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Scaling Strategies for Agricultural Innovation in Nigeria

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The Forum for Agricultural Research in Africa (FARA) is the apex continental organization responsible for coordinating and advocating for agricultural research-for-development. (AR4D). It serves as the entry point for agricultural research initiatives designed to have a continental reach or a sub-continental reach spanning more than one sub-region.

FARA serves as the technical arm of the African Union Commission (AUC) on matters concerning agricultural science, technology and innovation. FARA has provided a continental forum for stakeholders in AR4D to shape the vision and agenda for the sub-sector and to mobilize themselves to respond to key continent-wide development frameworks, notably the Comprehensive Africa Agriculture Development Programme (CAADP).

FARA's vision is; "Reduced poverty in Africa as a result of sustainable broad-based agricultural growth and improved livelihoods, particularly of smallholder and pastoral enterprises" its **mission is the** "Creation of broad-based improvements in agricultural productivity, competitiveness and markets by strengthening the capacity for agricultural innovation at the continental-level"; its **Value Proposition is the** "Strengthening Africa's capacity for innovation and transformation by visioning its strategic direction, integrating its capacities for change and creating an enabling policy environment for implementation". FARA's strategic direction is derived from and aligned to the Science Agenda for Agriculture in Africa (S3A), which is in turn designed to support the realization of the CAADP vision.

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Executive Summary

Towards poverty reduction, there is a need to generate agricultural technologies in order to increase agricultural productivity and reduce poverty and hunger among smallholders. But to develop agriculture, efforts must be made to embrace both generation of innovations and taking the innovations to scale. Scaling up of agricultural innovations has adopted different methods; scaling up requires a multi-stakeholder approach among national governments, donor agencies, NGOs, the private sector, research institutions, and extension workers among others.

Horizontal, vertical, and functional approaches are commonly listed for scaling up agricultural innovations; practices on the ground appear however to embrace combinations of the approaches. Technology generation through years of agricultural research in the various NARIs in Nigeria is believed to be way ahead of the rate of use of the various research outputs. If properly packaged, it will help potential beneficiaries of the wide array of the agricultural research outputs from the NARIs who includes processors, farmers, marketers, and allied agro-based businesses.

Cassava is a dual utility commodity in Nigeria; it is used for food and as an industrial raw material. Challenges to cassava development in Nigeria relate to production and post-harvest processing. Cassava Mosaic Disease (CMD) has led to yield losses and is a threat to the livelihood of cassava-growing families. CMD-resistant cassava varieties include NR8082, NR8083, TME 419, TME 98/0505, and TMS 30572. These varieties mature early, give high yields, and peel easily. Scaling up of agricultural innovation using an IP requires that the relevant stakeholders be linked and organised. Under the auspices of the Research into Use (RIU) Program in Nigeria, CMD-resistant varieties were introduced in Abia State through the joint effort of IITA, NRCRI, ARCN, and ADPs. The outcomes of the cassava IP to the farmers include larger farm sizes, access to improved varieties resistant to CMD, and higher productivity. Access to CMD-resistant varieties was generally easier within the IP. The access increased from fewer than 100 farmers in 2009 to over 450,000 farmers by 2010 in Abia State.

The Federal Government of Nigeria (FGN) has taken several steps over the years to use agriculture to alleviate poverty and attain food security. But the efforts faced significant constraints. Agricultural lands have been largely degraded in quality due to expansion of production by expanding cultivated area at the expense of intensive farming. Other factors in the low and declining productivity of the Nigerian agricultural sector include poorly developed irrigation potential, inadequate and poorly funded and maintained production and marketing infrastructure, poorly funded agricultural research and extension systems, inadequate availability and distribution of key inputs (fertilisers, chemicals, machinery, and improved seed), poor or lack of access to financial services for the procurement of needed inputs and services such as processing, storage, and transportation (World Bank, 2013).

The Federal Government of Nigeria, under multi-lateral financial assistance (from mainly World Bank and AfDB) implemented the National Fadama Development Project in three phases between 1992 and 2015, as Fadama I, Fadama II and Fadama III, Fadama III AF, in that order. The Project Appraisal Document (PAD) for Fadama III intended to support the financing and implementation of five main components designed to transfer financial and technical resources to the beneficiary groups in: (i) institutional and social development; (ii) physical infrastructure for productive use; (iii) transfer and adoption of technology to expand productivity, improve value-added, and conserve land quality; (iv) support extension and applied research; and (v) provide matching grants to access assets for income generation and livelihood improvements.

Prior to the Fadama project, the target beneficiaries were disorganised and operated as individuals, widely dispersed across rural space. They lived in communities that are beyond the reach of financial institutions that may be willing and able to extend services to the poor. This facility, i.e., financial support for acquisition of group assets, thus serve as a mechanism to mobilise the formation of community groups, to give FCA members practical financial experience as well as revenue from small income-generating activities. Also, the arrangement made the beneficiaries more attractive to be financed as a group by mainstream financial institutions. This was the innovation or intervention. Fadama II project in 18 states was expanded to cover all the 36 states and the FCT as Fadama III project. The learning and lessons of the CDD were used to scale up the acquisition, ownership and maintenance of productive assets using the group approach.

A total of 64,347 FUGs were registered nationally, of which 48.6 percent owned the listed categories of assets. The productive assets for which at least 1 percent of all nationally registered FUGs acquired included Animal Traction Unit, ATU (3867), tubewell (4409), sprayers (5569), fatten cattle (1220), cassava processing machine (1340), goatry (1076), rice processing machine (1282), tomato/pepper processing machine (1180), fish pond (2423), and poultry production units (2401). In line with the GIC commodity emphasis, our interest here is mainly a cassava processing machine and a rice processing machine.

The state-wise FUEF savings rates analysis shows that only 9 states out of 36 and FCT in the Fadama III project met the requirement of saving 10 percent or more of the replacement value of the assets in the group's possession. These states are: Adamawa (17.4 percent), Bauchi (13.6 percent), Gombe (13.9 percent), Kogi (10.3 percent), Nasarawa (21.2 percent), Niger (14.2 percent), Lagos (10.2 percent), Ogun (21.9 percent), and Plateau (16.6 percent). The national average savings by the group was 4.3 percent.

Fadama III AF was conceived for scaling up impacts on the ground and strengthening the development effectiveness of the well-performing Third National Fadama Development Project (Fadama III). FIII AF was designed to support clusters of farmers in selected states with comparative advantage and high potential to increase production and productivity of cassava, rice, sorghum, and horticulture value chains and link them to better-organised markets,

including Staple Crop Processing Zones (SCPZs) once established. FIII AF was to facilitate linkages between the federation of producers and existing processors. FIII AF retained the development objective of the Fadama III Project.

As a departure from past government interventions, the Agriculture Transformation Agenda (ATA) adopted in 2011 was focused on making improvements along the value chains of a number of prioritised agricultural commodities and working with the private sector. The ATA also differs from past efforts in that it pushes for badly needed policy reforms such as the fertiliser subsidy programme. FIII AF financed the procurement of advisory services to transfer know-how on proper utilisation of factors of production (fertilisers, improved seeds, and agricultural machinery), including advice on the associated downstream activities. The advisory services component comprises two subcomponents, advisory services and input supply. FIII AF used the same approach and strategy of Community Driven Development (CDD). The FIII AF supported critical production activities and organisation of farmers into clusters or out-grower groups in selected states with high potential. The priority value chains supported were rice, cassava, sorghum, and horticultural crops.

The outcomes of innovation scaling up include State-wide access to high-yielding and early-maturing varieties of cassava, namely, TME 419, TMX 30572, TMX 30555; State-wide access to high-yielding and early-maturing varieties of rice, namely FARO 44, FARO 52, FARO 54, FARO 62, FARO 60, FARO 61, FARO 57, with FARO 44 and FARO 52 most preferred/distributed across target states; Productive assets acquired for cassava production by the production groups include a sprayer, a wheelbarrow, a cassava lifter, and a First Aid box; Productive assets acquired for rice production and post-harvest value addition by the relevant groups include a sprayer, a water pump, a generator (for water pump), a milling machine, a de-stoner, and a thresher; and Fertilisers, seeds, and pesticides were accessed using the e-wallet approach proposed under the ATA.

Key Words: Poverty reduction, horizontal scaling, vertical scaling, functional scaling, interventions, scaling outcomes

Introduction

The need for scaling up agricultural innovations

Agricultural growth is the primary source of poverty reduction (Cleaver, 2012). Thus, there is a need to generate agricultural technologies in order to increase agricultural productivity and reduce poverty and hunger among smallholders. But to develop agriculture, efforts must be made to embrace both generation of innovations and taking the innovations to scale. This involves scaling those innovations “that work”. In so doing, the impact of the innovations is sustained and lives of more people are improved (Linn, 2014). In the effort to improve agricultural productivity and rural incomes, it is imperative to take to scale successful innovations. The non-realisation of agricultural growth in Africa is partly due to poor investment in agriculture. Most sub-Saharan Africa (SSA) countries invest less than 10 percent of their annual national budgets in agriculture, contrary to the 2003 Maputo agreement among member nations (Phillip *et al.*, 2016). Pockets of small investments can only lead to innovation impacts that are hard to sustain. Thus, poverty and hunger remain under poor or limited agricultural investments (Cleaver, 2012).

Meaning and scope of scaling up

Scaling up in agriculture has been defined in many related ways. Linn (2014) says, “Scaling up expands, replicates, adapts, and sustains successful policies, programs or projects to reach a greater number of people”. Linn (2014) further maintains that scaling up means that the benefits of successful agricultural technologies can reach more poor farmers. Scaling up also ensures coverage, impact and sustainability of successful interventions.

Scaling up an innovation aims to improve the livelihoods of the end-users. It embraces both technology transfer and ownership of the innovation by the end-users. Ownership ensures sustainability. For sustainability, farmers must be at the centre of the innovation to be scaled up (Nandesha and Reshad-Alam, 2000). In order to “mainstream” the smallholders, Hartmann (2012) defines scaling up to include two components. One, raw products may be “scaled up” in terms of processing or value addition and trading. Two, larger volumes of commodities may be produced, processed, and traded by market actors.

Minimum conditions for successful scaling up

Scaling up of an innovation in agriculture is content specific, meaning that there is no blue print approach that works in all situations or everywhere. As a guide, however, Nandesha and Reshad Alam (2000) list a few principles to follow towards a successful and sustainable scaling up:

- (i) focusing on the end-users, not on the technology. This requires that development workers understand the existing practices that sustain the livelihoods to be improved;

- (ii) not aiming to discard farmers' current practices, but rather propose a holistic integration of the existing and improved practices;
- (iii) teaching the end-users the science underlining the technology being introduced, so that they can appreciate potential links between their indigenous and the incoming practices;
- (iv) ensuring that scaling up does not depend heavily on external inputs, since the end-users are likely poor;
- (v) supporting scaling up with access to information, market and credit;
- (vi) giving each farmer the skill to adapt the technology to own conditions;
- (vii) formulating supporting policies or changing existing ones to support innovation;
- (viii) designing scaling up to accommodate gender differences and preferences;
- (ix) allowing scaling up to promote more communal harmony, not less.

Methods of scaling up agricultural innovations

Scaling up of agricultural innovations has adopted different methods. Whatever method is adopted eventually, Linn (2014) suggests that scaling up requires a multi-stakeholder approach among national governments, donor agencies, NGOs, the private sector, research institutions, and extension workers among others. The broad categories of existing methods include horizontal, vertical, and functional scaling up. In horizontal scaling up, information is transferred from people to people (Nandessha and Reshad-Alam, 2000). It involves working directly with the farmers. Linn (2014) explains horizontal scaling up as a geographical spread of an innovation.

Nandessha and Reshad-Alam (2000) views vertical scaling up as a partnership of institutions with the people. In this sense, the authors caution that farmers are better seen as partners and not just beneficiaries. Halwart and Haylor (2000) classify this as participatory approach. The need for partnership among same-minded organisations or institutions arises from dwindling resources and the need to pool efforts towards maximising the scaling impact. In vertical scaling, Linn (2014) specifically emphasise the need for higher level stakeholders (e.g. national government) to formulate or modify policies to promote technology adoption. Functional scaling up entails widening the scope or number of technologies to be scaled up (Linn, 2012).

Variants of Scaling up Methods

While horizontal, vertical, and functional approaches are commonly listed for scaling up agricultural innovations, practices on the ground appear to embrace combinations of the

approaches. This section presents selected practical experiences and challenges from content-specific cases.

Farmer field school (FFS): A farmer field school is a variant of the horizontal scaling up approach (Halwart and Haylor, 2000). In this arrangement, farmers organise themselves into small numbers per group. Members of a group jointly identify problems, make relevant field observations, and share solutions about the problems. This process may involve a technical trainer. The meeting may be periodic, say weekly with a specified number of hours per meeting. Halwart and Haylor (2000) notes that beyond on-station trials or research, the participation of farmers is needed to make available technologies adapted to local conditions. Farmers must be given lead roles in the local adaptation of technologies. This requires skill improvement and attitudinal changes. Both attitudinal change and skill improvement may take time to materialise. But they are required for sustainable innovation scaling up. Skill improvement requires building the capacity of the end-users (Halwart and Haylor, 2000).

Community approach: This scaling up approach requires the community members to pool resources towards identifying and solving their common agricultural problems. The approach is expected to enhance harmony in the community (Nandessha and Reshad-Alam, 2000). It may require identifying local lead farmers who will teach other farmers.

Partnership with government: A scaling up approach that partners with government will likely ensure the widest coverage and outreach. But challenges exist. These include bureaucracy within governance, suspicion of foreign development workers by local counterparts, and poorer pay structure among local counterparts that may limit their commitment.

Partnership with research institutes and universities: Universities and National Agricultural Research Institutes (NARIs) are prominent partners in every effort to generate and scale up agricultural innovations. In terms of policy, universities and research institutes need to have mandate and interest in doing research for farmers' improvement (Nandessha and Reshad, 2000). The NARIs and universities need to also partner with the farmers, indeed place farmers at the centre of the problem-solving framework. This will enable farmer participation in on-farm trials and make it possible to receive feedback from them for further improvement of the technologies tried. Other modifications of this partnership have involved NGOs and International Agricultural Research Centres (SPHI, 2013).

Pilot trials : Scarcity of funds may limit technology trial to individual or selected farms instead of involving all farmers in a group or within a geographical space. A pilot trial of an agricultural technology is a variant of the horizontal scaling (Demaine, 2000). Once pilot adaptation is verified, farmer to farmer dissemination may be considered.

Innovation Platform (IP): Innovation platform (IP) is a partnership among actors such as agricultural research institutes, farmers, universities, farmers, extension workers, and policy makers, NGOs, and private firms (Fungo *et al.*, 2011). In an IP framework, stakeholders are expected to make varying contributions towards the benefit and sustainability of the value chain. The contribution of stakeholders usually includes skills, time, capacity building,

sensitisation, labour, mobilisation of funds, equipment for construction, creation of awareness, market access, and finance among other items.

Benefits from an IP will normally include increased awareness about the usefulness of an innovation, increase in adoption in terms of the number using an innovation across space, and increase in the number adopting the complementary innovations (those related to the focal innovation).

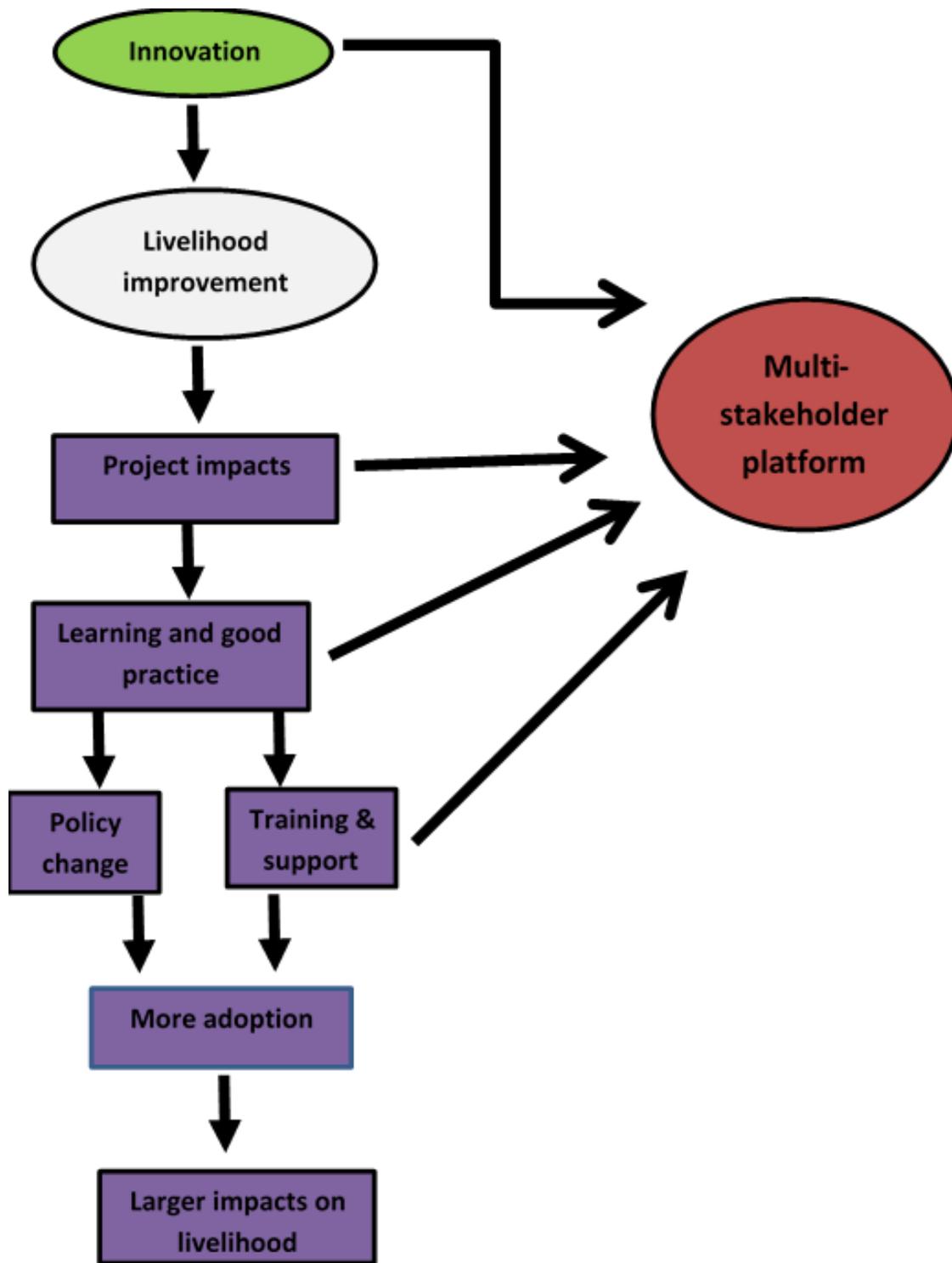
IPs cannot run without hitches. First, stakeholders may differ on problems brought for solution within an IP. Inability to solve a problem may lead to outright non-participation, poor participation or default in payment of membership fee by concerned members. Still, some members get their problems solved, but may nonetheless show poor participation or default in payment of membership fee. To address these and other problems, IPs must be backed by relevant rules and bye-laws (Eneku *et al.*, 2013).

Pathways to Scaling up

Linn (2012) defines a scaling up pathway as the sequence of steps that need to be taken to ensure that a successful pilot or practice is taken from its experimental stage through subsequent stages to the scale ultimately judged to be appropriate. Pathways may differ; examples are (Linn, 2012):

- (i) dissemination within a geographical area;
- (ii) dissemination from one geographical area to another (horizontal);
- (iii) pre-occupation with more than one intervention (functional);
- (iv) engaging tiers of government (local, state, federal) in the dissemination of an intervention (vertical); usually involves policy reform and building of supporting institutions.

In a related context, Linn (2014) outlines the following as constituting a scaling up pathway: initial technology introduction to farmers, evaluation of the adoption process, evaluation of the preliminary impacts, and using the lessons learned to expand adoption and adaptation. This process is captured in Figure 1 (FARM-Africa, 2007):



Source: FARM-Africa (2007)

Figure 1: Illustrative agricultural innovation scaling up pathways

Drivers of scaling up agricultural innovations

The private sector drives both agricultural and non-agricultural value chains, while the public sector supports with policy and institutional reforms. To keep the private sector interested and active along any segment of the value chain, financial returns to its investment is key (Hartmann, 2012). Financial returns may be weak if access to finance, infrastructure, and market are inadequate. Examples in this regard will include finance, rural roads, power or electricity, which will encourage installation of processing facilities.

The experience with the Self-Employed Women's Association (SEWA) is worthy of sharing. The support to producer associations within SEWA includes (i) linkage to banks for credit, (ii) training on farming practices, (iii) access to seed, fertilizer, and rental equipment, (iv) price information on crops, and (v) access to SEWA's processing centres (Desari and Joshi, 2013).

1. Country-specific agricultural innovation scaling

A. Scaling up Cassava Mosaic Disease (CMD)-resistant varieties

Background and rationale : Technology generation through years of agricultural research in the various NARIs in Nigeria is believed to be way ahead of the rate of use of the various research outputs. If properly packaged, it will help potential beneficiaries of the wide array of the agricultural research outputs from the NARIs who include processors, farmers, marketers, and allied agro-based businesses. Cassava is a dual utility commodity in Nigeria; it is used for food and as an industrial raw material. This dual usage has created enormous opportunities that can be harnessed (Daramola *et al.*, 2011).

Challenges to cassava development in Nigeria relate to production and post-harvest processing.

Cassava production problems, prior to IP establishment include (Udensi, 2011):

- limited access to credit;
- high cost of fertiliser
- limited access to CMD-resistant varieties
- high cost of labour
- poor access by women to inputs
- limited market for cassava roots

Challenges in cassava processing include (Udensi, 2011):

- high cost of transporting roots
- lack of post-harvest processing machines or equipment

The intervention/innovation : Cassava Mosaic Disease (CMD) has led to yield losses and is a threat to the livelihood of cassava-growing families. CMD-resistant cassava varieties include NR8082, NR8083, TME 419, TME 98/0505, and TMS 30572. These varieties mature early, give

high yields, and peel easily. (Daramola *et al.*, 2011). The CMD-resistant varieties belong to a larger family of 43 varieties that was jointly bred by IITA and NRCRI.

Scaling up CMD-resistant varieties using IP : Scaling up of agricultural innovation using an IP requires that the relevant stakeholders be linked and organised. Under the auspices of the Research into Use (RIU) Program in Nigeria, CMD-resistant varieties were introduced in Abia State through the joint effort of IITA, NRCRI, ARCN, and ADPs. The cassava IP consists of the following partners:

- post-harvest equipment fabricators
- National researchers (NRCRI)
- International research centres (IITA)
- Extension agency (ADP)
- farmers or cassava growers
- bakers
- input service providers
- financial institutions
- processors

Partners in the cassava IP were given or assumed responsibilities that ensured success. IITA organised NGOs and farmer organisations for varietal distribution across farmers, and demonstrated improved on-farm cassava production practices. NRCRI trained farmers, processors and ADP staff in post-harvest value addition. The Abia State ADP had responsibility for varietal distribution and timely access by farmers. The ADP provides land for on-farm demonstration of improved agronomic practices and identified CBOs and women organisations for reaching out to farmers.

The Nigerian Starch Mill (NSM) Ltd is an industrial cassava starch processor based in Uli, Anambra State. The NSM faced inadequate supply of roots for decades prior to establishment of the IP. Within the IP, NSM offered farmers guaranteed root prices and in turn, was assured a steady supply of roots. Aquada Development Corporation (ADC) also processes cassava roots into high-quality *garri*, provides easy market for cassava roots, and hosts IP meetings.

The Abia State Commissioner for Agriculture and wife of the State Governor were present at the official launch of the IP, lending policy support to the IP.

Print and electronic media (newspapers, radio, and TV) were all present at the launch and gave coverage to the IP activities regularly.

Outcomes of scaling up of CMD-resistant varieties: The outcomes of the cassava IP to the farmers include larger farm sizes, access to improved varieties resistant to CMD, and higher

productivity. Access to CMD-resistant varieties was generally easier within the IP. The access increased from fewer than 100 farmers in 2009 to over 450,000 farmers by 2010 in Abia State.

The Abia State cassava IP assures gender equity in varietal access, larger industrial demand for cassava roots, guaranteed price, and root supply, leading to expanded job opportunities (Udensi, 2011).

B. Scaling up of group access to and maintenance of productive assets under the national Fadama project

Background and rationale: The Federal Government of Nigeria (FGN) has taken several steps over the years to use agriculture to alleviate poverty and attain food security. But the efforts faced significant constraints. Agricultural lands have been largely degraded in quality due to expansion of production by expanding cultivated area at the expense of intensive farming. Other factors in the low and declining productivity of the Nigerian agricultural sector include poorly developed irrigation potential, inadequate and poorly funded and maintained production and marketing infrastructure, poorly funded agricultural research and extension systems, inadequate availability and distribution of key inputs (fertilisers, chemicals, machinery, and improved seed), poor or lack of access to financial services for the procurement of needed inputs and services such as processing, storage, and transportation (World Bank, 2013).

The Federal Government of Nigeria, under multi-lateral financial assistance (from mainly World Bank and AfDB) implemented the National Fadama Development Project in three phases between 1992 and 2015, as Fadama I, Fadama II and Fadama III, Fadama III AF, in that order. Fadama II and III projects have been designed to use Community Driven Development (CDD) approach to maximise the benefits inherent in the Nigerian Fadama resources. Fadama II was implemented in 18 States, with World Bank support in 12 states and the African Development Bank support in 6 States. Fadama III was implemented in the entire 36 states and the FCT, while Fadama III AF was implemented in 12 states.

The Project Appraisal Document (PAD) for Fadama III intended to “support the financing and implementation of five main components designed to transfer financial and technical resources to the beneficiary groups in: (i) institutional and social development; (ii) physical infrastructure for productive use; (iii) transfer and adoption of technology to expand productivity, improve value-added, and conserve land quality; (iv) support extension and applied research; and (v) provide matching grants to access assets for income generation and livelihood improvements” (World Bank, 2008).

The project development objective (PDO) of Fadama III was to increase the incomes of users of rural land and water resources on a sustainable basis. One of the key indicators and targets of

the PDO (World Bank, 2008) was that from project year 2, 10 percent of net earnings from income-generating activities of the FUGs is saved annually.

The Intervention/Innovation: Prior to the Fadama project, the target beneficiaries were disorganised and operated as individuals, widely dispersed across rural space. They lived in communities that are beyond the reach of financial institutions that may be willing and able to extend services to the poor. This facility, i.e., financial support for acquisition of group assets, thus serve as a mechanism to mobilise the formation of community groups, to give FCA members practical financial experience as well as revenue from small income-generating activities. Also, the arrangement made the beneficiaries more attractive to be financed as a group by mainstream financial institutions. This was the innovation or intervention.

For the economically active FUGs, who constitute the majority of beneficiaries, the Project contributed up to 70 percent of the total cost of the subproject demanded while the beneficiaries made upfront cash payment of up to 30 percent of the subproject cost. The cash counterpart payment was deposited in an approved commercial bank/financial institution. In addition, these FUGs were to establish a savings scheme in order to promote community-level capitalisation as well as to ensure sustainability of the investment activities funded through this component. The savings were in the form of a withholding of an amount equivalent to at least 10 percent of the net revenues of the FUGs annually. The vulnerable groups received a matching grant of up to 85 percent from the project. They paid 15 percent counterpart after harvest and/or sale of their marketable surplus.

Scaling up acquisition and maintenance of group assets: Fadama II project in 18 states was expanded to cover all the 36 states and the FCT as Fadama III project. The learning and lessons of the CDD were used to scale up the acquisition, ownership and maintenance of productive assets using the group approach. The SFCO and the facilitators assigned to the FCA assisted in marketing and collection of the dues. Each FCA registered at most one vulnerable group. The CDD approach to Fadama III implementation was to ensure sustainability. The FCAs, FUGs, the Local Government NGOs, and Service Providers were in place to continue after external support. The communities would learn to take own decisions in a socially inclusive and participatory manner. Management maintenance committees existed and were empowered to mobilise member groups. Facilitators had a central role of ensuring that the maintenance plans were operational. Service providers were expected to be continually available and readily accessible to train the users of assets. Availability of spare parts in local markets and utilisation of appropriate technology were expected.

Outcome of group approach to acquisition of productive assets : A total of 64,347 FUGs were registered nationally, of which 48.6 percent owned the listed categories of assets. The productive assets for which at least 1 percent of all nationally registered FUGs acquired included Animal Traction Unit, ATU (3867), tubewell (4409), sprayers (5569), fatten cattle (1220), cassava processing machine (1340), goatry (1076), rice processing machine (1282), tomato/pepper processing machine (1180), fish pond (2423), and poultry production units

(2401). In line with the GIC commodity emphasis, our interest here is mainly a cassava processing machine and a rice processing machine.

The sustainability of the productive assets was assessed indirectly, using satisfaction with asset maintenance and FUEF savings rates. The idea behind picking 'satisfaction with maintenance' is that a high level of this indicator is likely to encourage contribution by members into the FUEF account. The converse is assumed to be true. The average percentage of FUGs who were satisfied with the maintenance of the productive assets was 85.8 percent (FIII-WB), 88.4 percent (FII-WB) and 85.4 percent (FII-AFDB). This indicator of satisfaction confirms equally high satisfaction percentages for the individual productive assets under the Fadama project categories. Specifically, more than 70 percent of the FUGs were satisfied with the maintenance of most of the assets listed.

The FUEF savings rates were analysed into two perspectives, namely state by state and asset-wise. The state-wise analysis shows that only 9 states out of 36 and FCT in the Fadama III project met the requirement of saving 10 percent or more of the replacement value of the assets in the group's possession. These states are: Adamawa (17.4 percent), Bauchi (13.6 percent), Gombe (13.9 percent), Kogi (10.3 percent), Nasarawa (21.2 percent), Niger (14.2 percent), Lagos (10.2 percent), Ogun (21.9 percent), and Plateau (16.6 percent). The national average savings by the group was 4.3 percent.

The productive assets for which savings for replacement was 10 percent or higher included washbore (12.4 percent), Fish pond (15 percent), piggery (62.5 percent), snailry (46.7 percent), grasscuttery (36.1 percent), goatry (18.1 percent), palm oil processing (22.1 percent), cassava processing (11.3 percent), yam processing (10 percent), rice processing machine (33.3 percent), cold rooms (10.4 percent), rentals (21.4 percent), apiary (34.1 percent) and widows (17.4 percent). Again, the national average savings, using the productive assets, tallies with the state-wise analysis (4.3 percent).

C. Scaling up of agricultural input access policy reform

Background and Rationale: Fadama III AF was conceived for scaling up impacts on the ground and strengthening the development effectiveness of the well-performing Third National Fadama Development Project (Fadama III). FIII AF was designed to support clusters of farmers in selected states with comparative advantage and high potential to increase production and productivity of cassava, rice, sorghum, and horticulture value chains and link them to better-organised markets, including Staple Crop Processing Zones (SCPZs) once established. FIII AF was to facilitate linkages between the federation of producers and existing processors. FIII AF retained the development objective of the Fadama III Project.

As a departure from past government interventions, the Agriculture Transformation Agenda (ATA) adopted in 2011 was focused on making improvements along the value chains of a number of prioritised agricultural commodities and working with the private sector. The ATA also differs from past efforts in that it pushes for badly needed policy reforms such as the fertiliser subsidy programme.

Nigeria's ATA consists of four main elements: (i) fixing the fertiliser sector by withdrawing from direct government interventions in fertiliser distribution; (ii) strengthening marketing institutions by supporting private sector-led marketing organisations; (iii) fixing agricultural financing through the Nigerian Incentive-based Risk Sharing for Agricultural Lending (NIRSAL); and (iv) fixing the agricultural investment framework through the development of Staple Crop Processing Zones (SCPZs) as 'clusters' of nucleus and outgrower type arrangements centered on agribusiness investors supported with the necessary public infrastructure services.

Fadama III AF had six components: (i) capacity building, communications and information support; (ii) small-scale community-owned infrastructure; (iii) advisory services and input support; (iv) support to the Agricultural Development Program, research and on-farm demonstrations; (v) asset acquisition for individual Fadama User Groups/Economic Interest Groups; and (vi) project management, monitoring & evaluation, and Environment Management Plan compliance. No change was made in the PDO and in the components of the parent project to accommodate the proposed AF activities. This report is interested in Component IV.

The intervention/innovation: FIII AF financed the procurement of advisory services to transfer know-how on proper utilisation of factors of production (fertilisers, improved seeds, and agricultural machinery), including advice on the associated downstream activities. The bulk of the funds under this component would be for provision of critical inputs needed to ramp up production. In addition, the project-supported productivity improvement of the selected rice, cassava, sorghum, and horticulture value chains by upgrading the parent project's current paper input voucher programme to the use of e-wallet platform to deliver improved seeds and fertilisers to beneficiaries. This way, the Fadama III AF took advantage of the ongoing reforms (liberalisation) in the input sector where private seed and fertiliser companies including agro-dealers deliver inputs directly to farmers. The objective of this support is to ensure timely and equitable access (especially for women farmers) to these critical inputs in good quantity and quality to the production clusters in the project intervention areas where low yields are the binding constraint.

The advisory services component comprises two subcomponents, advisory services and input supply. The advisory needs of farmers were addressed either by ADP extension staff or farmer-selected service providers on a matching grant basis (10 percent co-finance requirement). Under input supply, farmers will receive a grant equivalent to 50 percent of the purchase price of the input per FUG, with the remaining 50 percent due as FUG beneficiary counterpart contribution. Confirmation by the Project of the deposit of the counterpart contribution into the Project account is required before actual purchase of the input. Access to this facility will be for a maximum of 2 years, during which time the FUGs are expected to become familiar with the selected new technology.

The scaling up: FIII AF used the same approach and strategy of Community Driven Development (CDD). The FIII AF supported critical production activities and organisation of farmers into clusters or out-grower groups in selected states with high potential. The priority value chains supported were rice, cassava, sorghum, and horticultural crops. Table 1 shows a description of

the potential of these states in terms of production cluster and processing. The actual selection of states for the implementation of FIII AF was modified as shown in Table 2.

Table 1: Potential Project Intervention Areas

Commodity	State	Strength
Rice	Lagos	Huge market and low capacity utilisation of existing mills
	Niger	Largest producer of rice, presence of production clusters and small scale processing mills
	Enugu/Anambra production Zone	Special Ecological zone with strong processing capability e.g. Omo Rice Mill
	Kano	Large irrigable land and irrigation facilities
Sorghum	Kano	High production potential and large market
Horticulture	Kano	Kadawa, the largest producer of tomato in Nigeria, and existing underutilised capacity for processing
Cassava	Kogi	Large producer of cassava and production cluster

Source: World Bank. 2013. Project Paper for the Third National Fadama Development Project (Fadama III)

Table 2: Value chains and targeted states

Value Chains	Target States					
Cassava	Kogi	Osun				
Rice	Enugu	Ebonyi	Osun	Lagos	Kano	Niger
Sorghum	Niger	Kano				
Tomato	Plateau	Kano				

Source: National Fadama Coordination Office, Abuja.

Outcomes of innovation scaling up:

- State-wide access to high-yielding and early-maturing varieties of cassava, namely, TME 419, TMX 30572, TMX 30555 (Phillip and Jayeoba, 2016);

- State-wide access to high-yielding and early-maturing varieties of rice, namely FARO 44, FARO 52, FARO 54, FARO 62, FARO 60, FARO 61, FARO 57, with FARO 44 and FARO 52 most preferred/distributed across target states (Phillip and Jayeoba, 2016);
- Productive assets acquired for cassava production by the production groups include a sprayer, a wheelbarrow, a cassava lifter, and a First Aid box;
- Productive assets acquired for rice production and post-harvest value addition by the relevant groups include a sprayer, a water pump, a generator (for water pump), a milling machine, a de-stoner, and a thresher; and
- Fertilisers, seeds, and pesticides were accessed using the e-wallet approach proposed under the ATA.

On average, the project was estimated to reach about 317,000 direct beneficiary households and 1.4 million indirect beneficiary households. These smallholder farmers are generally poor and face a number of binding constraints that prevent them from breaking away from poverty. A low-input, low-productivity trap and liquidity constraint are among chief binding constraints that the AF tried to address.

Conclusions

Prior works have unanimously concluded that agricultural innovation scaling up must inevitably rely on a multi-stakeholder approach among national governments, donor agencies, NGOs, the private sector, research institutions, and extension workers among others. The private sector will drive both agricultural and non-agricultural value chains, while the public sector supports with policy and institutional reforms. To keep the private sector interested and active along any segment of the value chain, financial returns to its investment must be assured consistently.

Under the auspices of the Research into Use (RIU) Program in Nigeria, CMD-resistant varieties were introduced in Abia State through the joint effort of IITA, NRCRI, ARCN, and ADPs. The outcomes of the cassava IP to the farmers include larger farm sizes, access to improved varieties resistant to CMD, and higher productivity. Access to CMD-resistant varieties was generally easier within the IP. The Abia State cassava IP assures gender equity in varietal access, larger industrial demand for cassava roots, guaranteed price, and root supply, leading to expanded job opportunities. The organization of small farmers into groups ensured easier access to productive assets financing and maintenance; this approach scaled up across the federating states. The remarkable success underscores the need to organize small farmers, which are individually vulnerable, weak and uneconomic, into larger, more productive, stronger and viable entities. The generation of agricultural innovations is a step towards fulfilling the mandate of agricultural productivity growth and poverty reduction. Scaling the innovations to the end users, using the combination of approaches outlined in this report is an inevitable complement of generating the much desired innovations. We have shown that all hands must collaborate to this end.

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