research farm
6	Federal Federal University of Technology, Minna	School of Agriculture & Agricultural Technology	Agricultural Economics and Extension Technology, Animal Production, Crop Production, Food Science and Technology, Soil Science and Land management and Water Resources, Aquaculture and Fisheries Technology.
7	Federal Federal University of Technology, Owerri	School of Agriculture & Agricultural Technology	Agriculture Economics; Agricultural extension; Animal science and technology; crop science and technology; Fisheries and aquaculture technology; forestry and wildlife technology; soil science technology
8	Federal Federal University, Dutse, Jigawa State	Agriculture	Agriculture Economics; Agricultural extension; Animal science; crop science; Fisheries and aquaculture; forestry and wildlife; soil science
9	Federal Federal University, Dutsin-Ma, Katsina	Agriculture and Agricultural Technology	Agricultural Economics and Extension, animal science; wildlife management

⁵⁶ Data from [Nigerian Universities Commission](#), [National Board for Technical Education](#), individual HEI websites.

10	Federal	Federal University, Kashere, Gombe State	Agriculture	Agriculture; Agricultural education
11	Federal	Alex Ekwueme University, Ndufu-Alike, Ebonyi State	Agriculture	Department of Agriculture and Department of Fisheries and Aquaculture for take-off. The programs being housed under Department of Agriculture are: Agriculture Economics, Agribusiness, Animal Science, Crop Science, Horticulture, and Soil Science. Department of Fisheries and Aquaculture runs only Fisheries and Aquaculture as a program.
12	Federal	Federal University, Oye-Ekiti, Ekiti State	Agriculture	Agricultural Economics and Extension; Agronomy; Animal science; fisheries and aquaculture; food science and technology; forestry and wildlife management; soil science; water resources and agrometeorology
13	Federal	Federal University, Wukari, Taraba State	Agriculture	Animal Production and health; Fisheries and aquaculture; Forestry and wildlife; Food science and technology; Soil science; crop production; Hospitality and hotel management
14	Federal	Michael Okpara University of Agricultural Umudike	College of Agric Economics, Rural Sociology & Extension	Agribusiness management; Agricultural extension and rural sociology; agricultural economics
			College of Animal Science And Animal Production	Animal breeding and Physiology, Animal nutrition and Forage science; Animal production and livestock management
			College of Applied Food Science and Tourism	Food science and technology, Human Nutrition and Dietetics; Home science/Hospitality management and tourism
			College of Crop And Soil Science	Agronomy, Plant health management; Soil science and meteorology
15	Federal	Modibbo Adama University of Technology, Yola	Agriculture	Agricultural Economics and Extension, Animal Science and Range Management, Crop Production and Horticulture, Crop Protection, Fisheries, Food Science and Technology, Forestry and Wildlife Management and Soil Science
16	Federal	National Open University of Nigeria, Lagos	Agriculture	Agricultural Extension and Rural Development; Animal science and fisheries; Crop and Soil Sciences
17	Federal	Nnamdi Azikiwe University, Awka	Agriculture	Agricultural Economics and Extension; Animal science and technology; Crop science and horticulture, Fisheries and aquaculture, food science and technology; Forestry and Wildlife management; Soil science and Land resources management
18	Federal	Obafemi Awolowo University, Ile-Ife	Agriculture	Agricultural Economics; Agricultural Extension and Rural Development; Animal Science; Crop Production; Soil Science; Family, Nutrition & Consumer Sciences
19	Federal	University of Abuja, Gwagwalada	Agriculture	Agriculture, Bachelor of Agriculture (Food Science and Nutrition) and Bachelor of Agriculture (Water Resources, Aquaculture and Fisheries).

20	Federal	Federal University of Agriculture, Abeokuta	College of Food Science and Human Ecology	Food Science and Technology; Home Science and Management; Nutrition and Dietetics; Hospitality and tourism
			College of Agricultural Management and Rural Development	Agricultural Economics and Farm Management; Agricultural Extension and Rural Development; Agricultural Administration; Communication and General Studies
			College of Animal Science and Livestock Production (COLANIM)	Animal Breeding and Genetics; Animal Nutrition; Animal Physiology; Animal Production and Health; Pasture and Range Management
			College of Plant Science and Crop Production	Crop Protection, Horticulture, Plant Breeding and Seed Technology, Plant Physiology and Crop Production, and Soil Science and Land Management.
21	Federal	Federal University of Agriculture, Makurdi	College of Agricultural Economics & Extension	Agricultural Economics; Agricultural Extension & Communication; Agricultural Management
			College of Agronomy	Crop Production; Crop & Environmental Protection; Plant Breeding & Seed Science; Soil Science
			College of Agricultural & Science Education	Agricultural Education; Science Education; Educational Foundation and General Studies
			College of Animal Science	Animal Production; Animal Breeding & Physiology; Animal Nutrition
			College of Forestry & Fisheries	Fisheries & Aquaculture ;Forest Production & Products; Plant Breeding & Seed Science; Social & Environmental Forestry; Forestry Wildlife & Range Management
			College of Food Technology & Human Ecology	Food Science and Technology; Home Science and Management; Nutrition and Dietetics;
22	Federal	University of Calabar	College of Agriculture, Forestry and Wildlife resources Management	Animal Science, Agricultural Economics, Agricultural Extension and Rural Sociology; Food Science and Technology; Crop Science; Forestry and Wildlife management
23	Federal	University of Ibadan	Faculty of Agriculture and Forestry	Agricultural Economics, Agricultural Extension Services, Crop Science, Soil Science, Horticulture, Animal Science, Agricultural Biochemistry and Nutrition, Crop Protection, Crop Improvement, Forest Resources Management, Fisheries Management and Wildlife Management.
24	Federal	University of Ilorin	Agriculture	Agricultural Economics and Farm Management; Agricultural Extension and Rural Development; Agronomy; Animal Production; Crop Protection; Home Economics and Food Science; Forest Resources Management

25	Federal	University of Jos	Agriculture	Agricultural Economics and Extension, Animal Production; Crop Production; The Farm
26	Federal	University of Maiduguri	Agriculture	Agricultural Economics; Agricultural Extension services; Animal Science; Crop Production; Crop Protection; Fisheries; Forestry and Wildlife; Soil Science
27	Federal	University of Nigeria, Nsukka	Agriculture	Agricultural Economics; Agricultural Extension; Animal Science; Soil Science; Food Science and Technology; Crop Science
28	Federal	University of Port-Harcourt	Agriculture	Crop and Soil science; Agric-Economics and Extension; Animal Science; Fisheries; Forestry And Wildlife; Food Nutrition and Home Science
29	Federal	University of Uyo	Agriculture	Agricultural economics and Extension; Animal Science; Crop Science; fisheries and Aquaculture; Food science and Technology; Forestry and Environmental Management; Human Ecology, Nutrition and Dietetics; Soil Science and Land Management
30	Federal	Usumanu Danfodiyo University	Agriculture	Agricultural E+A1:E42conomics; Agricultural Extension & Rural Development; Animal Science; Crop Science; Fisheries and Aquaculture; Forestry and Environment; Soil Science and Agricultural Engineering

		University	Faculty/School	Departments
1	State	Adamawa State University Mubi	Agriculture	Agricultural economics and Extension; Animal Production; Crop Science; fisheries and Aquaculture;
2	State	Adekunle Ajasin University, Akungba	Agricultural Sciences	Agricultural Economics; Agricultural Extension and Rural Development; Agronomy; Animal Science; Forestry and Wildlife Management; Fisheries
3	State	Akwa Ibom State University, Ikot Akpaden	Agriculture	Agricultural Economics and Extension; Animal Science; Crop Science; Soil Science; Fisheries and Aquaculture;
4	State	Ambrose Alli University, Ekpoma	Agriculture	Crop Science; Animal Science; Soil Science, Agricultural Economics and Extension
5	State	Chukwuemeka Odumegwu Ojukwu University, Uli	Agriculture	Crop Science; Fisheries; Forestry and Wildlife And Ecology; Education and Agriculture; Soil Science; Agricultural Economics and Extension; Food Science
6	State	Cross River State University of Technology, Calabar	Agriculture	Animal Science; Agricultural Economics and Extension; Agronomy; Fisheries and Aquatic Science; Forestry and Wildlife Management

7	State	Delta State University Abraka	Agriculture	Agronomy; Agricultural Economics; Agricultural Extension; Animal Science; Fisheries; Forestry; Soil Science
8	State	Ebonyi State University, Abakaliki	Agricultural and Natural Resource Management	Agricultural Economics and Extension; Animal Science; Fish and Aquaculture; Soil Science and Environmental Management
9	State	Ekiti State University	Agricultural Sciences	Fisheries and Aquaculture Management; Agricultural Economics and Extension services
10	State	Enugu State University of Science and Technology, Enugu	Agricultural and Natural Resource Management	Animal/Fisheries Science and management; Food Science and technology; Agricultural and Natural Resource Management; Agricultural Economics and Extension
11	State	Ibrahim Badamasi Babangida University, Lapai	Agriculture	Agricultural Economics & Extension Services; Crop production; Animal Production
12	State	Ignatius Ajuru University of Education, Rumuolumeni	Vocational & Technical Education	Agricultural science; Home Economics and Hotel management; Technical Education
13	State	Imo State University, Owerri	Agriculture and Veterinary Medicine	Agricultural Economics, Extension and Rural Development; Animal science and Fisheries; Crop Science and Biotechnology; Soil Science and Environment
14	State	Kaduna State University, Kaduna	Agricultural Sciences	Agricultural Economics and Extension, Animal Science and Crop Science
15	State	Kano University of Science and Technology, Wudil	Agriculture and Agricultural Technology	Agricultural Science and Education;
16	State	Kebbi State University of Science and technology, Kebbi	Agriculture	Forestry & Fishery; Agriculture
17	State	Kogi State University, Anyigba	Agriculture	Agricultural Economics & Extension (Option); Animal Production (Option); Soil and Environmental Management (Option); Crop Production; Fisheries & Aquaculture; Food Science & Technology; Home Sciences
18	State	Ladoke Akintola University of Technology, Ogbomoso	Agriculture	Agricultural Economics; Agricultural Extension and Rural Development; Crop Production and Soil Science; Crop and Environmental Protection; Animal Nutrition and Biotechnology; Animal Production and Health
19	State	Kwara State University, Ilorin	Agriculture and Veterinary Medicine	Agricultural Economics and Extension services; Animal Production, Fisheries and Aquaculture; Crop Production; Food Science and technology

20	State	Ondo State University of Science and Technology Okitipupa	Agriculture, Food and Natural resources	Agricultural economics and Extension; Animal production and Health; Crop, Soil and pest management; Fisheries and Aquaculture Technology; Forestry and Wildlife management; Food Science and Technology
21	State	River State University	Agriculture	Animal Science; Forestry and Environment; Food Science And Technology; Home Science And Management; Fisheries; Crop/soil Science; Agricultural Economics And Extension
22	State	Olabisi Onabanjo University, Ago Iwoye	Agricultural Sciences	Crop Production; Animal Production; Home and Hotel Management; Cooperative and Business management; Agricultural Economics; Agricultural extension
23	State	Nasarawa State University Keffi	Agriculture	Agricultural economics and Extension; Animal Science, Agronomy; Fisheries; Forestry and Wildlife; Home Science and Management
24	state	Niger Delta University Yenagoa	Agricultural Technology	Agricultural Economics, Extension and Rural Development; Animal Science; Crop and Soil Science; Fisheries and Aquatic Studies
25	State	Osun State University Osogbo	Agriculture	Agricultural economics and Extension; Animal Science, Agronomy; Fisheries and Wildlife Management
26	State	Tai Solarin University of Education Ijebu Ode	Agriculture	Agricultural Extension; Agronomy; Agricultural Science; Animal Production; Fishery & Wildlife Management; Agricultural Economics
27	State	Taraba State University, Jalingo	Agriculture	Agronomy; Animal Science; Agricultural Economics and Extension
28	State	University of Africa, Toru-Oria	Agriculture	Agricultural Economics and Extension Services; Animal Production and Health; Crop, Soil and Pest Management; Fisheries and Aquaculture; Hotel Management and Tourism
28	State	Moshood Abiola University of Science and Technology Abeokuta		Agricultural technology, Food Technology; Hospitality management

		University	Faculty/School	Departments
1	Private	Afe Babalola University, Ado-Ekiti - Ekiti State	Agriculture	Agricultural Sciences
2	Private	Babcock University, Ilisan	Agriculture	Agricultural Economics and Extension; Animal Science; Agriculture in Agronomy and Landscape Design
3	Private	Benson Idahosa University	Agriculture and Agricultural Technology	Agricultural Economics and Extension Services; Animal Science and Animal Technology; Agronomy and Environmental management
4	Private	Edwin Clark University, Kaigbodo	Agricultural Sciences	Agricultural Economics & Extension; Animal Science; Crop Science; Aquaculture & Fisheries; Forestry & Wildlife; Hotel Management & Tourism
5	Private	Gregory University, Uturu	Agriculture	Agriculture; Hotel Management and Tourism
6	Private	Joseph Ayo Babalola University, Ikeji-Arakeji	AGRICULTURAL & NATURAL SCIENCES	Agricultural Economics and Extension Services; Biochemistry; Computer Science; Food Science and Technology; Industrial Chemistry; Microbiology
7	Private	Landmark University	Agriculture	Agricultural Extension and Economics; Crop and Soil Sciences; Animal Science

List of Polytechnics with significant Agricultural Schools

		Polytechnic	Faculty/School	Departments
1	Federal Polytechnic	Akanu Ibiam Federal Polytechnic	Agricultural Technology	Agricultural technology, Food Technology; Horticulture; Hospitality Management
2	Federal Polytechnic	Federal Polytechnic, Mubi	Agricultural Technology	Agricultural technology; Animal Health; Agricultural and Bio-Environmental Engineering
3	Federal Polytechnic	Federal polytechnic, Ado-Ekiti (EKITIPOLY)		Accountancy; Agricultural Engineering / Technology; Agricultural Technology; Architectural Technology; Business Administration and Management; Chemical Engineering Technology; Computer Science; Electrical / Electronic Engineering; Estate Mangement And Valuation; Food Technology; Glass / Ceramics Technology; Mechanical Engineering Technology; Office Technology And Management; Purchasing and Supply

4	State Polytechnic	Lagos State Polytechnic	School of Agriculture	Fisheries Technology; Agricultural Management Extension; Animal Production and Fisheries; Crop Production and Horticulture
5	State Polytechnic	Rufus Giwa Polytechnic	Agricultural Technology	Agricultural Technology; Animal Health and Production Technology; Fisheries technology; Forestry Technology; Horticulture
6	State Polytechnic	Binyaminu Usman College of Agriculture (BUPOLY)	School of Agriculture	Agricultural Technology; Animal Health and Production Technology; Fisheries technology; Forestry Technology; Home and Rural Economics; Wildlife and Eco-Tourism

List of Federal and State Colleges of Agriculture

	College	Departments
1	Federal Federal College of Agricultural Produce Technology (FCAPT-KANO)	Agricultural Technology; Food Technology; Horticulture
2	Federal Federal College Of Agriculture, Akure (FCAA)	Agricultural and Bio-Environmental Engineering / Technology; Agricultural Engineering / Technology; Agricultural Technology; Animal Health And Production Technology
3	Federal Federal College of Forestry Mechanisation Afaka, Kaduna	
4	Federal Federal College Of Agriculture, Ishiagu (FCAI)	Agricultural Engineering / Technology; Fisheries Technology
5	Federal Federal College Of Agriculture, Moor Plantation, Ibadan	Agricultural Engineering / Technology; Agricultural Technology; Home and Rural Economics
6	Federal College Of Agriculture DAC-ABU Kabba	Agricultural Technology; Horticulture
7	Federal Federal College Of Fisheries And Marine Technology, Victoria Island	Fisheries Technology; Forestry Technology; Horticulture; Labour studies; Marine Engineering Technology; Nautical Science
8	Federal Federal College of Forestry, Jos	Agricultural Technology; Computer Science; Forestry Technology; Horticulture; Statistics
9	Federal Federal College of Forestry, Jericho Hill	
10	Federal Federal College of Horticulture, Dadin Kowa	Agricultural Technology; Horticulture
11	Federal Federal College Of Freshwater Fisheries Technology, New Bussa (FCFFTNEWBUSSA)	Agricultural Technology; Fisheries Technology; Hospitality management
12	Federal Federal College Of Freshwater Fisheries Technology, Baga, Maiduguri	
13	Federal Federal College of Wildlife Management, New Bussa,	
14	Federal Federal College of Land Resources Technology, Owerri, Imo State.	

15	Federal	Federal College of Land Resources Technology, Kuru.	
16	Federal	Federal College of Animal Health & Production Technology, Vom	
17	Federal	Federal College of Animal Health & Production Technology, Ibadan	
18	Federal	Samaru College of Agriculture, DAC ABU, Zaria, Kaduna State	
19	State	Enugu State College of Agriculture (ESCAIEDU)	Agricultural Technology; Horticulture
20	State	Akperan Orshi College of Agriculture, Yandev, Benue	
21	State	Anambra State College of Agriculture, Mgbakwu	
22	State	Audu Bako College of Agriculture, Danbatta. Kano	
23	State	Bauchi State College of Agriculture	
24	State	College of Agriculture and Animal Health, Bakura, Zamfara State	
25	State	College of Agriculture, Jalingo, Taraba State	
26	State	College of Agriculture, Lafia, Nasarawa State	
27	State	College of Agriculture, Zuru, Kebbi State	(Planned upgrade to Federal University of Agriculture in 2020)
28	State	Edo State College of Agriculture, Iguoriakhi, Edo State	
29	State	Enugu State College of Agriculture, Iwollo	
30	State	Mohammed Lawan College of Agriculture, Maiduguri, Borno State	
31	State	Niger State College of Agriculture, Mokwa	

32	State	Plateau State College of Agriculture, Garkawa	
33	State	Yobe State College of Agriculture, Gujba	
34	Specialised	Federal Cooperative College, Ibadan	Forestry Technology; Horticulture
35	Specialised	Federal Cooperative College, Kaduna	

Appendix 5 - Outline of BMAS for B. Agriculture⁵⁷

Description of Bachelor of Agriculture with Options in:

- Agriculture Economics
- Animal Science
- Agricultural Extension and Rural Sociology-
- Crop Science
- Soil Science

Crop Science is taught as one of the core subject areas in Agriculture. Except in two universities, there is no specialization as such in crop production. Rather, all Agriculture students are exposed to crop science courses from the second year of their training. In the fifth and final year, the student of crop science is offered the option of specializing in any of the three broad areas of Crop Production, Horticulture and Crop Protection.

In some universities, Food Science and Technology is taught as a separate degree programme. In others, the Faculty of Agriculture provides courses in Food Science and Technology, which are taken by Agriculture Students. The programme aims at developing in students' orientation for self-employment, local sourcing of raw materials through novel utilization of local agricultural produces and upgrading of indigenous technologies for national food self-sufficiency.

Generally, the first year is devoted to the study of Basic Sciences, and General Studies. The second and third years are spent within the range of courses approved for the programme. The fourth year should be devoted to the Practical Farm Training (not less than 80% should be devoted to practical training on a farm and related industries - There should be no classroom lectures during the practical year). The fifth and final year be reserved for selected options in the student's area of interest and ability.

During the first four years all students pursue a common programme. In the fifth year they are allowed to choose options. In addition to prescribed academic courses in the option area students must carry out a research-oriented project. The project and the course work for the final year should carry a minimum of 30 credit units with the project work accounting for at least 4 units. The major areas in which a student can choose an option include: Agricultural Economics and Extension, Animal Science, and Crops/Soil Science, Horticulture. The prescribed course work in the option year should be made up of 80% of courses from the option area and 20% from other major areas of agriculture.

⁵⁷ Derived from <https://docplayer.net/18242637-Benchmark-minimum-academic-standards-for-undergraduate-programmes-in-nigerian-universities.html>

Prescribed Courses the B. Agriculture Programme (BIMAS)

<p>Yr 1 - First Semester (18 Credits)</p> <ol style="list-style-type: none"> 1.Communication in English 2.Logic Philosophy & Human Existence 3.Physical Chemistry 4.General Biology I (Botany/Zoology) 5.Practical Biology 6.General Physics 7.Mathematics 8.Organic Chemistry 9.Practical Chemistry 	<p>Yr 1 - Second Semester (17 Credits)</p> <ol style="list-style-type: none"> 10.Communication in English II 11.Nigerian People and Culture 12.Social Sciences 13.Organic Chemistry 14.Biology II 15.Organic Chemistry II 16.Mathematics 17.Practical Physics 18.Use of Library
<p>Yr 2 - First Semester (18 Credits)</p> <ol style="list-style-type: none"> 1.Climatology and Biogeography 2.General Agriculture 3.Anatomy and Physiology of Farm Animals 4.Crop Anatomy, Taxonomy and Physiology 5.Principles of Soil Science 6.Principles of Agricultural Economics 7.Introduction to Forestry Resource Management 8.Introduction to Biotechnology 	<p>Yr 2 - Second Semester (19 Credits)</p> <ol style="list-style-type: none"> 8.Principles of Animal Production 9.Principles of Crop Production 10.Principles of Food Science and Technology 11.Introductory Biochemistry 12.Introduction to Computers 13.Introduction to Fisheries & Wildlife 14.Introductory Statistics 15.Entrepreneurial Studies 16.Introduction to Home Economics
<p>Yr 3 - First Semester (17 Credits)</p> <ol style="list-style-type: none"> 1.Non-ruminant Animal Production 2.Arable Crop Production 3.Introduction to Soil Pedology and Physics 4.Introduction to Agricultural Extension and Rural Sociology 5.Introduction to Farm Machinery 6.Applications of Computer to Agricultural Production 7.Crop Genetics and Breeding 8.Introduction to Farm Management and Production Economics 	<p>Yr 3 - Second Semester (18 Credits)</p> <ol style="list-style-type: none"> 9.Ruminant Animal Production 10.Permanent Crop Production 11.Principles of Crop Protection 12.Animal Genetics and Breeding 13.Soil Chemistry and Micro-Biology 14.Extension Teaching, Learning Process & Methods 15.Agricultural Biochemistry and Methods 16.Statistics and Data Processing 17.Entrepreneur StudiesII
<p>Yr 4 – Practical Year (30 Credits)</p> <ol style="list-style-type: none"> 1.Crop Production Techniques (Permanent Arable and Horticultural Crops etc.) 2.Animal Husbandry Techniques (cattle, sheep, goats, poultry, pigs and rabbits) 3.Agricultural Products Processing and Storage 4.Crop Protection and Pests and Disease Control 5.Animal Health Management 6.Soil Fertility, Soil and Water Management 	<ol style="list-style-type: none"> 7.Farm Design, Farm Survey and Land Use Planning 8.Farm Management, Farm Records and Farm Accounts 9.Extension Practices 10.Workshop Practices 11.Farm Mechanization Practices 12.Agricultural Meteorology 13.Report Writing
<p>Year 5 – (Crops/Soil Science/Horticulture Option) - First Semester (22 Credits)</p> <ol style="list-style-type: none"> 1.Vegetable and Fruit Crop Production) 2.Crop Husbandry (Field Crops) 3.Field Experimentation 4.Plant Protection 5.Soil Survey and Land Use Planning 6.Soil Physics 7.Soil and Plant Analysis 8.Soil Chemistry2 <p>Elective</p> <ol style="list-style-type: none"> 9.Seminars 10.Soil and Water Conservation 11.Floriculture 12.Landscape Design 13.Micropropagation 14.Park Design and Management 15.Project 	<p>Year 5 – (Crops/Soil Science/Horticulture Option) Second Semester (17 Credits)</p> <ol style="list-style-type: none"> 16.Crop Husbandry (Plantation Crops) 17.Forage and Fodder Crop Production 18.Plant Breeding (Including Seed Production) 19.Weed Science 20.Post Harvest Physiology and Product Storage 21.Soil Fertility and Plant Nutrition 22.Principles of Irrigation 23.Project 24.Seminar

Year 5 courses descriptions (courses related to Horticulture)

Vegetable and Fruit Crop Production (2 Credits)

History, definition, classification and importance of vegetable crops. Ecological distribution of vegetables and fruits in Nigeria. Varieties and adaptation of exotic vegetables and fruits to the Nigerian environment. Types and systems of vegetable and fruit production. Production practices, harvesting, handling, processing, storage, marketing and utilization of vegetables and tropical fruit crops. Methods of plant propagation. Nursery systems, diseases and pests of vegetables and fruit crops. Horticultural machines and equipment. Principles of producing, planting, maintaining ornamental trees, shrubs, perennials and fruits in the nursery, home and parks

Seed Production Technology (2 Credits)

Structure and nature of seed, functions of parts of seed, seed viability, vigour, dormancy and deterioration. Methods of breaking seed dormancy, production, processing, drying, treatment, packaging, storage and distribution of improved seed, seed certification. Procedures for field inspections; seed legislation and control. Seed testing procedures. Seed programmes in Nigeria. Seed Marketing.

Horticultural Courses offered at FUNAAB

HRT 202: INTRODUCTION TO LANDSCAPING (2 Units)

Definition of landscaping: – Natural versus man-made landscape. Scope and historical sketches of landscaping: to enhance property beauty and value; to provide screening – effect from security and privacy, etc. Types of landscaping, institutional, private property, parks, and recreational area landscaping – e.g. sporting arena. Elements of landscaping colour, texture, etc, Principles of landscaping design, selection criteria for plants and pavings. Review of soft and hard landscaping. Practical: Identification of tropical and subtropical ornamental plants. Visits to places of interest. Plan reading and translation.

HRT 501: VEGETABLE CROPS PRODUCTION (OLERICULTURE) (2 Units)

Principles and practice of vegetable crops production. Major classes of vegetables – indigenous, exotic and wild vegetables. Factors influencing site selection – climatic and soil requirements. Field establishment, management, cultural practices. Processing, storage and marketing. Problems of vegetable production.

Practical: Raising vegetable transplants in the nursery. Seed identification. Fresh produce identification. Visit to appropriate establishments for some few vegetables grown in Nigeria.

HRT 502: PLANTATION CROPS PRODUCTION (POMOLOGY) (2 Units)

Climatic and soil requirements. Fruit tree propagation, selection and preparation of nursery site of cacao, kola, oil palm, citrus, cashew, coffee and rubber, etc. Plantation/orchard establishment: site selection, layout, and land preparation, planning. Crop management/improvement practices. Chemical weed and pest control. Harvesting: Seed control, preservation, storage, packaging, processing and marketing.

HRT 503: POST HARVEST PHYSIOLOGY AND PRODUCE STORAGE (2 Units)

Seed storage and factors affecting storage of seeds, grains fruits, roots, tubers and vegetables. Effect of environment on maturity and senescence. Factors affecting plant nutrition as related to

production of vegetable parts, seeds grain, fruits, tubers. Physical and chemical factors influencing produce quality. Storage of fruits and vegetables; low temperature storage. Locally fabricated low temperature storage structures, e.g. portable evaporative coolant structure. Controlled atmosphere storage, field storage environment. Post-harvest losses and prevention, economic, quantitative, qualitative, nutritional and germination losses.

Practical: Training in handling, harvesting and storage of produce to minimize losses. Traditional methods of produce storage. Visit to Nigerian Stored Products Research Institute and Processing Companies. Seed Storage Environment Structure and Maintenance. Disease and Pest control in storage. Environmental Control Storage.

HRT 504: PROPAGATION OF HORTICULTURAL CROPS (2 Units)

Propagation defined; major types of propagation – sexual and vegetative. Definition and importance of nursery. Nursery management techniques and implication for horticultural crops. Factors of nursery establishment, Fruit-tree propagation, selection and preparation of nursery site, propagation structures and techniques, seed, tissue culture, stem cutting, laying, grafting, budding etc. Micro and macro propagation definition and importance. Introduction to biotechnology. Physiological basis of plant culture at cellular level. Potting media. Nutrient basis in tissue culture. Environmental control in tissue culture. Influence of pathogens on cultures propagates.

Practical: Identification of suitable plants and plant parts for tissue culture. Identification, preparation utilization and maintenance of culture media. Identification of propagation equipment.

HRT 505: DESSERT FRUIT CROPS (2 Units)

Definition of dessert fruit crops. Major classes of dessert fruit crops, indigenous, wild and exotic fruits. Economic importance. Factors affecting their cultivation. Climatic and soil requirements. Distribution of dessert fruit crops – mango, plantain, banana, pawpaw, guava, pineapple, apple, passion fruit, viticulture, date palm etc. Site selection, layout, land preparation, planting. Crop improvement practices. Orchard maintenance. Harvesting, grading, storage, packaging, processing and marketing.

Practical: Land preparation techniques, nurseries and management, visit to orchards of the crops named above. Seed and fresh fruit identification. Grape vine pruning and training. Grape and resin processing.

HRT 506: PARK AND GARDEN DESIGN AND MANAGEMENT (2 Units)

History of gardens. Garden types. Architectural design for local modern parks and gardens. Functional designs for parks and gardens, e.g. parks for family relaxation, parks for holidaying. Concept of national parks and gardens, botanical gardens, horticulture gardens, estate gardens, etc. contracts and contractual agreements. Establishment and management of park and garden. Garden and park facilities and maintenance.

Practical: Design of parks and gardens. How to prepare contract documents: Visit to notable parks and gardens.

HRT 507: ORNAMENTAL HORTICULTURE (2 Units)

Identification of tropical ornament plants. Culture of trees, shrubs and flowers. Shade trees, ground covers, annual flowers, perennial shrubs and hedge plants, bedding and foundation flowers plants, lawn grasses, nursery management, palms as ornamental plants, rock gardens, aquatic plants, forms orchids.

Practical: Field work – to identify various species of trees, shrubs, hedge plant propagation, cutting and seeds, etc. Potting media, flower show. Flower arrangement. Pot flower production. Home beautification – Interior and external decoration.

HRT 508: ORGANIC AND URBAN FARMING (2 Units)

Definition of organic and urban farming. Major types of horticultural crops grown under organic and urban farming. Organic and Urban farming production system. Importance of organic farming. Protected crops cultivation. Peculiarities of organic and urban farming. Concepts of home gardening, market gardening and commercial gardening. Certification of organic horticultural products. Materials used in organic crops production. Sources of organic fertilizer materials. Environmental and earthy implication of organic and urban farming. Influence of urbanization and environmental factors. Problems of organic, urban/dry season horticultural farming. Maintenance of soil fertility and crop protection. Irrigation. Prospects of organic and urban/dry season horticultural farming. Practical: Compost preparation and preservation. Green manures/Farmyard manure identification. Land preparation, appropriate establishments, particularly on techniques, establishment. Visit to organic farming, protected farming and urban farming of interest.

HRT 509: LANDSCAPE HORTICULTURE (2 Units)

Definition of landscaping. Natural versus manmade landscape. Scope and historical sketches of landscaping: to enhance property beauty and value; to provide screening – Institutional, private, property, parks, gardens, roundabout and recreational areas. Landscaping – e.g. gardens, sporting arena, stadia. Design principles, design practice, basic styles, preparing the plan design practice, basic style, preparing the design. Landscape construction. Hard landscaping, soft landscape, contracts and contractual agreements.

Practical: Identification of tropical ornamental plants. Visit to places of interest. Plan reading and translation. Drawing and design production, design concepts. Field work-contour development.

Topographic map production. How to prepare contract documents.

AGS 597: SEMINAR I (1 Unit)

How to use library – Review of literature on special topics and proposal presentation.

AGS 598: SEMINAR II (1 Unit)

Presentation of project report post-data seminar

AGP 599: PROJECT (4 Units)

Special project submitted to the Department in partial fulfillment of the requirements for award of B. Agric. in Horticulture.

Appendix 6 - List of NBTE accredited agricultural programmes⁵⁸

National Diploma Programmes (under agriculture and related technology):

1. Agricultural Extension and Management
2. Agricultural Technology (General Agriculture)
3. Animal Health & Production Technology
4. Animal Health Technology
5. Animal Production Technology
6. Crop Production Technology
7. Fisheries Technology
8. Forestry Technology
9. Home & Rural Economics
10. Horticulture & Landscape Technology
11. Pasture & Range Management
12. Pest Management Technology
13. Soil Science & Technology
14. Veterinary Laboratory Technology
15. Wildlife Management

Higher National Innovation Diploma (HNID) and National Innovation Diploma (NID)

1. Innovation Agriculture
2. Environmental and Safety Management

Programmes available in technical colleges (under agricultural trades):

1. Animal Husbandry
2. Fisheries Craft Practice

National Vocational Certificates (NVC) Programmes available in Vocational Enterprise Institutions (VEIs)

1. Agriculture

Approved National Skills Qualifications (NSQs)

1. Animal Husbandry (poultry, cattle, sheep/goat): levels 1 and 2
2. Aquaculture, levels 1 and 2
3. Fisheries levels 1 and 2
4. Poultry Farming levels 1 and 2
5. Feed Production levels 1 and 2

⁵⁸ Source: [*Directory of accredited programmes offered in polytechnics, technical and vocational institutions in Nigeria; 21st edition, 2019*](#)

Appendix 7 - ND Horticultural Technology Curriculum and Course Specifications⁵⁹

Goal: The National Diploma programme in Horticultural Technology is designed to produce horticultural technicians who are self – reliant, skilled and capable of adopting and imparting modern techniques in horticultural production.

Objectives: A product of National Diploma in Horticultural Technology programme should be able to:

1. Establish horticultural farm enterprises.
2. Employ modern techniques in horticultural crops production.
3. Assist in processing, storage, and marketing of horticultural produce.
4. Assist in pest and disease management.
5. Carry out horticultural extension services.
6. Carry out ornamental gardening and conservation practices.
7. Carry out basic field survey involving land measurements and field layout.

Curriculum:

The curriculum of the ND programme consists of four main components. These are:

- General Studies/ Education.
- Foundation Courses.
- Professional courses.
- Supervised Industrial Work Experience Scheme

The General Studies component shall include courses in: English Language and Communication, Citizenship Education, Sociology, Philosophy, Geography, Entrepreneurship studies. The courses in Citizenship Education, Entrepreneurship and English Language and Communication are compulsory. The General Studies component shall account for not more than 15% of total contact hours for the programme.

Foundation Courses include courses in Economics, Mathematics, Pure Sciences, Technical Drawing, Statistics etc. The number of hours will account for about 10-15% of the total contact hours.

Professional Courses give the student the theory and practical skills he needs to practice his field of calling at the technician/ technologist level. These may account for between 60- 70% of the total contact hours.

Supervised Industrial Work Experience Scheme (SIWES) shall be taken during the long vacation following the end of the second semester of the first year.

⁵⁹ [National Board for Technical Education, National Diploma \(Nd\) in Horticultural Technology Curriculum and Course Specifications, March, 2011](#)

NATIONAL DIPLOMA IN HORTICULTURAL TECHNOLOGY SECOND SEMESTER COURSES ND I

COURSE CODE	COURSE TITLE	THEORY HOURS/WEEK	PRACTICAL HOURS	TOTAL CREDIT UNIT/HOURS
HOT 121	Introduction to Pomology	2	2	4
HOT 122	Introduction to Vegetable Crops Production	2	2	4
HOT 123	Nursery Management Techniques	2	2	4
HOT 124	Graphic Presentation II	0	2	2
AGT 122	Crop Protection	2	1	3
AGT 128	Post- Harvest Technology & Biology	2	2	4
SUG 101	Basic Principles in Surveying	1	3	4
COM 121	Computer Application II	0	3	3
GNS 121	Citizenship Education II	2	0	2
GNS 202	Communication in English II	2	0	2
	SIWES			
				32
TOTAL				480

LIST OF COURSES FOR NATIONAL DIPLOMA IN HORTICULTURAL TECHNOLOGY FIRST SEMESTER COURSES -- ND I

COURSE CODE	COURSE TITLE	THEORY HOURS/WEEK	PRACTICAL HOURS	TOTAL CREDIT UNIT/HOURS
HOT 111	Horticultural Crop Production	2	2	4
HOT 112	Principles of Landscape Architecture	2	1	3
HOT 113	Graphic Presentation I	0	2	2
ABE 101	Introduction to Agricultural & Bio- Environmental Engineering	1	2	3
AGT 111	Principles of Crop Production	2	2	4
AGT 112	Elements of Agricultural Economics	2	0	2
AGT 113	Introduction to Soil Science	2	2	4
COM 001	Computer Application	0	3	3
GNS 101	Communication in English I	2	0	2
GNS 111	Citizenship Education I	2	0	2
				29
TOTAL				435

NATIONAL DIPLOMA IN HORTICULTURAL TECHNOLOGY FIRST SEMESTER COURSES ND II

COURSE CODE	COURSE TITLE	THEORY HOURS/WEEK	PRACTICAL HOURS	TOTAL CREDIT UNIT/ HOURS
HOT 211	Horticultural Seed Production	2	2	4
HOT 212	Floriculture / Garden Design & Development	1	2	3
AGT 127	Principles of Irrigation and Drainage	2	1	3
AGT 212	Agro-Climatology	1	2	3
AGT 215	Soil Fertility & Crop Nutrition	2	2	4
AGT 216	Farm Soil Management	2	2	4
AGT 231	Statistics & Field Experimentation	1	2	3
BAM 116	Introduction to Entrepreneurship	1	1	2
MEC 112	Basic Workshop Practice	0	3	3
				29
TOTAL				450

NATIONAL DIPLOMA IN HORTICULTURAL TECHNOLOGY SECOND SEMESTER COURSES ND II

COURSE CODE	COURSE TITLE	THEORY HOURS/WEEK	PRACTICAL HOURS/Week	TOTAL CREDIT UNIT/ HOURS
HOT 221	Landscape Planning & Design	1	2	3
HOT 222	Horticultural Farming Systems	2	1	3
HOT 223	Introduction to Plant Taxonomy	1	2	3
HOT 224	Introduction to Beverages and Medicinal Plants	1	2	3
AGT 223	Farm Power & Mechanization	2	2	4
AGT 224	Genetics & Breeding	1	1	2
AGT 229	Farm Management	2	0	2
AGT 230	Agricultural Extension & Rural Sociology	3	0	3
BAM 216	Practice of Entrepreneurship	1	2	3
	Project			3
				29
TOTAL				435

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