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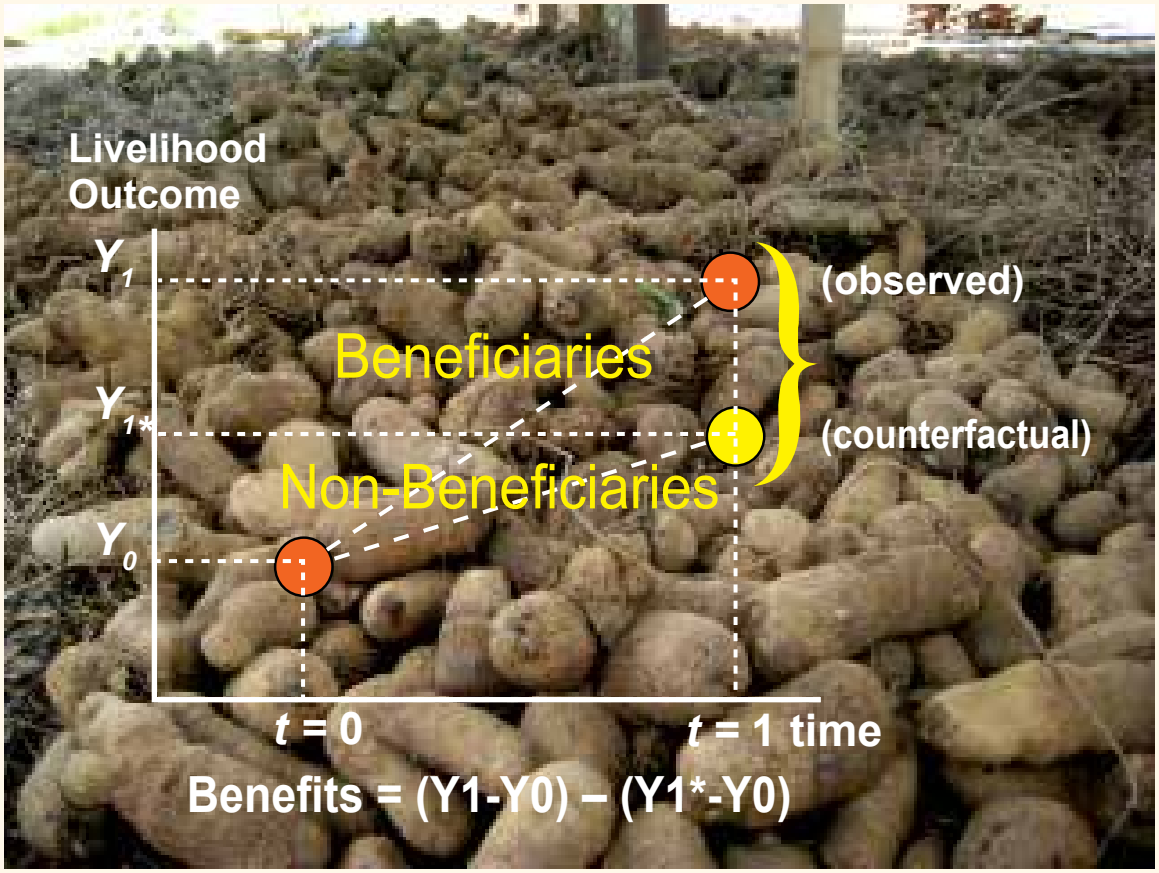
Impact Evaluation Protocols for Agricultural Projects: The Case of Yam Improvement for Income and Food Security in West Africa

Djana B. Mignouna, Adebayo A. Akinola, Tahirou Abdoulaye, Arega Alene, Norbert Maroya, Beatrice Aighewi, Thomas Wobill, and Robert Asiedu



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Impact Evaluation Protocols for Agricultural Projects

The Case of *Yam Improvement for Income and Food Security in West Africa*

Impact-Evaluation Guidelines

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Cover photo: Better harvest had and stored ready for sale in Lambata market, Niger state in Nigeria.

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Project Organizational History

Basis of the Project *Yam Improvement for Income and Food Security in West Africa*

Numerous problems have been identified in the yam food sector that impede efforts in national policy programs aimed at promoting yam as a priority crop in the various countries in West Africa. The high cost and unavailability of disease-free seed yam are major challenges which are linked to a competition between seed and food uses (Ironkwe 2005). This situation is compounded by a high incidence of destructive pests and diseases at both pre-harvest and post-harvest stages; the high labor input associated with land preparation, planting, staking, weeding, and harvesting; and the increasing shortage of virgin land (fertile soil) suitable for the production of the crop. These problems are associated with the low production and post-production technologies that are available in the sector (Maroya et al. 2014). As a way of addressing these myriad constraints, a project known as *Yam Improvement for Income and Food Security in West Africa* (YIIFSWA) was initiated. The project aims in a 10-year horizon to double productivity, stimulate a sustainable increase in incomes for smallholder producers, and contribute to their food security and economic development.

The YIIFSWA project is led by the International Institute of Tropical Agriculture (IITA) and funded by the Bill and Melinda Gates Foundation. IITA is working together with various partners, service provider organizations, the private sector, farmers, and traders (Maroya et al. 2014) to find solutions that will reduce poverty and increase food security through investments in the yam sector.

The vision for the project's first five years is to increase by 40% the productivity (yield and net output) of 200,000 smallholder farmers in Ghana and Nigeria, and deliver key global good research products. After an external mid-term review, the initial seven objectives of the project were repackaged into two major components. One is the seed component, which deals with the development of the formal and informal seed yam systems. It focuses on the reduction of postharvest losses, development of technologies for high ratio propagation of high quality pre-basic and basic seed yam, and identification of more effective tools and strategies for the prevention and management of pests and diseases. The second component (leadership, governance, and partnerships) includes project monitoring, evaluation and learning, communication and information dissemination, project coordination and management, as well as the evaluation and scale-out of production technologies using popular new and local varieties.

To achieve the project's vision, an impact pathway was designed identifying the itinerary from which the intended project interventions should achieve the desired impacts. Together with proper problem diagnosis, the impact pathway was critical in determining what interventions were needed, when and where, to achieve the envisioned results.

The impact pathway for the YIIFSWA project

The impact pathway provides a useful way of conceptualizing the cause-and-effect relationship between different types of changes while impact assessment focuses mainly on the changes occurring at the outcome and impact levels (Maredia 2009). Figure 1 illustrates a simplified impact

pathway (or a results chain) to show how actions related to YIIFSWA affect the goal of enhancing income and food security. It also introduces the concept of impact assessment, which evaluates final effects (long-term impacts on poverty, hunger, etc.,) and intermediate effects (medium-term outcomes on production, income, consumption, and prices) caused by the project's activities (Baker 2000).The development hypothesis was premised on the following theoretical assumptions: (i) Use of appropriate technologies will stimulate increased productivity and production in Nigeria and Ghana; (ii) Linkage of yield and production with the market "pull" along the value chain will reduce transaction costs of production and marketing; (iii) The reduction in transaction costs will ultimately contribute to increased income and food security for smallholder farmers, especially women. In this regard, YIIFSWA supports key innovations through different inputs/activities across its objectives. These include: i) Pest- and disease-free seed yam on a commercially viable basis capable of increasing yield by at least 50%; ii) Post-harvest storage and handling technologies capable of reducing tuber losses by at least 30%; iii) Access to markets enabling smallholder farmers to increase sales and generate needed cash incomes. It is envisaged that the key to stimulating production will be improved accessibility and the use of pest- and disease-free seed yam, coupled with enhanced post-harvest and handling technologies with better access to markets. On the other hand, it is also envisaged that increased access to markets will help to reduce the transaction costs of smallholder farmers and in turn increase profitability and then their income.

The model explains how an intervention is expected to lead to intended or observed impacts. A series of expectations and assumptions identify the presumed relationships among the following:

- inputs generating various activities;
- activities and their immediate outputs/intermediate outcomes at various levels; and
- intended effects (such as households and communities that have become financially self-sufficient and food-secure from their own production, lower post-harvest losses, etc.).

The favorable impact of new technologies and practices on the lives of farmers in yam-growing areas is an important barometer of the contribution that YIIFSWA will achieve to development and in particular to human resource development. This working paper guides the collection and processing of data and analytical information about the impact of YIIFSWA on households and communities. This is the reference in analyzing trends at community, household, individual, and plot levels as measured and assessed through various surveys. The study is meant to provide answers to the following questions:

1. What are the technologies/practices brought by YIIFSWA in the targeted areas?
2. What are the levels of adoption of these technologies/practices?
3. What has been their impact since introduction?
4. Are there constraints holding back farmers from adopting the new technologies/practices that need attention so they could benefit the broader society?

This working paper intends to organize implementation by providing suggestions on designing impact evaluation (IE) for the project on production, productivity, and profitability. The document considers the challenges of conducting an IE of agricultural projects as well as the methods for assessing impact. Issues of collecting agricultural data for an IE and how to put together the design strategy in an evaluation plan are also covered. Moreover, it outlines a broad methodological approach for the

process and IE of YIIFSWA. The study is structured into four parts. Section 1 provides the background by discussing the project generally. Section 2 introduces the methodology, discusses the specific challenges of conducting IEs of such agricultural projects, and describes a conceptual framework for the evaluation of YIIFSWA interventions on poverty. The possible methods for assessing impact are presented in Section 3; Section 4 addresses practical issues of data collection.

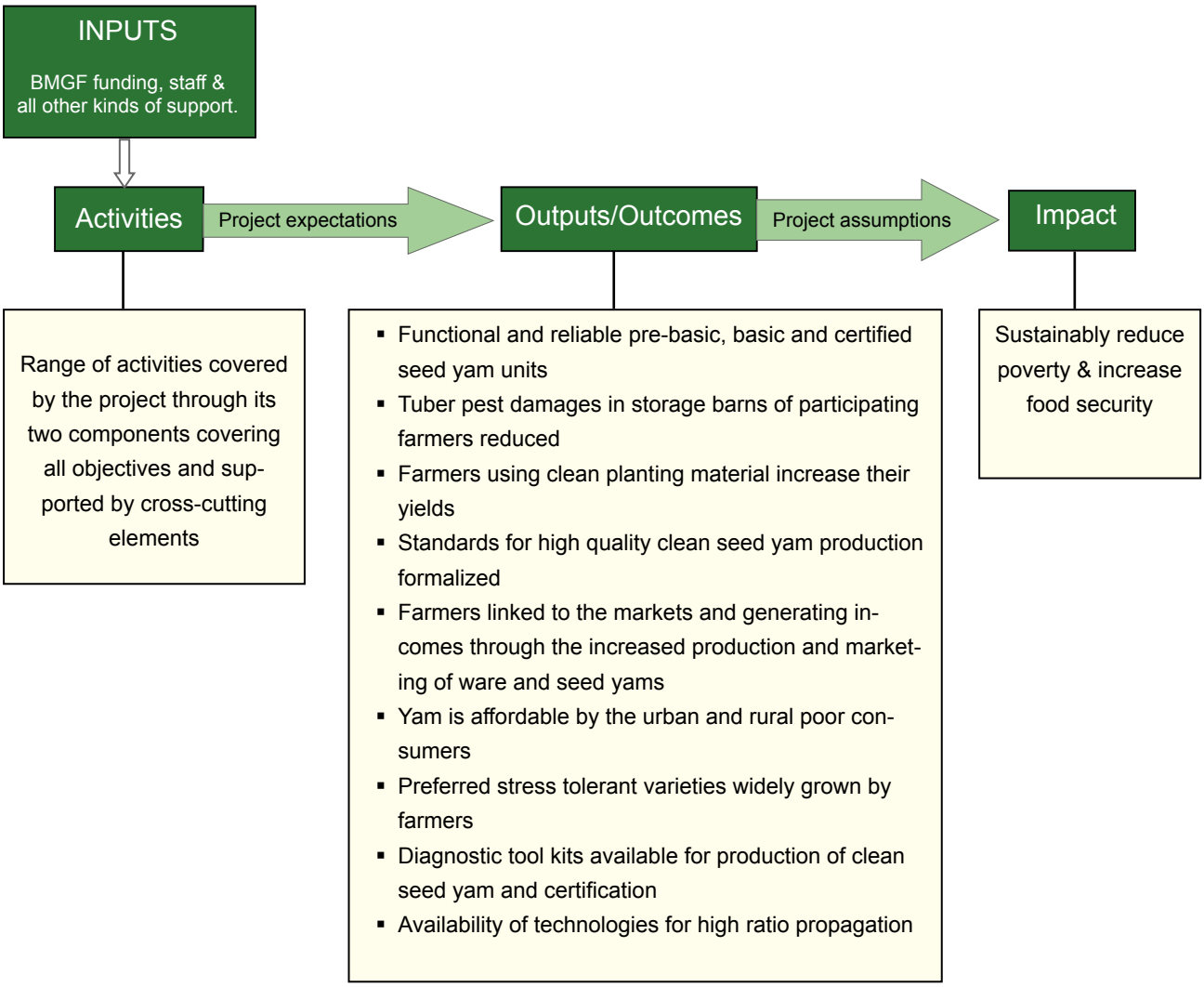

Figure 1. A generalized impact pathway of the YIIFSWA project focused on enhancing income and food security.

An Overview of Impact Evaluation 2

This section provides an overview of IE, followed by discussions on its importance as evidence-based policy and later emphasizes the modality of the IE to be used for YIIFSWA.

Impact Evaluation

The IE is rooted within broader monitoring and evaluation systems and provides a core set of tools that stakeholders can use to focus on results. Borrowing from the OECD-DAC Glossary (2002) as the most widely shared definition, impact is considered as change, positive and negative, primary and secondary, produced by a development intervention, directly or indirectly, intended or unintended. Impact occurs at multiple levels and time frames that can be short-term, intermediate, and long-term changes resulting from an intervention. Impact occurs in different ways depending on the type of intervention and the context. An IE is a systematic and pragmatic study that measures the changes that are attributable to a defined intervention, attempting to establish whether the intervention has made a difference in the lives of people. According to UNEG (2013), the IE enables the process(es) by which impacts are achieved to be better understood and those factors that promote or hinder their achievement to be identified as an important feedback into ongoing or future initiatives, including the adaptation of successful interventions to suit new contexts.

However there is reluctance in carrying out IEs because they are deemed to be expensive, time consuming, and technically complex. Moreover, findings from IEs can be politically sensitive, particularly if they are negative. Similarly, many evaluations have been criticized because the results did not come early and did not answer the right questions, or were not carried out with sufficient analytical rigor. The IE is critical especially for developing countries where resources are scarce and the spending of every dollar should have the aim of maximizing its impact on poverty reduction. The lessons to be learnt from IE studies will also provide critical input to the appropriate design of future projects. This working paper seeks to provide general knowledge and the tools needed for evaluating the impact of agricultural projects with a focus on the YIIFSWA project.

An IE can use qualitative or quantitative methods or both. Good research that convinces a range of clients on the difficult questions of causality always requires a combination of techniques. For attribution, this section describes the benefit of using a quasi-experimental method to assess the impact of YIIFSWA as compared with non-experimental methods and then discusses the methodological and sampling approaches to be implemented.

In the case of YIIFSWA, an IE aims at: (i) estimating the early impacts, positive and negative, primary and secondary, that result from the project; (ii) assessing the direct and indirect contribution of the project on smallholder yam farmers, whether intended or unintended, and (iii) providing lessons that can be learned.

The IE provides answers to questions about what goes well or badly, how, for whom, and why. To provide these answers, the IE links cause and effect: it assesses the direct and indirect causal contribution of the project to change in people's lives. Attribution is the dividing line between an IE and less rigorous forms of evaluation: it is the evidence that the project actually caused the effect

being measured. The challenge of attribution is the central problem to be solved in IE (Suresh et al. 2007; Harold 2007). Unfortunately, the only way to truly know whether an intervention caused the observed effect is to compare the effect on individuals who participated in the project with what would have been the effect on those same individuals if they had not participated in the project. This state of non-participation of the participant is known as the ***counterfactual*** outcome. The IE requires a credible and rigorously defined counterfactual that estimates what would have happened to the beneficiaries in the absence of the project.

The standard challenge in any IE is therefore determining what would have happened in the absence of the project. To truly understand the impact of a project on a given indicator, information would ideally be available on project beneficiaries with the project and those same beneficiaries without the project. The indicator could then be compared between these two states to see if the project had had an impact. To be legitimate, this counterfactual or control group would need to be exactly like the project beneficiaries or treatment group, except that they would not receive the benefits of the project. Thus, any differences in the indicator could be attributed to the project. Creating a counterfactual through identifying a reasonable control group and ensuring that an identified impact can be attributed to a project are always challenges. This document will discuss evaluation methods that allow for attribution. Some key challenges are specifically related to the evaluation of farmer-targeted agricultural projects.

Professional evaluators (particularly economists) have developed methods to produce counterfactual estimates since an individual or household or community cannot be both participant and non-participant in the same project at the same time. Counterfactual estimation is usually achieved through the use of a control group. However, for a control group to represent an unbiased counterfactual, the people who do not receive the treatment must share so many characteristics with the treatment group that the two are statistically indistinguishable from each other. Thus, in the rigorous evaluations of development projects, the best control groups are known (and proved) to share many characteristics with the treatment group. Frequently recorded examples of the characteristics that should be common to both groups include the following: location, age, livelihood, level of education, household size, language, tribal-ethnicity, consumption expenditure, access to capital, health status, marital status, sex, and access to public services.

To produce an unbiased counterfactual estimate, it is not enough to compare a treatment group with an arbitrarily selected control group (or what is known as a comparison group in non-experimental designs). The control group in an impact assessment must provide evidence of being a reliable counterfactual so it must be statistically capable of actually being the treatment group.

Randomized control trials (that are referred to as RCTs or experimental designs), with an appropriate use of mixed methods, are IE methodologies that generally provide the greatest opportunity for learning and constituting a strong counterfactual. However, when an RCT is not feasible or desirable, quasi-experimental IEs that use methodologies such as Difference-in-Difference, Propensity Score Matching, and Regression Discontinuity Design, combined with mixed methods, are other means that facilitate learning and allow for the attribution of impact. The IEs serve two key purposes– providing both accountability and learning. Accountability compares the costs and impacts on final outcomes, such as income and poverty that are attributed to project investments. Learning relates

to the development of hypotheses and explores how well or how poorly a particular development approach works. It provides a better understanding of the causal chains expected to link the project investments with income changes. For example, trained yam farmers should: i) learn why positive seed yam selection practices increase yields; ii) adopt these practices; iii) improve their yields; iv) increase farm income; and v) ultimately raise their household incomes. Learning requires understanding how and why these causal linkages do or do not happen and why it is essential to test the assumptions behind the project design. The IEs are an essential tool for learning and for accountability, but they are not the right tool for every project. They should be used selectively, with a special focus on where the potential for learning is greatest.

Evaluation in the agriculture sector is especially challenging due to several factors that fall into two broad categories–how agricultural projects can pose challenges for evaluation and how evaluation approaches can cause challenges for the implementation of agricultural projects. This working paper will not discuss these combined factors which can make implementers and sector specialists hesitant about rigorous IE. The concern will focus on the main challenges related to the yam sector and attempt to develop practical solutions for managing IEs in this context.

Challenges for evaluation

Several factors such as the crop cycle and weather variations are key factors for evaluation related to yam. Others, such as self-selection, are relevant to a variety of sectors but can be especially magnified in agriculture in general.

Yam cycle and seasonality

The seasonality of agriculture creates two challenges related to timing. The first is relative to the yam cycle. Yam are mainly considered an annual crop and the life cycle poses strict windows for when training and related activities can occur. If these windows are missed because of delays in project implementation or evaluation planning, a full crop cycle can be lost. This has implications for the project's ability to achieve its objectives and to evaluate impact. The second is the expected time between an intervention and the expected results. Agricultural projects often require several crop cycles to yield benefit, as farmers become proficient in new techniques, expand their application, and learn from one season to the next. In addition, with some projects, the difference in outcomes between farmers in the treatment and control groups should substantially grow over time. This creates challenges for evaluation when this is done very soon after a project has been completed because impact can be seriously underestimated.

Context variables and risks

Yam production is severely affected by natural disasters and other unknown and unpredictable phenomena; conditions which are susceptible to change from time to time. In theory, a valid control group should, on average, face the same weather shocks as the treatment group, but interventions may influence the magnitude of weather effects on outcomes, implying that weather shocks can influence impact estimates. For instance, at Idah in Kogi State and Illushi in Edo State, Nigeria, there was a severe flood along the banks of the river Niger and farmers' yields were affected in years 1 and 4 of the project. Hardly any results were achieved those years because most of the demonstration plots that had been set up and the planting material were destroyed by the flood.

In Ghana, an erratic rainfall pattern and a long drought in the Northern region have affected some project activities as well as occasional attacks by cattle on yam fields in both Ghana (Ashanti and Northern regions) and Nigeria (Nasarawa and Niger States).

Spillover effects

Spillover or demonstration effects are sometimes to be expected, such as when people outside the primary targeted beneficiary groups adopt techniques supported and promoted by YIIFSWA to gain from a desired outcome. If YIIFSWA indirectly affects the outcomes of the control group even though the control group itself did not participate in the activities, there will be biased estimates of impact. Spillover effects can be quite large in this project where technology is easily transferred and are often an explicit component of project logic.

Implementation changes

Even when the project design is set, its implementation approaches may require significant changes over time in response to project goals and mid-term evaluation. Adjusting implementation approaches makes interventions more effective and improves beneficiaries' targeting. However, this could challenge the validity of the evaluations and reduce the potential for learning what really works.

How will the project make its impact on poverty?

Assets are the primary transmission channel by which YIIFSWA expects to make an impact on poverty. Specifically, it is envisaged that the skills and knowledge of project clients will be strengthened through training and demonstrations. In some cases, this knowledge may be translated into increased physical capital. More fundamentally, it is anticipated that building human capital will catalyze increases in financial capital through higher farm revenues as a result of the uptake of new technologies. It is also expected that certain outcomes will result in enhanced human capital in the form of improved nutritional status among members of client households. Participation in group activities to promote technology dissemination might promote enhanced social capital in some instances, particularly for women, if their subsequent successful adoption of the promoted technologies is the result of their participation, but this is by no means a primary outcome. Employment might also serve as a secondary transmission channel for poverty reduction if production gains for commercial operations are of sufficient magnitude to stimulate expansion warranting the employment of additional hired labor, and if efforts to strengthen input supply-side value chains create significant additional demand for related services.

Lessons on putting IE in agriculture into practice

Although these challenges are real and can be difficult to manage, they should not prevent the pursuit of rigorous IE in the agricultural sector. Given the critical role of agriculture for development, and the tightening of development budgets worldwide, it is essential that the development community should deepen its understanding about what approaches work best to reach desired outcomes in a cost-effective way. Many of the lessons presented identify approaches that facilitate the use of a counterfactual, which compares the changes that occur both with and without a given intervention through the use of treatment and control groups. These solutions also adhere to evaluation methodologies that maintain the integrity of counterfactuals so that IEs can identify attributable impacts.

The lessons are designed to support donors, partners' countries, implementers, and evaluators in striking a good balance between achieving impact, measuring results, and learning what works in agricultural investments. The following challenges and lessons emerge from discussions about IE in the yam sector but many are also broadly applicable to other developmental sectors.

i. Define early the project logic and objectives of the evaluation, and how to integrate the two. The most important first step - both for successful implementation and evaluation - is to have a clear picture of what a project aims to achieve and how planned interventions are expected to lead to that outcome.
ii. Engage early and communicate often. Coordinated planning and ongoing communication are essential ingredients for minimizing and managing trade-offs between implementation approaches and evaluation methodologies.
iii. Foster joint ownership by aligning incentives. Everyone involved must feel ownership over both the implementation and evaluation of the project, so incentives must be aligned for donors/ sponsors, partners' countries, project implementers, and evaluators.
iv. Match evaluation methodology and project design. The most rigorous method for measuring attributable project impacts is through RCTs, but when they are not feasible, there are other rigorous methods to be considered for evaluation.
v. Focus on long-term impacts but be prepared to show early results. The IEs are often not carried out for a year or two after project completion. While planning to be accountable for progress and to communicate early results, the measurement of long-term impact must not be neglected.

Conceptual framework

The conceptual framework for this methodology was developed for interventions which promote technological innovations such as the adaptive yam minisett technique (AYMT), vine propagation, conventional tissue culture, aeroponics and bioreactors systems, diagnostic tools, new and existing technological packages for ware yam production, also varieties for adaptation to environments with low soil fertility and low moisture stress, as well as labor-saving systems, and crop management and postharvest practices. In this project, clients (technology user groups) and service providers (research and extension agencies) work together on the adaptation and uptake by clients of particular technical or institutional innovations, The first stage in developing a methodology to assess innovations' impacts on the poor is to identify (i) the different processes by which innovations affect the poor; and (ii) the factors affecting these processes.

Figure 2 shows a simple schema of four elements, steps, or processes (elaborated in Table 1) by which YIIFSWA can exert an impact on different members of a rural community. The project undertakes a range of experimentation, adaptation, capacity building, and organizational development activities (1). These lead to a process of innovation adoption by the target audience and by others in the community (2). Adoption then results in 'direct impacts' on the livelihoods of these adopters (in this case by increasing their incomes or improving food security) (3). Changes in the productive activities and livelihoods of these adopters will then have indirect positive and/or negative impacts on non-adopters (4).

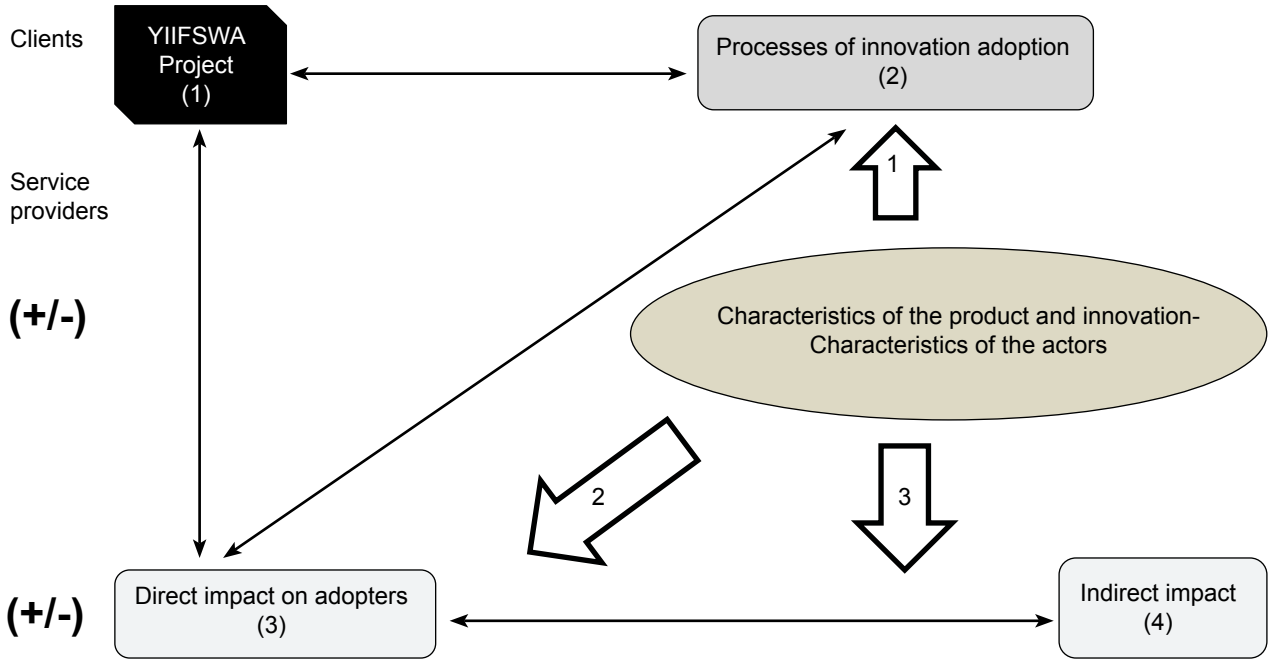

Figure 2. Impacts of agricultural innovation, YIIFSWA conceptual framework.
(Adapted from Paz et al. 2006)

Table 1. YIIFSWA processes and characteristics of technology, actors, and community.

Processes	Characteristics of the technology/practice	Characteristics of the actors	Characteristics of the community
Innovation adoption	Relative advantage, complexity, compatibility, feasibility, observable results, a connection between direct impact and the options and objectives pursued, services/institutions required, perceptions regarding direct and indirect impact, etc.	Objectives pursued and livelihoods (pathways, existing activities), network membership, knowledge, education, gender, risk aversion, need for and availability of resources, perceptions regarding direct and indirect impacts, power relations, ability to link the requirements of YIIFSWA project with local organizations, etc.	Networks, local organizations, associations, demographics, (population density, distribution, age structure), roads, telecommunications, gender relations, other beliefs and norms, educational facilities, other services, past experience, price tendencies, natural and local resources, etc.
Direct impacts	Profitability, productivity, quality, uses (commercialization or subsistence), resource requirements (labor, capital, land, skill (type/quality)), variability, prices (qualitative evaluation of sensitivity for investment/ cash and credit flow), services / institutions required, livelihood contributions, goods tradability, use of surplus, etc.	Livelihoods, activities, roles and purposes of the activities, capital (financial, social, natural, physical and human) holding and access, vulnerability, other risks and uncertainties, social relations and roles, gender, etc.	Local organizations, access to markets, labor market integration, roads, presence of innovators, other services, telecommunications, prices trends and their vulnerability, alternative opportunities, economic growth / stagnation (by social levels), etc.
Indirect impacts	Requirements for skilled / unskilled labor and for inputs and services for production, inputs for processing; profitability (for reinvestment and consumption expenditure); product tradability, etc.	Adopters and their relation with the labor market, investment and consumption patterns (good tradability)	Local market size, labor market integration, elasticity and structure of the labor market, investment opportunities, local supply of goods, income distribution, general consumption patterns (tradability), etc.

Methodological Approach to Impact Evaluation 3

Introduction

Indicators to be employed for impact assessment are the yields of R&D plots relative to yields of farmers' non-demonstration plots, an increase in the production of yam in project areas, yam value-added products, coverage of use of new practices in project areas, total increase in income and food security, training of farmers, NGOs, entrepreneurs, extension and research officers, and other stakeholders depending upon locations. However, the process of impact assessment will be done at different levels but predominantly at farmers' and households' levels as illustrated in Figure 3.

The results framework for YIIFSWA reflects a commitment to embark on rigorous and systematic methods of projecting, tracking, and evaluating its impacts. Together with transparency, this approach is a cornerstone of YIIFSWA's obligations to accountability and learning where M&E is committed to making its evaluations as rigorous as warranted to understand the causal impacts of the project on the expected outcomes. Evaluations support two objectives derived from these core principles as mentioned earlier: accountability and learning. Accountability refers to the project's obligations to report on its activities and attributable outcomes, accept its responsibility, and disclose its findings in a public and transparent manner. Learning refers to improving the understanding of the causal relationships between interventions and changes in poverty and incomes.

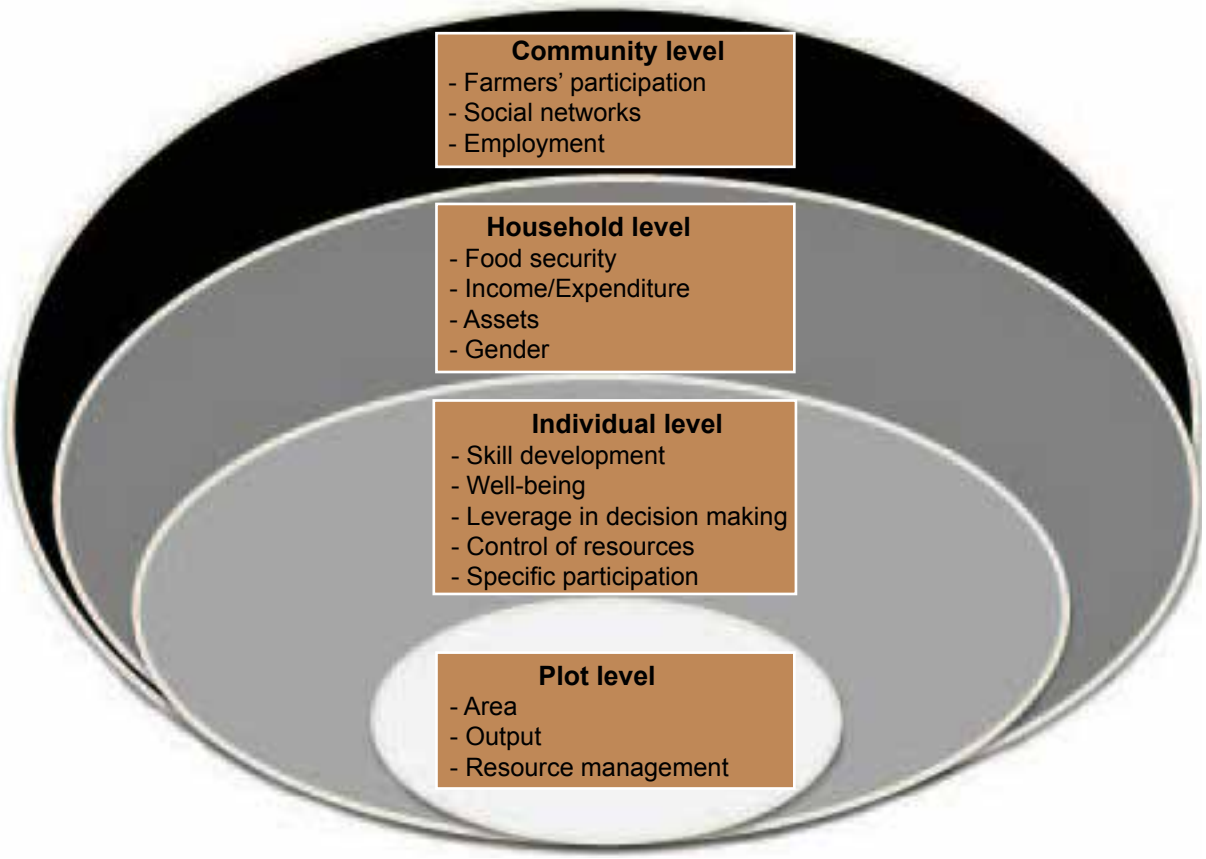

Figure 3. Levels of impact from plot, individual, household, and community.

No single evaluation methodology can respond to the questions of interest to clients and stakeholders about many kinds of evaluation, nor can any single design understand and respond to interventions from YIIFSWA. Therefore, the study will use a variety of methods and approaches to assess the impacts of the project.

Prospective evaluations were developed at the same time that the project was designed, and were built into project implementation. Baseline data were collected prior to implementation for both treatment and control groups. Prospective IEs were adopted to produce strong and credible evaluation results, with the generation of baseline data to establish pre-project measures of outcomes of interest. This provided advance information on beneficiaries and comparison groups. The baseline survey served as a foundation for a before/after comparison of pre- and post-treatment states. It therefore allows for the application of a quasi-experimental design, which is discussed in the next section, together with the qualitative means to be used to collect data.

Design approaches for IE

On the basis of the review of methodological literature and of existing IE cases that used a broader range of methods, the following designs and methods were chosen.

Experimental and statistical approaches

Economists have increasingly emphasized the use of RCTs to determine the effectiveness of development assistance (Duflo and Kremer 2005; Banerjee 2007). Although there is some debate over whether RCTs are the only valid approach (Ravallion 2009), there seems to be agreement on the value of carefully collecting data to evaluate the impact of development projects and the importance of using carefully constructed datasets and empirical approaches to identify impact.

Agricultural evaluations are often complicated by indirect or “spillover” effects that are due to the transferring of new technologies and management practices from project participants to non-participants. In fact, agricultural interventions, particularly for technology adoption projects, often explicitly aim at facilitating spillover effects. Although these factors often increase the impact of the operations, they complicate the evaluation design by making it hard to find an “uncontaminated” counterfactual. Additionally, since much of the influence of the project may be through these spillover effects, a correct assessment of the project requires considering how to identify them when they exist and to ensure a reasonable, uncontaminated counterfactual (Angelucci and De Giorgi 2009; Angelucci and Di Maro 2010). In this study, attempts would be made to properly document and capture the spillovers of the intervening technologies of YIIFSWA project.

Although the data and evaluation design issues require special consideration, evaluating agricultural projects can be done using standard approaches with some modifications. The purpose of this guideline is to provide suggestions on designing IE for agricultural projects. In particular, the working paper focuses on YIIFSWA which directly targets smallholder farmers, and seeks to improve production, productivity, and profitability.

A number of approaches can be taken in evaluating projects. There is a range of accepted approaches to determining an appropriate comparison group for counterfactual analysis, using either prospective (*ex-ante*) or retrospective (*ex-post*) evaluation design. Prospective evaluations

begin during the design phase of the intervention, involving the collection of baseline and end-line data from intervention beneficiaries and non-beneficiaries; they may involve the selection of individuals or communities into treatment and comparison groups. Retrospective evaluations are usually conducted after the implementation phase and may exploit existing survey data, although the best evaluations will collect data as close to the baseline as possible, to ensure the intervention and comparison groups are comparable..

The IE designs are identified by the type of methods used to generate the counterfactual and can be broadly classified into three categories, the experimental, quasi-experimental, and non-experimental, that vary in feasibility, cost, and involvement during the design phase or after the implementation phase of the intervention, and the degree of selection bias.

Since data collection tends to be representative samples of treated and control households or individuals, statistical methods, particularly coming from the econometrics literature, are used to identify impact. The best method for assessing impact for a given project depends on the data available. As a general rule, the better the data, the less sophisticated the econometric procedures that are needed for analysis. Because such models necessarily rely on certain assumptions, there has been an increasing emphasis on collecting better data to avoid having to use more complicated econometric procedures. For YIIFSWA, the quasi-experimental design will be used.

Quasi-experimental design

To assess impact, it is necessary to identify a counterfactual and then to take measures to ensure the estimate of impact is free from bias. Quasi-experimental methods include matching, differencing, instrumental variables, and the pipeline approach. If selection characteristics are known and observed, they can be controlled to remove the bias. Matching involves comparing project participants with non-participants, based on observed selection characteristics. Propensity Score Matching (PSM) uses a statistical model to calculate the probability of participating on the basis of a set of observable characteristics and matches participants and non-participants with similar probability scores. Difference-in-differences or Double Differences, which use data collected at baseline and end-line for intervention and comparison groups, can be used to account for selection bias with the assumption that unobservable factors determining selection are fixed over time (‘time invariant’). Estimation of instrumental variables accounts for selection bias by modeling participation using factors (‘instruments’) that are correlated with selection but not the outcome, thus isolating the aspects of program participation which can be treated as exogenous.

One common issue with evaluating agricultural projects is that they often involve self-selection of participants. For example, agricultural extension projects usually interact with self-formed groups of farmers. Self-selection implies that only farmers of certain types may choose to participate in a given project. If an evaluation attempts to determine the impact of a project by comparing those that chose to be in the project with those that did not, the differences in the indicator of interest may reflect not only the impact of the project but also any innate differences between participants and non-participants. Suppose the better yam farmers in a region decide to participate in an agricultural extension project – that is, farmers who are innovative and like to experiment with their production to see what works best. Such yam farmers are likely to have higher yields even without the project. A comparison of yields between these innovative, treated farmers and non-participant, control farmers

is likely to show higher yields for the treated farmers due to the project but also due to the fact the farmers are innovative. The problem is that it is hard to know how much of the yield difference is due to the project and how much to the differences in the types of farmer. This makes any estimate of project impact biased since the estimate cannot solely be attributed to the project. Clearly, selection is also an issue if farmers with certain attributes are chosen by the project to participate. If a project focuses on farmers with limited land access, those with larger landholding are unlikely to provide a good comparison. However, these attributes tend to be observable since the project must observe them to identify who will participate. With YIIFSWA, a careful evaluation design was done in combination with project design before implementation, creating a reasonable counterfactual and avoiding biased estimates of impact. Self-selection can also be managed, as discussed in the next section, but tends to be more complicated.

In YIIFSWA we expect a strong evaluation function and feedback loop that will enable us to be accountable in both cases, and to learn from each so that we can make continuous improvements. We can do this only with evidence and data to inform our decisions. The evaluation in YIIFSWA will mainly use the DD approach and PSM..

Difference-in-Differences approach

The DD approach is one of the most popular non-experimental techniques in IE since it allows controlling for some types of selection in a straightforward and intuitive way, as long as baseline data are available. In a DD model, the relevant comparison is the changes in the indicator over time. Here, the difference of outcome indicator levels is measured for both the treatment group and a control group, before and after the treatment. First, for each group the mean difference between the outcome indicator levels in the pre- and post-intervention periods is calculated. The difference between these two mean differences is subsequently calculated. This two-step approach gives the method its name[1]. The impact of the project is thus defined as:

$$\left(Y_{t'} - Y_t \mid D = 1\right) - \left(Y_{t'} - Y_t \mid D = 0\right)$$

With:

t being the time of the baseline and;

t' the time of the post-treatment survey.

The result equals the project's impact if the underlying assumption holds true that the difference between before and after the intervention in the control group can serve as a proper counterfactual for the treatment group (Wooldridge 2001).

The end-line surveys, necessary for calculating the impact estimators, should be as comparable to the baseline survey as possible, ideally encompassing the same survey design, same questionnaire, same interviewers, etc. It would be best even to ask the same respondents but if this is not feasible, going for the same geographic clusters or strata is recommended, especially for some other variable(s) (Baker 2000).

4 The approach is named non-uniformly in the literature, the most common terms being Double-Difference-method, or otherwise Difference-in-Difference estimator.

The great benefit of using DD is that it controls for unobservable differences in the baseline characteristics of treatment and control households, thus minimizing potential biases in impact estimates. The DD estimates address only time-invariant differences in control and treatment groups. This means that if there are changes that occur over time that affect one group and not the other, this cannot be controlled by using this approach. The evaluator must be confident that such changes did not occur to be sure that impact estimates are reasonable.

The most widely applied method for evaluating donor interventions is probably DD, but it is also the most data-intensive. (See Duflo 2001, DiTella and Schargrodsky 2005, and Todd 2008 for a review of studies applying DD estimators.) The method as already outlined above relies on comparing the outcomes of interest for the treatment group with a control group both before and after the intervention. Therefore, the applicability of the method crucially depends on the availability of the baseline data. This approach will be used in conjunction with PSM, where DD will be estimated for the matched groups.

Propensity Score Matching approach

This approach is based on the selection of a group most similar to the treatment group in terms of the probability of being selected which is derived from accumulated contributions from observed characteristics.

Economic impacts will be assessed using PSM to control for the self-selection into adoption that normally arises when technology adoption is not randomly assigned. The main parameter of interest in a non-experimental framework is the Average Treatment effect for the Treated population (ATT), expressed as:

Where:

> Y_1 denotes the value of the outcome when the household adopts the technology (1), and Y_0 is the value of the same variable when the household does not adopt (0). The problem that arises with unobservability is by virtue of the fact that) can be estimated but not. Although τ= can normally be estimated, it is potentially a biased estimator of τATT .

To ensure the reliability of PSM, participants and controls have the same distributions of unobserved characteristics. Failure in this condition is often referred to as a problem of “selection bias” in econometrics, or “selection on unobservables” (Heckman and Robb 1985). Also, the support for the comparison and the program participants should be the same. Finally, the same questionnaire will be administered to both groups and participants and controls must be derived from the same economic environment.

Other approaches

Other approaches exist and are not currently widely deployed in IE. They will be used since they offer considerable potential for linking interventions with outcomes and impacts. Some of these approaches are discussed below.

Case-based approaches

These approaches might be case-studies or outside traditional acceptance as case-studies. They may be policy interventions, institutions, individuals, events, trainings, or demonstrations during a particular period. This represents a shift from focusing causal analysis on variables taken out of their specific context. Locating variables in the context of the 'case' and conducting within-case analysis alongside comparisons across cases has opened up major new opportunities for causal analysis that are still largely ignored in evaluation practice. The design will take into account the case studies that generally focus on the unique characteristics of a single case. These case studies avoid causal analysis even though they contribute to such analysis in several ways. For example, interpretative case studies help to define construct validity in terms that make sense to stakeholders on the ground and give voice to project beneficiaries, both at the stage that evaluation questions are formulated and when interpretations of findings are being made. These approaches tend to generalize under certain conditions and identify clusters or subsets of cases about which it is possible to make similar causal inferences.

Participatory Approaches

Development evaluation has expressed ideas such as participation in ownership through methods such as Participatory Rapid Assessment and Participatory Action Research, These approaches relate to IE, even if only indirectly. They could help in the following:

- Ensuring that beneficiaries have a voice from the beginning of YIIFSWA, thus improving its plans and interventions.
- Investigating local communities and circumstances, clarifying problems and constraints, thus improving 'construct validity'.
- Adding a beneficiary and stakeholder perspective to the conclusions and lessons learned from an IE.

This last point raises the question: who participates? In YIIFSWA, those participating include beneficiaries but also country-based officials and decision-makers. There will be different implications from different patterns of participation. For example, the participation of decision-makers may have implications for efficiency and sustainability in implementation. To be seen as a design that contributes more directly to IE, participatory approaches need to support causal inference. Participatory approaches to causal inference do not see recipients of aid as passive recipients but rather as active 'agents'. Within this understanding, beneficiaries have 'agency' and can help 'cause' successful outcomes by their own actions and decisions. As suggested above, this is the case of YIIFSWA where country-based decision-makers were actively involved in the project and its evaluation. It should be possible to interpret impacts in terms of a participatory content for interventions: for example, the extent to which involvement, ownership, and commitment improve development outcomes. This is being explored in this study.

YIIFSWA: Contributory cause and causal packages

Simple sufficient causation could be more promising in that an intervention on its own may be sufficient to produce the impact but in YIIFSWA, many interventions are seen as a 'contributory' cause and are demanding conditions for impact to occur. There are a variety of ways that such

impacts might be realized, for example, quality training outcomes and empowerment. Contributory cause in this case recognizes that effects are produced by several causes, none of which might be necessary or sufficient for impact. It is difficult for statistical and econometric models to deal with multiple causalities and to capture the influence of combinations of causal factors rather than of each factor as a free-standing agent.

The causal package consists of the delivery mechanism for a variety of agricultural products and services such as input development, distribution, trainings, and demonstrations. These products and services include: (i) Training in minisett and vine cutting technologies; (ii) Training in business plan development for pre-basic and basic seed producers; (iii) Training in business plan development for seed producers; (iv) Training in business plan development for yam producers; (v) Provision of seed tubers; (vi) Provision of QDS/pre-basic/basic materials for seed production; (vii) Provision of plantlets; (viii) Training on high-ratio seed yam propagation techniques; (ix) Production of certified seed yam; (x) Training in seed yam quality control and certification; (xi) Improved yam storage facilities. To measure the early impact of complex development projects such as YIIFSWA all the agricultural interventions will be assessed as a causal package. However, this evaluation will not give a clean estimation of the effect of a particular intervention. Instead, it will measure the effect of YIIFSWA's package of interventions as delivered, which will be compared with the status quo of services. Agricultural innovations in YIIFSWA can be classified according to their impact as new products, yield-increasing and cost-reducing innovations, as well as innovations that enhance product quality.

Most of the interventions in the work plan reaching farmers do not introduce novel technologies, but rather build upon the existing practices of clients through initiating simple improved management to increase yields. These technologies are also largely appropriate within the context of social and cultural norms regarding gender roles. In this context, attention would be on the role of the AYMT in that package. Was it a necessary ground-preparing cause, a necessary triggering cause, or something that did not make any difference? Would a similar effect have occurred without the intervention? If the intervention was indeed a trigger, then a stronger claim becomes possible. If the intervention starts the causal chain and possibly supports change along the way, it is possible to claim that it was the intervention that made the difference because it was an initiating contributory cause.

Adaptive yam minisett technology adoption

The availability and affordability of high quality seed yam are among the most important challenges facing the yam sector in West Africa. Seed yam are expensive (Ironkwe 2005), accounting sometimes for as much as 63% of total variable production costs. The multiplication ratio of tubers is very low (less than 1:10) compared, for instance, with some cereals (1:300).This leads to a scarcity of seed tubers which often results in mounds prepared in farmers' fields remaining unplanted (Aighewi et al. 2002); some farmers also keep a reserve batch of seed yam (up to one-third of the quantity planted) to replace those that do not germinate. This situation has been aggravated by the poor quality of the seed yam, as those that germinate tend to carry problems (viruses, fungi, nematodes, and insects) from the storage barns to the field, thereby resulting in low tuber yields and poor shelf life (Ampofo et al. 2010).

To overcome the shortcomings of the traditional methods of producing seed yam in West Africa, the NRCRI and IITA through research efforts developed in 1982 an effective and affordable technique, the yam minisett technique (YMT), for farmers to produce their own seed yam (IITA 1985). With this technique, the multiplication ratio could be increases from the traditional 1:5 to 1:30 (Orkwor et al. 2000). The development and introduction of YMT are key strategies for transforming the sector and for enhancing the well-being of the rural population in West Africa. The technology has been promoted for three decades. However, these efforts have not been evaluated rigorously and, in particular, there is a lack of panel data which could be utilized to empirically trace adoption since the 1980s. Moreover, several studies which have attempted to address the areas (Ironkwe et al. 2007; Bolarinwa and Oladeji 2009; Wiredu et al. 2012; Abubakar et al. 2015) revealed that few households have adopted the new technology and many "disadopted". Recently not much is heard regarding YMT because it is not being actively promoted and evidently convincing (Aighewi et al. 2002). This technology has not been adopted by farmers, and both adoption and disadoption have been going on simultaneously. Such a challenge has been investigated and this provided an opportunity for YIIFSWA to address the gap on disadoption rates and an AYMT was introduced to strengthen the yam seed system for quantity and quality assurance in both Ghana and Nigeria. On this note, YIIFSWA has been vigorously promoting the adoption of AYMT since its inception in 2011. However, the current level of adoption and its associated impact on farming households are yet to be empirically investigated. Among others, this study would provide this empirical evidence.

Supporting and facilitating farmers in their engagement in agriculture are critical keys to improving their welfare through providing information, skills, and technologies. Building capacity can be organized in a variety of forms to increase farmers' productivity and income. According to Anderson and Feder (2003), productivity increases are possible only when there is a gap between actual and potential productivity. They suggest that gaps of two types contribute to the productivity differential – the technology gap and the management gap. Education can contribute to a reduction of the productivity differential by increasing the speed of technology transfer and by increasing farmers' knowledge and assisting them in improving farm management practices (Feder et al. 2004). Additionally, it also plays an important role in improving the information flow from farmers to scientists (Anderson 2007).

A range of approaches aiming at building farmers' knowledge have been promoted over the years.

A number of models have been implemented since the 1970s, combining approaches to outreach services and adult education, including the World Bank's Training and Visit model (Anderson et al. 2006), participatory approaches (Hagmann et al. 1999), and farmer field schools (FFS) most recently (van den Berg and Jiggins 2007). Additional modalities include ICT-based delivery which provides advice to farmers on-line and other approaches such as the promotion of model farms (Birner et al. 2006).

The YIIFSWA project set up a scheme using participatory approaches with an integrated Training and Visit model to encourage smallholder farmers to produce good quality seeds as well as providing links to retailers of farm inputs to ensure the quality of their produce. Organizations[2] in Nigeria were the Missionary Sisters of the Holy Rosary (MSHR), Justice for Peace and Development (JDPM), Arimatheas Foundation for Development (AFD) and Umuasua-Isuikwuato Smallholder

2 NGO based in Nigeria with significant role as service provider in the seed yam systems as well as the dissemination of project outputs and capacity strengthening of farmers in the targeted areas in Nigeria.

Oil Palm Farmers' Cooperative Society Ltd (SHOP) and in Ghana[3] the Catholic Relief Services (CRS), Ecumenical Association for Sustainable Agricultural and Rural Development (ECASARD), and Sustenance Ago Ventures and SKY-3 Farms (SAVE). Farmers were grouped in selected communities and assigned to demonstration plots under special supervision and guidance. They benefited from trainings on AYMT; hence, each group treated their setts before planting. Some of the farmers were also trained in business plans with ongoing input demonstrations. Participation is hypothesized to affect the adoption and economic impact of technologies by improving the relevance and appropriateness of the technology to the potential beneficiaries, thereby enlarging the pool of potential adopters.

The FFS aimed at providing agricultural technologies for livelihood support. The farmers participated in the schools and learned new agricultural technologies and practices, such as farm management, seedbed preparation, proper spacing, new varieties, and planting techniques. Participants were both males and females and the numbers varied in Nigeria and Ghana. Participants attended lectures on agricultural technologies in (open-air) classes and training at demonstration plots included operations from seedbed preparation to harvest and storage.

Sites were purposely selected to deal with "*Doubting Thomases*", showing how the setts could perform, yielding good quality seed yam which would be used to produce a great harvest of ware yam. The fields were planted with setts treated with a cocktail of insecticide (Chlorpyrifos, 48EC) and fungicide (Mancozeb, 80WP), at the rate of 100 ml of the insecticide formulation and 100 g of the fungicide formulation per 10 liters of water. In some of the plots, a few rows were planted with untreated setts so that farmers could clearly see the difference between the two. Each plot was farmer-owned and farmer-managed. No problems were reported with the agronomic practices as the inputs were supplied and all farmers also received training on AYMT and other sound practices such as crop rotation.

The idea of keeping records of participants is new and somehow creates the expectation of some future help, no matter how great or small. Each site is clearly marked with its own small board which helps those interested to see how this plot is different from their own.

Empirical investigation into adoption of adaptive yam minisett technique

An important step in assessing the impacts of AYMT is to document its adoption rates. Adoption and the economic impact of AYMT– defined as technology impacts – will be assessed using conventional adoption studies and econometric analysis, complemented by qualitative data from interviews with farmers. The adoption profiles of technologies developed/promoted over time could be derived using the S-shaped logistic function (Griliches 1957), which has been used widely to analyze adoption patterns over time (Feder et al. 1985; CIMMYT 1993; Maredia et al. 2000; Bantilan et al. 2005). The size of the impact of AYMT depends on whether and to what extent – in terms of area planted, for example – the technique has been taken up and grown by farmers.

The adoption of AYMT can help to increase productivity, farm incomes, and food security, and so reduce poverty levels, thus improving household welfare. The decision of whether or not to adopt

3 NGO based in Ghana, sub-grantee to IITA under YIIFSWA, in charge of developing and promoting technologies for enhanced seed yam production and development of seed growers. These two key activities seek to contribute to the establishment of sustainable availability of high quality seed yam on a commercially viable basis in targeted areas in Ghana.

AYMT hinges upon a careful evaluation of a large number of technical, institutional, and socio-economic factors. The observed adoption choice of AYMT is hypothesized to be the result of a complex set of inter-technology preference comparisons made by farmers. It is common to examine factors affecting the adoption and intensity of use of AYMT by estimating Probit or Logit models of the above-mentioned variables on areas planted with AYMT. This area will thus represent a censored distribution since some farmers (non-users) will assume a value of zero for not adopting.

Theoretical model and empirical specifications

Adoption is conventionally conceptualized to be the mental process through which an individual passes from first learning about an agricultural innovation to finally adopting it (Mutandwa et al. 2007). In modeling the utility or satisfaction derived from the use and integration of AYMT into the smallholder farming system, the economic values or benefits associated with the technique need to be considered. A typical smallholder farming-household seeks to maximize a multi-dimensional objective function, including increasing incomes and food security and reducing all forms of risk (Strauss et al. 1989). When there is a change in the economic parameters associated with AYMT, the central question is related to how much compensation, whether paid or received, would render the decision-maker indifferent to the change. Thus the change in welfare associated with this development was used as the basis for the economic valuation process. When an individual farmer faces a change in a measurable attribute, for example, higher yield in terms of quality seed yam produced from AYMT (q), then q changes from q_0 to q_1 (with $q_1 > q_0$). The indirect utility function u after the change becomes higher than the status quo. Now the status quo can be represented econometrically as follows:

$$u_{1j} = u_{\mathrm{i}} (y_i, z_j, q^0, \varepsilon_{0j})$$

On the other hand, the changed or final state due to the introduction of AYMT is shown by:

$$u_{2\mathrm{j}} = u_{\mathrm{i}} (y_i, z_j, q^1, \varepsilon_{ij})$$

Where:

y_i, refers to the farmer's income, Z_j is a vector of the farmer's socio-economic variables and attributes of choice, and ε_j is the stochastic error term representing other unobserved utility components.

The farmer would opt, pay for, and adopt AYMT in the following conditions:

$$u_i (y_i - P_i, z_j, \varepsilon_{ij}) > u_0 (y_i, z_j, \varepsilon_{0j})$$

Where:

P_i is the monetary investment associated with AYMT.

Since the random components of the preferences are not known with certainty it is possible to make only probabilistic statements about expected outcomes. Thus, the decision by the farmer to adopt AYMT is the probability that he/she will be better off if this technology is used. This is represented as follows:

$$Prob\ (Yes_i) = Prob\ [u_i\ (y_i - P_i, z_j, \varepsilon_{ij}) > u_0\ (y_i, z_j, \varepsilon_{ij})]$$

Since the above utility functions are expressed generally, it becomes critical to specify the utility function as additively separable in deterministic and stochastic preferences. Using, this argument, the function becomes:

$$u_i\ (y_i, z_j, \varepsilon_{ij}) = u_i\ (y_i, z_j) + \varepsilon_{ij}$$

Where:

The first part of the right-hand side is the deterministic part and the second is the stochastic part. The assumptions that ε_{ij} are independently and identically distributed with mean zero describe most widely used distributions.

Determinants of adoption of AYMT

Two widely used distributions are the normal (Probit) and logistic regression models (Logit). In this study, the statistical dichotomous choice data are modeled by superimposing a probability function. The dependent variable takes the value 1 if the smallholder farming-households adopt AYMT or 0 if they do not adopt. And if the farming households adopt, how much could they adopt? The observed adoption of AYMT is hypothesized to be the end-result of combined effects of a number of factors related to the farmer's goals and means of achieving them.

The Probit (the standard cumulative distribution function) and the Logit models (Polson and Spencer 1991) will be used for this study. Following Polson and Spencer (1991) and Adesina and Zinnah (1993) the Probit model is:

$$\Pr ob(Yes_i) = F(W_i) = \int_{-\infty}^{W_i} \frac{1}{\sqrt{2\pi}} \exp(-S^2/2) ds$$

$$\text{For } -\infty < w_i < \infty; w_i = X_i'\beta$$

Where:

Prob (Yes$_i$) is the probability that the *i*th farmer chooses to use AYMT, zero otherwise.

X is the *n* by *k* matrix of the explanatory variables and *Beta* is a *k* by 1 vector of parameters to be estimated.

The logistic distribution function is closely associated with the standard normal cumulative function of the Probit model. The change in the probability that the farmer uses a purchased input, given change in any one of the explanatory variables, can be computed as:

$$\frac{\partial \Pr ob(Yes_i)}{\partial x_i} = (\frac{\partial_F}{\partial w_i})(\frac{\partial w_i}{\partial x_i}) = F(w_i)\beta$$

Where:

$F(w_i)$ is the standard normal density (logistic density) function for the Probit (Logit) model.

To avoid the censoring bias that Ordinary Linear Square could generate, the Tobit regression model could also be applied to investigate the determinant factors where the ratio of land with AYMT was used as a dependent variable. The Tobit model, originally developed by James Tobin (1958) the Nobel laureate economist (Gujarati 2004), has been useful in several empirical applications in statistics, econometrics, and the adoption literature (Amemiya 1973; McDonald and Moffit 1980; Shakya and Flinn 1985; Adesina and Zinnah 1993; Oladele 2005; Akpoko 2007). The function is estimated from censored samples where the dependent variables have mass points at the low end called limit values and continuous values above the limit. The Tobit model will be appropriate in this study since the dependent variable is the share of land under AYMT; thus the dependent variable must be between 0 limit, and continuous levels of adoption above the limit. A Tobit model censored at zero could be used because a share of land under AYMT smaller than zero will not be observed and some respondents may report a zero share of land under AYMT. The application of this type of limited dependent variable model is not new. A few recent examples include Doss and Morris (2001), Ransom et al. (2003), Nkamleu (2004), and Nkamleu and Tsafack (2007). While other estimation approaches, such as the Heckman's model, could also generate unbiased results, the Tobit approach conserved degrees of freedom and is relevant in cases such as this one, where the independent variables had a continuous effect on the dependent variable. Generally, the Tobit model uses the Maximum Likelihood Estimation method to estimate the parameters assuming normality and homoskedasticity conditions. According to Greene (2003), the general formulation of the censored regression (Tobit) is an index function shown below:

$$Y_i^* = \beta' X_i + \varepsilon_i, \quad Y_i = y_i^* \text{ If } y_i^* > 0$$

$$Y_i = 0 \text{ if } y_i^* \leq 0$$

Where:

The index variable, Y_i^* defines an underlying unobservable tendency where the adoption is a choice rather than a technical outcome. βX_i is a vector of unknown parameters and ε_i is a random error term.

The equation above means that the adoption (y_i) of AYMT will be observed only when the latent tendency is above the unobservable threshold ($y_i^* > 0$). If y_i^* is less than or equal to zero, then y_i becomes zero, meaning that there is no adoption. To estimate the probability and the level of adoption of AYMT, the Tobit model using the STATA computer package will be applied on the equation above.

The dependent variable Y_i i.e., the adoption of AYMT, will be expected to give a value ranging between 0 and 1, signifying that a certain proportion of area is planted with AYMT. The model combines aspects of the binomial Probit for distinction of $Y_i = 0$ versus $Y_i > 0$ and the regression model for $E[Y_i \mid Y_i > 1, X_i]$

Where:

Y = the proportion of area cropped with yam under AYMT

β = vector of parameters to be estimated; and

ε_i= error term

Designing data collection procedures

Collecting farm-level agricultural data is complicated by the fact that agriculture is complex, often involving multiple products (crops and livestock), numerous plots, and a range of inputs. The fact that agriculture is a self-employment activity also means that it is difficult to ascertain income from the activity without carefully determining revenues and costs. The farm household often consumes much of the outcome of production, making the valuation of the output challenging. Furthermore, farmers are rarely involved solely in agriculture and understanding the impact of a project on farmers frequently requires looking at an agricultural household's total livelihood strategy to see if labor or other resources have shifted as a result of the project. The logistics of collecting data can also be complicated by the fact farmers tend to be widely dispersed. In this section of the guideline, some suggestions are provided for collecting data for IE. Of course, in considering the data to collect, it is necessary to keep in mind the indicators previously identified during the baseline survey to assess impact and the approach that will be used for identifying impact. The data collected will be used to create variables that are used either as impact indicators or as part of the analysis.

Our expectation is that any reasonable IE should be designed to have at least two rounds of data collection: a baseline collection already done and the upcoming post-intervention collection. More rounds of data collection are possible and can be quite useful, especially if short- and long-term impacts from the project are to be distinguished. One of the general rules of collecting data in multiple rounds is to try and maintain the same format and type for questions. Changes in the questionnaire can result in differences over time being due to changes in the way questions were posed rather than in changes in the underlying variable of interest. A common starting point for evaluating YIIFSWA is to use a standard questionnaire that has already been administered in the yam-growing areas and is already field-tested.

The data collection for assessing the impact of farmer-targeted projects focuses primarily on obtaining information from detailed questionnaires of farmers, including the treated and control groups. Other information can also be collected from community-level or market-level surveys as appropriate. Here, the focus is on the data collection via questionnaires administered to farm or agricultural households, although other complementary surveys should be considered. Other considerations should focus on the following.

Timing and periodicity

Timing and periodicity are two of the main aspects to be considered when the procedure for data collection is being designed. The timing refers to the period (month, year) in which the data will be collected. Administering the questionnaire at the end of the season reduces the recall period and the measurement error as it enhances accuracy on the estimates of inputs used, production sold,

prices, and so on. The survey should be administered after the harvest for the main agricultural season has taken place. It might be problematic to collect data when the main season crop has not yet been harvested. The follow-up surveys should always be collected at the same period that the baseline was collected. Furthermore, it is important to maintain consistency checks to be sure questions refer to the same plot and crop. A benefit in addition to a reduction in recall error and thus better data is that each visit should be shorter, taking less of the farmer's or the farming family's time. However, this approach tends to be much more costly and there is a risk that the farmer would refuses to continue answering questions at some stage.

The next aspect to consider when collecting agricultural data is periodicity. This refers to the time between the baseline administration and the follow-up surveys. The main factor that influences the periodicity of data collection is the estimated time that the project is expected to take to have an impact. This is particularly important when there is a limited budget that includes resources for only a baseline and one follow-up survey. If this is the situation, it is crucial to time the follow-up survey after the project's impact has been expected to occur. Otherwise, the evaluation might not be able to detect any impact and would disregard the importance of the project when the actual problem was the timing of the follow-up survey. This requires a broad knowledge of the project and its effects as well as of previous empirical evidence. For instance, for technology transfers, it is expected that farmers need to learn how to incorporate the technology and how to use it appropriately; this might take time for the expected results on productivity to be produced.

Pilot-testing and survey preparation

Besides administering a baseline and an end-line survey, the data collection strategy must also include planning for the survey to be pilot-tested. The main purpose is to check the validity of the questionnaire by finding questions or words that might be misinterpreted, misread, or misunderstood as well as to check the functionality of the questionnaire in the field.

Questionnaires often have procedures for quality assurance such as checklists that verify all questions are asked and that questions are consistent across sections. In addition, data quality assurance protocols can also be assessed. For this localized survey in which there is limited variation in the types of households, about 25-30 tests of the survey will be done. The pilot tests are also useful as a beginning to considering the logistics for survey administration. The pilot tests resemble the data collection process in the field so they can be used to consider the best manner in which to organize both data collection and data entry.

Survey Design, Planning, and Execution 4

This section provides the details of the end-line survey design in terms of collection methods, questionnaire design, and applied statistical analysis. This study is designed after the baseline study. The survey is necessary for calculating the impact estimators and is designed to be comparable to the baseline survey as much as possible, thereby encompassing the same survey design and instruments.

Study area

Following the baseline survey, the end-line survey will be done within the major yam-producing zones. The survey design will be based on a multistage, random sampling procedure, drawing on the total households from yam-growing areas of Nigeria and Ghana.

Sample size determination

The need for quantitative and qualitative information about households requires a statistically plausible sample of the target population. Accurate sampling is important to minimize the risk of sampling bias and to allow inferences about the population to be drawn with a level of confidence that can be statistically estimated. The Confidence Interval Approach used previously for the baseline survey will be used to estimate the sample size (Mignouna et al. 2014).

Under ***simple random sampling***, at the 95% confident level desired, the sample size *n* must satisfy the formula:

$$n \geq \frac{Z_{0.95}^2 NP(1-P)}{(N-1)e^2 + Z_{0.95}^2 P(1-P)} \Rightarrow n \geq \frac{Z_{0.95}^2 P(1-P)}{e^2}$$, if N>10,000

Where:

Z = value of the standard variate at a given confidence level and to be worked out from the table showing the area under normal curve, at 1.96 corresponding to 95% confidence level;

N= Total population

$$n \geq \frac{(1.96)^2 \times 0.45 \times 0.55}{0.05^2}$$

$n \geq 380$ Provided that response rate is 100%

n_{srs}=380/r = 380/0.95 = 400 given 95% response rate.

Under ***cluster sampling***, for the results to be useably reliable, we apply a default value of design effect[1] of 2.0 in Nigeria and 1.5 in Ghana as follows:

$$n_{cls} = \delta \times n_{srs}$$

Where:

n_{cls} = Sample size under cluster sampling;

$\delta =$ Design effect, given the default effect δ =2.0 for Nigeria and 1.5 for Ghana (UN Stat. Division 2005);

$$n_{cls}\left(Nigeria\right) = 2.0 \times 400 = 800$$

$$n_{cls}\left(Ghana\right) = 1.5 \times 400 = 600$$

Therefore the end-line survey will target the same total of 1400 sample households consisting of participating and non-participating households and will be conducted in the second semester 2015 in Nigeria and Ghana.

However, a security challenge in Nasarawa State compelled us to select the Federal Capital Territory (FCT) as an addition. The selection of suitable comparator LGAs was undertaken to replace a few. The choice of such LGAs in FCT was predicated on their biophysical and socio-economic conditions as well as their population-related characteristics that were similar to those in Kogi, Nasarawa, and Niger States (Kasim et al. 2014).

Prepared survey questionnaires (Annexes 3, 4 and 5) will be administered by trained enumerators through personal interviews and field measurements. The surveys will be conducted in the same YIIFSWA project areas as they were for the baseline.

For field measurement, one out of the retained households will be randomly selected from each selected community (Annexes 1 and 2). Following the baseline, fields to be measured should amount to 200 in Nigeria and 100 in Ghana (Mignouna et al. 2014).

Data collection instruments

The YIIFSWA project will integrate both qualitative and quantitative methods to collect and analyze data. Quantitative results can be capable of being generalized and qualitative data will supplement quantitative IEs in providing complementary perspectives on the project's performance in generating information that may help in understanding the mechanisms through which the project supports beneficiaries.

1 A design effect represents the combined effect of a number of components such as stratification, clustering, unequal selection probabilities, and weighting adjustments for non-response and non-coverage. A specific design effect has been applied for Nigeria and Ghana due to the different form of complex sample design employed.

Data will be collected for both countries by means of existing information (studies, reports, etc.,) structured questionnaires, and a set of qualitative approaches including focus groups and interviews with selected beneficiaries and other key informants. The household questionnaire (Annex 3) includes sections on (i) interview background; (ii) household composition; (iii) household identification; (iv) social capital and networking; (v) household assets; (vi) knowledge and adoption of improved/new yam varieties; (vii) crop production for all crops grown by the household during last cropping season; (viii) biotic and abiotic stress incidence; (ix) transfers and other sources of income last year; (x) household expenditure; and (xi) access to capital and support services.

Community/village information will be provided using a profile form (Annex 4) in all the selected villages. The survey will capture details on existing infrastructures and facilities; active community-based groups, local decision-making systems; new varieties of yam, major livelihood strategies and constraints, and gender issues. The surveys will be facilitated by extension officers.

In addition, monitoring data already collected would also be used as they constitute an important resource in the project's IE. They will be of help in verifying which participants received the project, how fast the project is expanding, how resources are being spent, and generally whether activities are being implemented as planned.

Indicators for assessing project impact

Agricultural projects such as YIIFSWA are designed to improve production or the returns to agriculture. Therefore the IEs of such projects focus on production-based indicators: gross margins, crop prices, yields, productivity, agricultural investment, spending on agricultural inputs, technology adoption, changes in patterns of land use, crop, and varietal diversification, and food for home consumption. Collecting information of this type can be challenging, beginning with the definition of the sample unit: in fact, while production is often linked to multiple plots and crops, the decision-making process takes place at the household level. Although the full logic of an agricultural project should be considered, certain indicators can be more readily attributed to a given project and an IE focuses on these results. Projects may also contribute to achieve some results with a wider scope, such as a reduction in poverty rates, which may be very difficult to attribute to the project. Additionally, different indicators need to be measured and estimated at distinct time intervals. For instance, the adoption of new practices is often a short-run measure but a change in productivity is a medium to long-run measure. In considering indicators, the timing of measurement and the possibility of being able to attribute the effects to the project should be considered.

The IEs often focus on examining a series of indicators to obtain a picture of the average effects of the intervention as well as the mechanism by which these effects were obtained. In analyzing agricultural production, the relationship between inputs and outputs or profitability is often examined through production or profit functions. Presumably, agricultural projects have an impact not only on production inputs and outputs but also on how they are used and combined. This is being considered in the evaluation of the YIIFSWA project.

The evaluation aims to synthesize quantitative estimates of the effectiveness of AYMT demonstration plots relating to intermediate outcomes such as knowledge acquisition, adoption and diffusion of technology, and final outcomes such as agricultural yields, household income, and poverty status as depicted in the different indicators (Table 2).

Table 2. Indicators for Assessing Project's Impact on Targeted Farmers.

Impact Indicators Measure
Agricultural income (*$*)
Food security
Agricultural Profits (*$/ha*)
Gross Margins (*$/ha*)
Output (*tonne*)
Yields (*Output/ha*)
Mechanisms of impact
Price of output (*$/unit*)
Value of harvest (*$*)
Value or percentage of harvest lost (*$ or percentage*)
Value or percentage of harvest for home consumption (*$ or percentage)*
Value or percentage of harvest sold (on farm, local market, exports) (*$ or percentage*)
Volume traded (*Share of total*)
Market participation (*Yes=1, No=0*)
Transaction costs *($/unit of time*)
Input costs ($/ha)
Costs of key inputs (seeds, fertilizer, etc.) (*$/ha*)
Family labor used (*days/ha or value of days/ha*)
Cost of paid labor (*$/ha*)
Costs of rented machinery (tractor, sprayer, etc.) (*$/ha*)
Costs of rental land (*$/ha*)
Adoption of key technology (seeds, practice, etc.) (*Yes=1, No=0*)
Attitude and behavioral change
Capacity building and development (#trainings and trainers, #MSc & PhD)
Networking & sharing (#Collaborating institutions and organizations)

Training of enumerators and supervisors

Obtaining high quality data will be the stated aim of the survey and, as recommended by Puetz (1993), this will depend on enumerators who will be motivated, well trained, and well supervised. The structured questionnaires will be administered by enumerators under supervisors, all trained in two different methodology workshops which will be organized by IITA. The training of enumerators will be conducted for two full days and the training agenda will include project background, survey objectives, and a review of questionnaires, practice sessions, demonstrations, and logistics/ scheduling. A number of simulation sessions will be done to familiarize enumerators with questions in the household questionnaire for information to be successfully collected. Also a complete review of the questionnaires will be made on the same day in the vicinity of the sample households to permit revisits for errors to be corrected where necessary.

The enumerators for each State/District will be identified after the training and testing for the whole survey. The process will be guided by factors such as (i) academic qualifications and minimum level of experience in data collection. (ii) willingness to work for long periods of time, (iii) ability both to speak the local language fluently in each given area as well as to interact with people of different ethnic groups in different environments, and (iv) familiarity with the places where the field work would be conducted.

Supervisors will be chosen based on extensive experience in data collection and familiarity with the survey areas. They will be trained and confirmed after an interview to make a follow-up of the whole data collection process. They will be associated with the whole process and will undertake the second quality check right in the field before the questionnaires will be accepted.

Pre-testing questionnaires and guidelines will be organized and require each enumerator to complete two household questionnaires. Based on their experience, a feedback session on technique and methods will be facilitated the following day. The questionnaires and guidelines will be subsequently modified, based on enumerators' feedback.

Field data collection, data entry, and database management

A field data collection schedule will be developed with the assistance of agents from the Agricultural Development Projects (ADPs) or the Ministry of Food and Agriculture (MoFA) to organize teams and assign villages according to geographic position. Geographic position in this case refers to the relative distance between the selected villages and a logical sequence for travelling without retracing routes, rather than simply those villages that were most conveniently close to the road. Because of the number of communities and the distances between them, up to three supervised teams will often be deployed in separate vehicles to each targeted administrative State/District to complete interviews. After a preliminary tour of one week, organized in surveyed areas to set up the recruitment process for potential enumerators, data collection will be undertaken from the end of 2015 in Nigeria and Ghana.

IITA will be responsible for quality control of the primary data on a daily basis. Every evening, the enumerators and the field supervisors will check each household questionnaire for inconsistencies and errors. Data will be regularly packed up after a thorough check and sent for centralized data entry at IITA-Ibadan where consultant data entry clerks will be enrolled for the task.

Field measurements

Accurately estimating crop yields is never easy (Fermont and Benson 2011) but will improve agricultural statistics (de Groote and Traoré 2005). The study will aim at measuring crop yield directly from farmers' fields to get more accurate estimates.

The head of the household and spouse, where applicable, will be interviewed at the household level in their home for information such as characteristics of the household, available resources, yam production objectives, etc. At the field level, a structured questionnaire (Annex 5) will be employed. The field owner will respond to the oral interview for information such as production methods, varieties grown, costs of production, plans for sale and for home consumption of yam to be harvested, etc. The field-level interviews will be conducted in the selected fields.

Yam yield and field area will be measured with guidance from the owner of the field. Field area measurement will be done with a Global Positioning System (GPS) receiver. Yield measurement will be based on three selected sample plots (two at the extremes and one at the center of the field) using one of the diagonal lines passing through the entire length of the given field; numbers of stands will be counted and tubers will be weighed. The yam will be purchased from the farmer at the market rate. Measurement will be done regardless of variety and fields that are'milked' for seed production will be skipped in yield measurement.

Local farmers will be used as labor for harvesting; they and the survey farmers will be paid the wage rate obtained in the community. Enumerators who will conduct the interviews and take the field area and yield measurements will be experienced scientists from IITA and the national R&D institutions in the survey countries.

Field data management

The questionnaires to be used on the fields will be reviewed by the YIIFSWA scientists who will lead in the field data collection. The data will be transcribed by data entry clerks who will be university graduates. After the transcription, the YIIFSWA scientists will go through the data in a verification exercise before the beginning of analyses. Verification will be a continuous process.

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Annexes

1. YIIFSWA Project Communities in Nigeria.

States	LGAs	Communities
BENUE	Agatu	Enumgba
BENUE		Igoje
BENUE		Obagaji
BENUE		Okokolo
BENUE		Oshigbudu
BENUE	Gboko	Adzer-Nor
BENUE		Akpager
BENUE		Luga
BENUE		Tchowanye
BENUE		Yandev
BENUE	Katsina-Ala	Abaji
BENUE		Gbor
BENUE		Ikowe
BENUE		Sai
BENUE		Tor-Donga
BENUE	Otukpo	Adoka
BENUE		Ogali
BENUE		Otobi
BENUE		OtukpoNobi
BENUE		Uwaba-Aokwu
BENUE	Tarka	Agudu
BENUE		Gwarche
BENUE		Nyambee
BENUE		Tyiotyu
BENUE		Wannune
BENUE	Ukum	Ayati
BENUE		Chito
BENUE		Kyado
BENUE		Vaase
BENUE		Zaki-Biam
EBONYI	Ezza North	Ekka
EBONYI		Inyere
EBONYI		Nkomoro
EBONYI		Ogboji
EBONYI		Umuoghara
EBONYI	Ivo	Akaeze-Ukwu
EBONYI		Ihenta
EBONYI		Iyuoji
EBONYI		Mgbede
EBONYI		Umobor
EBONYI	Izzi	Agbaja
EBONYI		Agbanyim
EBONYI		Igbeagu
EBONYI		Ndieze
EBONYI		Yimaegu
EDO	Esan	Illushi
EDO		Ivue
EDO		Obeidu
EDO		Onogholo
EDO		Oria

Annex 1. YIIFSWA Project Communities in Nigeria contd.

States	LGAs	Communities
EDO	Orthioromwon	Iguemokhua
EDO		Owuo
EDO		Ugoniyekonhonma
EDO		Umoghun-Nokhwa
EDO		Uromehe
EDO	Owan East	Arokho
EDO		Ihiebe
EDO		Irbiaro
EDO		Ohanmi
EDO		Warake
ENUGU	Aninri	Mpu
ENUGU		Ndiaboh
ENUGU		Nenwe
ENUGU		Oduma
ENUGU		Opanku
ENUGU	Awgu	Agbogugu
ENUGU		Agwu
ENUGU		Amoli
ENUGU		Ifite
ENUGU		Maku
ENUGU	Enugu East	Alulu
ENUGU		Amorji
ENUGU		Ibagwa
ENUGU		Nkwugbo
ENUGU		Ugwogo
ENUGU	Igbo-Eze	Aguibeje
ENUGU		Amube
ENUGU		Okpo
ENUGU		Onicha
ENUGU		Umuopu
ENUGU	Igbo Etiti	Ekwegbe
ENUGU		Ohodo
ENUGU		Ozalla
ENUGU		Ukehe
ENUGU		Umunko
ENUGU	Udenu	Imilike
ENUGU		Obollo Eke
ENUGU		ObolloEtiti
ENUGU		Ozalla-Ezimo
ENUGU		Umundu
ENUGU	Uzo-Uwani	Abbi
ENUGU		Nimbo
ENUGU		Nrobo
ENUGU		Opanda
ENUGU		Uvuru
FCT	Abaji	Agyana
FCT		Makana
FCT		Nuku
FCT		Pandagi
FCT		Yewuni
FCT	Gwagwalada	Ibura II
FCT		Luda

Annex 1. YIIFSWA Project Communities in Nigeria contd.

States	LGAs	Communities
FCT		Pagadan
FCT		RaphinZuti
FCT		Wura
FCT	Kuje	Chibiri
FCT		Kiyi
FCT		Shadarbi
FCT		Shazi
FCT		Tarkarba
FCT	Kwali	Ashara
FCT		Kilankwa I
FCT		UboSaidu
FCT		Ubosharu
FCT		Yambabu
KOGI	Ibaji	Odogwu
KOGI		Ogaine
KOGI		Ojuba
KOGI		Onyedega
KOGI		Ujeh
KOGI	Idah	Ajibaja
KOGI		Ekwokata
KOGI		Ichala
KOGI		Ijobe
KOGI		Ojigagala
KOGI	Omala	Abejukolo
KOGI		Ajiyolo
KOGI		Bagaji
KOGI		Icheke?
KOGI		Odoh
KOGI	Yagba East	Ejuku
KOGI		Imela
KOGI		Jege
KOGI		Ponyan
KOGI		Takete-Isao
NASARAWA	Lafia	Adogi
NASARAWA		Agudu
NASARAWA		Assakio
NASARAWA		BukanBuzu
NASARAWA		Bukan Koto
NASARAWA	Nasarawa	Gadabuke
NASARAWA		Karmu
NASARAWA		Kwoho
NASARAWA		Laminga
NASARAWA		MararabaUdege
NASARAWA	Obi	Agyaragu
NASARAWA		Daddere
NASARAWA		Kpangwa
NASARAWA		Obi
NASARAWA		Zherugba
NIGER	Bosso	Beji
NIGER		Garatu
NIGER		Garusu
NIGER		Gbaiko
NIGER		Kampala

Annex 1. YIIFSWA Project Communities in Nigeria contd.

States	LGAs	Communities
NIGER	Gurara	Bonu
NIGER		Diko
NIGER		Lambata
NIGER		Lefu
NIGER		Tufa
NIGER	Lapai	BirninMaza
NIGER		Gabi
NIGER		Gulu
NIGER		Gupa
NIGER		Lapai
NIGER	Mashegu	BabbanRamin
NIGER		Makari
NIGER		Mashegu
NIGER		Masuchi
NIGER		Sahorami
NIGER	Rafi	Karaya
NIGER		Katako
NIGER		Madaka
NIGER		Sambuga
NIGER		Tegina
NIGER	Shiroro	Gwada
NIGER		Kadna
NIGER		Pina
NIGER		She
NIGER		Zumba
NIGER	Tafa	Azhi
NIGER		Garam
NIGER		Gyedna
NIGER		Ijagwari
NIGER		SabonWuse
OYO	Irepo	Adagbangba
OYO		Gudu
OYO		Nufe
OYO		Sooro
OYO		Welewele
OYO	Olorunsogo	Alawa
OYO		Bi-Alaso
OYO		Dogo
OYO		Igbeti
OYO		TesiGarubar
OYO	Orelope	Bonni
OYO		Igbope
OYO		Kajola
OYO		Oloko
OYO		Sooro

2. YIIFSWA Project Communities in Ghana.

Regions	Districts	Communities
ASHANTI	Ejura-Sekyedumase	Bisiw 1
ASHANTI		Bisiw2
ASHANTI		Bompa
ASHANTI		Ejura Nkwanta
ASHANTI		Hiawoanwu
ASHANTI		Kasei
ASHANTI		Kramokrum
ASHANTI		Krampong
ASHANTI		Kropong
ASHANTI		Leafu Kura
ASHANTI		Mesuo
ASHANTI		Nkrama
ASHANTI		Nokreasa
ASHANTI		Nyinasei
ASHANTI		SamariNkwanta
ASHANTI		Sunkwae
BRONG-AHAFO	Atebubu-Amantin	Akyeremade
BRONG-AHAFO		Amanfrom
BRONG-AHAFO		Asanteboa
BRONG-AHAFO		Badukrom
BRONG-AHAFO		Boniafo
BRONG-AHAFO		Densi
BRONG-AHAFO		Duabone 1
BRONG-AHAFO		Duabone 2
BRONG-AHAFO		Kafaano
BRONG-AHAFO		Kumkumso
BRONG-AHAFO		Lailai
BRONG-AHAFO		Mem
BRONG-AHAFO		Morochusu
BRONG-AHAFO		Nwowam
BRONG-AHAFO		Old kronkrompe
BRONG-AHAFO		Patuda
BRONG-AHAFO		Praprabon
BRONG-AHAFO		Primukyea
BRONG-AHAFO		Sampa
BRONG-AHAFO		Tintare
BRONG-AHAFO		Watro
BRONG-AHAFO	Kintampo	Aduma
BRONG-AHAFO		Alassankura
BRONG-AHAFO		Asantekwa
BRONG-AHAFO		Asuma Kura
BRONG-AHAFO		Attakura
BRONG-AHAFO		Bablioduo-Kokomba
BRONG-AHAFO		Badu Krom (Kofi)
BRONG-AHAFO		Basabasa
BRONG-AHAFO		Ben Krum
BRONG-AHAFO		Busuama
BRONG-AHAFO		Chiranda
BRONG-AHAFO		Dawadawa
BRONG-AHAFO		Gulumpe
BRONG-AHAFO		Kadelso
BRONG-AHAFO		kaka
BRONG-AHAFO		Kandige
BRONG-AHAFO		Kawampe
BRONG-AHAFO		KurawuraAkura
BRONG-AHAFO		Mansira
BRONG-AHAFO		Miawani
BRONG-AHAFO		NanteZongo
BRONG-AHAFO		Nyamebekyere 1
BRONG-AHAFO		Nyamebekyere 2
BRONG-AHAFO		Sogliboi
BRONG-AHAFO		Suronuasi
BRONG-AHAFO		Taidifufuo
BRONG-AHAFO		Techira 1
BRONG-AHAFO		Techira 2
BRONG-AHAFO		Yaara
BRONG-AHAFO		Yabraso

Annex 2. YIIFSWA Project Communities in Ghana contd.

Regions	Districts	Communities
NORTHERN	East Gonja	Abrumase
NORTHERN		Adamupe
NORTHERN		Bau
NORTHERN		Bunjai
NORTHERN		Dagbabia
NORTHERN		GrunshieZongo
NORTHERN		Jemitutu
NORTHERN		Kakoshi
NORTHERN		Kalande
NORTHERN		Mbawupe
NORTHERN		Katanga
NORTHERN		Kigbatito
NORTHERN		Kijewu
NORTHERN		Kitoe
NORTHERN		Kpolo
NORTHERN		Kumburupe
NORTHERN		Latinkpa
NORTHERN		Masaka
NORTHERN		Mbawudo
NORTHERN		Nakpaye
NORTHERN		shishipe
NORTHERN		Talkpa
NORTHERN		Tunga
NORTHERN	Mion	Gunsi
NORTHERN		Kulunkpegu
NORTHERN		Mahakpi
NORTHERN		Mbatinga
NORTHERN		Ndiyuriyili
NORTHERN		Puriya
NORTHERN		Salankpang
NORTHERN		Sang
NORTHERN		Sanze
NORTHERN		Zakpalsi

3. Household level questionnaire

International Institute of Tropical Agriculture (IITA)
Yam Improvement for Income and Food Security in West Africa (YIIFSWA)
TECHNOLOGY ADOPTION & IMPACT SURVEY
HOUSEHOLD QUESTIONNAIRE
Nigeria and Ghana

Part A. Interview Background

1. Field supervisor's name _____ 2. Date Checked _____

3. Data Entry clerk's name _____ 4. Date Entered _____

Respondent's Telephone Number: _____

5. Enumerator's name: _____ 6. Date of interview: _____

7. Country: _____ 8. State/Region: _____

9. LGA/District: _____ 10. Village/Community: _____

GPS readings at the house of respondent

Latitude (N/S)										Longitude (W/E)										Altitude in meters		
									0										0			

[The respondent must be the head or de-facto head of the household]

11. Name of respondent: _____

12. Gender of respondent: _____ [***1] Male [0] Female***

13. Age of respondent (in years): _____

14. Education (***in years with 0= None/Illiterate***): _____

15. Religion of the household head: _____ (***1. No religion/atheist/traditionalist; 2.Christian; 3.Muslim; 4. Other***)

16. Experienceof the household head in growing yam (***years***): _____

17. Is the respondent the head of the household? ____ ***[1] Yes [0] No***

18. Total number of people in the household: _____, Females out of the total: _____

19. Have you benefited directly or indirectly from YIIFSWA project? _____ ***(1=Direct; 2 = Indirect; 3=Both)***

20. If you benefited from YIIFSWA project from Question 19, indicate how. _____ ***(1= Training in minisett technique; 2= Training in vine cutting technologies; 3= Training in business plan development for pre-basic and basic seed producers; 4= Training in business plan development for seed producers; 5=Training in business plan development for yam producers; 6=Provided with seed tubers; 7=Provided with QDS/pre-basic/basic materials for seed production; 8=Provided with plantlets; 9=Training on high-ratio seed yam propagation techniques; 10=Production of certified seed yam; 11=Training in seed yam quality control and certification; 12=Improved yam storage facilities; 13= Others (specify: _____)***

21. Have you put the benefit gained into use? ____ ***(1= Yes; 0= No)***

22. If Yes to question 21 above, how many people have benefited from you? _____

23. If you benefited from YIIFSWA project, how has it helped you?_____ ***(1= Yam production increased; 2=Area of yam produced increased; 3= Output per unit of area increased; 4= Reduced losses; 5= Improved quality and safety of processed products; 6=Application of quality management protocols system in seed yam production; 7= Others (specify: _____)***

24. In which year did you start benefiting from YIIFSWA project? ____ ***(1=2012, 2=2013; 3=2014; 4=2015)***

25. How satisfied are you with the project benefit(s)? _____ ***(1= Very satisfied; 2= Satisfied; 3= Not satisfied)***

26. If not satisfied with the project benefit(s), why? ____ (***1= Lack/shortage/unavailability of input; 2=Not enough time for learning; 3= Not convinced; 4= Poor quality of planting material received; Others, specify: _____)***

27. Type of toilet used: _____

(***1. Flush toilet private; 2. Flush toilet shared; 3. Ordinary pit latrine private; 4. Ordinary pit latrine shared;***

5. No toilet/use open air)

28. Main walling material of main residential house: _____

(1. Burned bricks; 2. Unburned bricks; 3. Mud bricks; 4. Concrete blocks; 5. Pole and mud; 6. Timber;

7. Sticks and grass; 8. Iron sheets; 9. Other, specify…….....)

29. Main roofing material of main residential house: _____

(1. Grass thatch; 2. Iron sheest; 3. Tiles; 4. Asbestos; 5. Other, specify……)

30. Taking into consideration ALL food sources (own food production + food purchases + help from different sources + food hunted from forest and lakes, etc.), how would you assess your family's food consumption in the past 12 months? _____

(***1. Food shortage through the year, 2.Occasional food shortage, 3. No food shortage but no surplus, 4. Food surplus)***

31. In case of food shortage from 30 above, what is the most important coping strategy used? _____

1. Rely on less preferred foods; 2. Limit the variety of foods eaten; 3. Limit portion size at meal-times;

4. Reduce number of meals eaten in a day; 5. Restrict consumption by adults for small children to eat; 6. Borrow food, or rely on help from a friend or relative; 7. Have no food of any kind in your household; 8. Go to sleep at night hungry because there is not enough food; 9. Go a whole day and night without eating anything; 10. Seek jobs inside the community; 11. Migrate to urban centers in search of non-farm jobs; 12. Other, specify: ……)

32. Distance from residence to the nearest primary school in the community? _____ (***minutes of walking time and NA if none***)

33. Distance from residence to the nearest farm? _____ (***minutes of walking time***)

34. Distance from residence to the local market? _____ (***minutes of walking timeand NA if none***)

35. What means of transport do you use most frequently to get to the local market from your residence? _____
(1=Walking; 2=Bicycle; 3=Motorcycle; 4=Tractor; 5=Vehicle; 6=Cart; 7=Other; 8=NA)

36. Quality of road to the main market (district) ___ ***(1=Very poor; 2=Poor; 3=Average; 4=Good; 5=Very good)***

37. Average one-way transport cost (/person) to the main market using a car _____(***Naira/Cedi/pers***.)

38. Distance to the nearest health center from residence _____ (***minutes of walking time***)

39. Main source of drinking water _____ ***(1=Piped/tap; 2=Deep well protected and covered; 3=Deep well unprotected & uncovered; 4=Stream; 5=River; 6=Dams; 7=Ponds or floods; 8=Borehole)*** *Note: protected refers to water sources internally plastered and covered with a cap of wood, stone, or concrete)*

40. Distance to main water source for drinking _____ (***minutes of walking time***)

41. Are you involved in any projects that are going on in the community? ___ ***[1] Yes [0] No***

42. If Yes to question 41, what kind of projects are they? ***(Tick as appropriate):***

a. Agricultural extension services

b. Microcredit

c. Community Health Volunteer Training

d. Water supply

e. NGO (Non-governmental Organization) starting new activities

f. Other projects, which? _____

Part B. Household Composition

1. We are interested in knowing more about the composition of your **household** (all the people living in the same compound, eating from the same "pot" and working on the family farm)

Name *(Start with the house-hold head)*	**Gender** 0=Female 1=Male	**Age** in Years	**Relation to head**: (*See Code below*)	**Marital Status** (*See Code below*)	**Education level** *(in years with 0= Il-literate)*	Indicate **type of off-farm income** HH member is earning (*Code below*)	**Number of months** liv-ing at home in the last 12 months	**Number of months** (in a year) available for farm work	For those **under the age of 5**, any illness in the last one year? (See Codes below)	
									3 years ago	**Now**
1.										
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										
10.										
11.										
12.										
13.										
14.										
15.										
			0=Head 1=Spouse 2=Parent 3=Child/grand child 4=Nephew/Niece 5=Son/daughter-in-law 6=Brother/Sister 7=other relative	0=Single 1=Married 2=Widowed 3=Separated 4=Divorced		0=Petty trading 1=Teaching 2=Masonry/carpentry 3=Nursing 4=Arts and crafts 5=Driving 6=Fitting mechanic 7=Farm labor 8=Civil service 9=Other 10=N/A			0. No disease 1. Fever/malaria 2. Dysentery/diarrhoea 3. Respiratory problems 4. Measles 5. Typhoid fever 6. Under-nutrition 7. Tuberculosis 8. Lifetime disease/Disorder 9. Other specify	

Part C. Social Capital and Networking

1. Have you and/or your spouse belonged to any farmers' associations in your Village/Community in the last 3 years? ____

[1]=Yes [0] No

2. If Yes to Question 1, Which of the following association(s) do you belong to and what level of involvement?

Association	**Yes=1, No=0**	**If yes, year joined**	**Role in the association** *1=Leader, 2=Active member, 3=Ordinary member*	**Major activity (Use codes)** *1. Input access/pro-duce marketing; 2.Seed production; 3. Farming; 4.Savings and Credit; 5. Funeral group; 6.Church group /congregation; 7.Input credit*
Input supply/farmer coops/union				
Cooperative				
Yam producer and marketing group				
Other crop/seed producer & marketing group/ coop				
Local administration				
Farmers' Association				
Women's Association				
Youth Association				
Religious association				
Savings & Credit group				
Funeral association				
Government team				
Cooperative farming				
Other, specify: _____				

3**.** Number of years you have been living in this community: _____

4. Number of yam traders that you know in this community who could buy your yam: _____

5. Number of yam traders that you know outside this community who could buy your yam: _____

Part D. Gender Role

Section 1. Household decision-making

Per activity mentioned, please use <u>only one option</u> along the row	**Head alone**	**Spouse alone**	**Jointly** **(Head and spouse)**	**Children**
Crops to plant *(1=Yes)*				
Type of yam variety to plant *(1=Yes)*				
Purchase of yam seeds to plant *(1=Yes)*				
Allocation of labor under yam *(1=Yes)*				
Amount of yam produced to be consumed *(1=Yes)*				
Amount of yam produced to be sold *(1=Yes)*				
Food security coping mechanism to use in case of food shortage *(1=Yes)*				

Section 2. Household farming operations

Farm Operation	**Who decides on the following?** *1-Head alone; 2- Spouse alone; 3- Jointly; 4- Children 5-NA for unused operation*	**Who did most of the farming operations?** (*Please mark only one option per farming operation*)			
		Men mostly *(1=Yes)*	**Women mostly** *(1=Yes)*	**Both equally** *(1=Yes)*	**Children** *(1=Yes)*
Land clearing					
Seedbed preparation					
Yam treatment					
Planting					
Fertilizer application					
Mulching					
Staking					
Weeding					
Harvesting					
Transport					
Storage					
Marketing					

Part E. Household Assets

Section 1. Ownership of productive and household assets

Asset	**Number** (if no equipment, put zero)	**Estimated unit value in terms of how much you would receive from the sale** (Naira/Cedi) (if more than one item reported in column 2, take average price)
Cart		
Axe		
Machete/ cutlass		
Hoe		
Sprayer		
Grain mill		
Pump		
Spade or shovel		
Radio		
CD Player		
Television set		
Cell phone		
Stove		
Bicycle		
Motorbike		
Car		
Tractor		
Jewellery		
Wooden box		
Metal box		
Bed		
Chair		
Table		
Thatched house		
Corrugated iron sheet house		
Fish pond		
Sofa		
Panga knife		
Other, specify.....		

Section 2. Livestock ownership

Livestock owned			
Type	**Number owned**	**Type**	**Number owned**
1.Cattle		7.Poultry (Chickens, Guinea fowl, Ducks)	
2.Donkeys		8.Doves/pigeons	
3.Horses		9.Pigs	
4.Goats		10.Other (Specify1: _____)	
5.Rabbits		11. (Specify2: _____)	
6.Sheep		12. (Specify3: _____)	

Section 3. Land holding during the last cropping year

Land category	**Land holding** (ha)	**Land holding share for ware yam** (%)	**Land holding share for seed yam** (%)	**Land holding share for women** (%)
1. Own land used (A)				
2. Rented in land (B)				
3. Rented out land (C)				
4. Borrowed in land (D)				
5. Borrowed out land (E)				
6. Total owned land (A+C+E)				
7. Total operated land (A+B+D)				

Section 4. Yam storage during the last cropping year

Number of months your yam is stored	**Type of storage used** (Use codes below)	**Percentage lost at the end of storage**		
		Rotting (%)	Sprouting (%)	Other: ……
…….. months				

Codes: 1=Improved storage system, 2=Traditional room storage; 3=Under trees; 4=Raised sheds in the field; 5=Yam barns in the compound ; 6=Raised huts; 7=Left in the soil after maturity; 8= Other (specify: ……..)

Part F. Knowledge and adoption of new yam technologies

Section 1. Awareness, adoption, and disadoption of yam technologies

1. Indicate on the Table below the different yam varieties planted

How many different varieties of yam did you/will you plant?			**What were the main varieties of yam planted last season?**			**If you divide the total plots into 10 parts, how many parts are under your main yam variety?**
3 years ago	Last season	In the future	First variety	Second	Third	
						_____ /10

Code for Ghana					***Code for Nigeria***	
1-Pona	6-Nanto	11- Chinchinto	16-Matches/ Seidu/ Afasie/ Blu/ Water yam	18-Mankro-npona	*21-Amula*	*26-Meccakusa*
2-Lariboko	7-Kokropa	12-Maamak-umba		19- Aso-bayere/ Auntie/Ako-sua	*22-Ame*	*27-Hembakwase*
3-Dente	8-Nooma	13-Serwaa/ Afibetua			*23-Pepa*	*28-Danancha*
4-Akaba	9-Akwa	14-Lobare/ Dorban		20-Oth-ers:_____	*24-Gwagwa*	*29-Water yam*
5-Lelee	10-Enkanfo	15-Kwaseko-hwe	17-Mu-chumudu/ Araba/ Asana/ Moonye/ Moninyo		*25-Yangode*	*30-Others:_____*

2. Have you **ever** planted any new variety of yam during the last 5 years? ___ ***[1] Yes [0] No***

3. If No to question 2, why have you **never** planted any new yam variety?

[1] N/A

[2] Not heard of any new varieties

[3] No access to planting material

[4] No money to buy the planting material

[5] Satisfied with the local varieties I plant

[6] Simply not interested in experimenting with new varieties

[7] Not seen any demonstration to show superiority of new varieties

[8] Other: _____

If No to question 2, skip to question 15, Otherwise continue with question 4 below.

4. How many years ago did you plant a new variety of yam for the first time? _____

5. What was the name of the new variety you planted for the first time? _____

6. What was the source of information about the new variety?

[1] Fellow farmer [2] Local retail shop

[3] Ministry of Agric. Extension agent [4] Seed company staff _____

[5] Research Institute [6] NGO (specify) _____

[7] Radio [8] Television

[9] Newspaper [10] Other (specify) _____

7. What was your source of planting material?

[1] Do not remember [2] Free plant. mat. from a neighbor

[3] Free plant. mat. from government program [4] Free plant. mat. from an NGO program

[5] Purchased from a Seed company [6] Purchased from NGO

[7] Purchased from Ministry of Agriculture [8] Purchased from another farmer

[9] Purchased from market [10] Purchased from an agro-dealer

[11] Other: _____

8. What was the reason for your choice of source of planting material?

[1] No reason [2] Cheaper source [3] Available source

[4] Lack of cash [5] Near homestead [6] Free source

[7] Other: _____

9. Have you been planting new yam varieties since then (continuously)? ____ ***[1] Yes [0] No***

10. If No to question 9, how many years ago did you discontinue planting? _____

11. If No to question 9, **why** did you discontinue planting?

[1] N/A [2] Preferred variety no longer available

[3] No cash to purchase plant. mat. [4] Not satisfied with performance of the varieties

[5] Depressed prices [6] Other: _____

12. After discontinuing, in which year did you resume planting any new yam variety? _____

13. Which variety did you plant when you resumed planting? _____

14. Why did you resume planting new yam varieties?

[1] N/A [2] New varieties satisfied my demand

[3] Local varieties performing too poorly [4] Convinced by extensionist

[5] Other: _____

15. Will you purchase any new variety for planting in the future? _____ [***1] Yes [0] No***

16. If No to question 15, why will you not purchase yam planting material in the future?

[1] N/A [2] No cash to purchase plant.mat.

[3] Will not obtain preferred variety [4] No plant. mat. retailer within locality

[5] Already satisfied with the plant. mat. I have [6] Other (specify):_____

Section 2. Awareness of adaptive yam minisett technology, adoption, and disadoption

Awareness and adoption related questions *(If No to the below row for both technologies, skip the table)*	**Adaptive yam minisett technology**	**Improved yam storage technology**
Ever heard (***1=Yes, 0=No***)		
Year first known or heard (***YYYY***)		
Main source of information (***Codes A***)		
Ever planted/used (***1=Yes, 0=No***)		
If ever planted/used, year first planted/used (***YYYY***)		
If ever planted/used, area/volume first planted/used (***ha/liter***)		
If ever planted/used, source of sett/storage first planted/used (***codes C***)		
If ever planted/used, quantity of sett/yam first planted/stored (***indicate number of setts or kg or baskets***)		
If ever planted/used, main means of acquiring the setts/technology first planted/used (***Codes D***)		
If ever planted/used, yield/quality of first planted /used(***indicate number of minitubers or kg or use Codes E***)		
If ever planted/used, number of years minisetts have been planted/ months yam stored (***Number***)		
Did you plant/store minisett/yam last season (2014)? (***1=Yes, 0=No***)		
If never planted/stored, give main reason why (***Codes B***)		

Codes A	Codes B	Codes C	Codes D
1. Government extension 2. Farmers' Coop/group 3. IITA 4. CRS, MSHR, New NGOs 5. CRI, GLDB, NRCRI, 6. Seed company/grain stockist 7. Relative/ Neighbor 8. Radio/newspaper/TV 9. Local input provider 10. Other, specify_____	1. Technical knowledge not available 2. Seeds/technology not available 3. Lack of cash/credit to acquire seeds/technology 4.Susceptible to diseases/pests 5. Poor taste 6. Low yielding/quality 7. Price too high 8. No market 9. Poor storability 10. Lack of enough land 11. Requires high skills 12.Content with current 13. Other, specify_____	1. On-farm trials 2. Extension demo fields 3. Farmers' groups/coops 4. Local seed producers 5. Seed retailers 6. Private seed suppliers 7.MoFA/ADP 8.Club/association 9. Farmer-to-farmer seed exchange 10. Provided free by NGOs/govt 11. Other (specify)_____	1. Gift/free 2. Borrowed seeds 3. Bought with cash 4. Payment in kind 5. Exchange with other seeds 6. Research Institute/IITA 7. CRS/MoFA/MSHR 8. Other, specify_____ **Codes E** 1.Lower 2.Unchanged 3. Better

Part G. Crop Production for <u>All Crops</u> Grown by the Household during last Cropping Season

Section 1. Characteristics, investment, and input use

Definitions: A field is a piece of land physically separated from others; a plot is a subunit of a field. If more than one crop is grown on a field (that is, on different plots), repeat the code in next row and use plot code. If the plot is intercropped, use same row and separate the different intercrops by commas. Consider only 3 main intercrops if you encounter more than 3 crops on a plot and <u>start always the first row(s) with yam</u>.

Serial number	Field code (start with one next to resi-dence)	Field loca-tion name (as called by farmer)	Plot code	Plot size (Ha)	Intercrop? **(0=No; 1=Yes)**	Crop rotation **(0=No; 1=Yes)**	Crop(s) grown **(Use Annex 1 codes)**	Crop variety **(0=local; 1=new)**	Percent of area un-der each intercrop (e.g. 50,50)	Transport used from residence to field **Codes A**	Field distance from residence **(walking minutes)**	Plot ownership **Codes B**	Plot manager **Codes C**	Soil fertility **Codes D**	Soil slope **Codes E**	Soil depth **Codes F**	Soil type/colour **Codes G**	Soil & water conser-vation method **Codes H**	Crop residue left on plot **1=Yes; 0=No**
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

Codes A 1. Walking 5. Other 2. Bicycle 3. Motorcycle 4. Vehicle/ tractor	**Codes B** 1. Owned 2. Rented in 3. Rented out	4. Borrowed in 5.Borrowed out 6. Other, specify….	**Codes C** 0. Women 1. Men 2. Both equally	**Codes D** 1. Good 2. Medium 3. Poor	**Codes E** 1. Gentle slope (flat) 2. Medium slope 3. Steep slope	**Codes F** 1. Shallow 2. Medium 3. Deep	**Codes G** 1. Black 2. Brown 3. Red	4. Grey 5. Other, specify…	**Codes H** 0. None 1. Terraces 2. Mulching	3. Grass strips 4. Trees on boundaries 5. No tillage	6.Minimum till 7.Soil bunds 8.Stone bunds 9. Box ridges 10.Other, specify…

Section 2. Crop harvested, utilization of crop produced, and household food security

Different from Section 1 above: i.e., record <u>one row per crop</u> (e.g., add production from all yam fields together) and start with yam

NB. Report the number of tubers for yam instead of kg

Crop ***(Use codes in Annex 1)***	Total harvested last season ***(kg)***	Form ***Codes A***	Carryover stock from previous harvest ***(kg)***	Total available stock for this season ***(kg)***	From the total available stock (**Column 5**)…					Amount left in store before next harvest ***(kg)***
					Quantity sold ***(kg)***	In-kind payments (labor, land and others) paid during last cropping season ***(kg)***	Seeds used during last cropping season ***(kg)***	Gifts, donations given out during last cropping season ***(kg)***	Consumption during last cropping season ***(kg)***	
1	**2**	**3**	**4**	**5=2+4**	**6**	**7**	**8**	**9**	**10**	**11=5-6-7-8-9-10**

***Codes A*:** 1. Fresh/green; 2. Dry

Section 3. Marketing of crops

1. Different from Sections 1 & 2 above: i.e., record <u>one or more than one, according to market type transaction</u> (e.g., add production from all crop fields together by market type) and start with yam

NB. Report the number of tubers for yam instead of kg

Crop ***(Use codes in Annex 1)***	Market type ***Codes A***	Month sold ***Codes B***	Quantity sold ***(kg)*** (sum by crop should be equal to Column 6 of Section 2)	Who sold? ***Codes C***	Price (Naira/ Cedi/kg)	Buyer ***Codes D***	Relation to buyer ***Codes E***	Mode of transport ***Codes F***	Time taken to get to the market ***(minutes)***	Actual transport cost ***(Naira/Cedi)***
1	2	3	4	5	6	7	8	9	10	11

Codes A	**Codes B**		**Codes C**	**Codes D**		**Codes E**	**Codes F**
1. Farm gate 2. Community market 3. Main/district market	1. January 2. February 3. March 4. April 5. May 6. June	7. July 8. August 9. September 10. October 11.November 12. December	0. Female 1. Male 2. Both	1. Farmers' group/union / coop/club 2. Consumer or other farmer 3. Rural assembler 4. Brokers/middlemen 5. Rural grain trader/wholesaler	6. Urban grain trader/wholesaler 7. Exporter 8. Miller 9. FRA 10. Other, specify……	1. No relation but not a long-time buyer 2. No relation but a long-time buyer 3. Relative 4. Friend 5. Money lender 6. Other, specify……	1. Bicycle 2. Hired vehicle 3. Public transport 4. Donkey 5. Oxen/horse cart 6. Back/head load 7. Other, specify……..

2. What is the maximum amount of money you would be willing to pay for a seed yam variety that has the desired qualities and is sufficient for planting one hectare? ..... (***Naira/Cedi***s)

3. What is the most important objective for growing yam for your household_____ (***1=Sale; 2=Food; 3=Both***)

4. How many times did you harvest your field_____ (***1=once; 2=twice; 3=more than twice; 4=others, specify:*** _____)

5. Where did (would) you carry the yam harvested? ___ (***1=Home; 2=Market; 3=Store in the field; 4=Other, specify***: _____)

6. Main type of seed yam used? _____ (***1=Whole tuber; 2=Sliced tuber; 3=Milked tuber***)

7. If you divide the entire yam you harvest into 10 parts, how many parts do you use as seeds?

Use as seeds _____ Parts out of 10

8. If you divide the yam you sell into 10 parts, how many parts will you take to market and how many parts will traders come to you and buy?

To market _____ Parts out of 10

Traders come for _____ Parts out of 10

_____

Total 10

9. If you divide the yam you sell into 10 parts, how many parts will you sell immediately after harvest and how many parts will you store and sell later?

Sell immediately at harvest _____ Parts out of 10

Store and sell later _____ Parts out of 10

_____

Total 10

10. Do you process the yam you produce? ____ (***1=Yes; 0=No***)

11. If Yes to Question 10 above, If you divide the entire yam you harvest into 10 parts, how many parts will you process?

To process _____ Parts out of 10

12. What is the main challenge/constraint confronting the sales of your yam products in this community and in other places? ___ (***1=Transportation costs; 2=Low patronage; 3=Influence of other competitors, 4=Storage-related issues; 5=Others (specify***) _____
_____)

13. What do you think is needed to boost your sales?

(1=_____

(2=_____

14. Do you have any physical or technical barriers to selling in any place of your choice in this area? __ (***1=Government restriction; 2=Restriction by market association's leader; 3=Restriction by other custom or tradition; 4=Others (specify***)_____)

15. Is there any quality demanded by customers of your products that you think you are not satisfying presently? ___ (***1=Taste; 2=Tuber flesh color; 3= Size; 4= Price; 5=Storability; 6=Cooking time***)

16. What is the general perception of your customers about your yam products? __ (1=Satisfied; 2=Not satisfied; 3= Indifferent)

17. In which month of the year is the marketing of this yam product high? _____

And why? _____

Part H. Stress Incidence

In your opinion, what are the major constraints to the yam production?

*(Please rank according to importance with **1 = highest rank**, please be specific and use codes in the table)*

Constraints	Rank	Now	5 years ago
Kindly pick among the following key constraints, the major 5 in yam production? (*Please rank them*) 1-Planting material; 2-Pests & diseases;3-Water logging; 4-Drought; 5-Rodents; 6-Low soil fertility; 7-Shortage of staking material; 8-Inadequate input supply; 9-Inadequate storage facilities; 10-Land shortage; 11-High cost of labor; 12-Lack of new varieties; 13-Lack of credit; 14. Access to markets; 15-other (specify) _____?	1st 2nd 3rd 4th 5th		

Part I. Transfer and Other Sources of Income Last Year

Who earned/received? Use first name used before	Sources of income Use Codes A	Total income (cash & in-kind)		Total income (Naira/Cedi)
		Cash (Naira/Cedi)	Payment in kind Cash equivalent	
1	2	3	4	5= 3+4

Codes A		
1. Rented/sharecropped out land	8. Pension income	16. Sale of crop residues
2. Rented out oxen for ploughing	9. Drought/flood relief	17. Quarrying stones
3. Salaried employment	10. Safety net or food for work	18. Rent al property (other than land and oxen)
4. Farm labor wages	11. Remittances (sent from non-resident family and relatives living elsewhere)	19. Interest from deposits
5. Non-farm labor wages	12. Marriage gifts	20. Social cash transfer
6. Non-farm agribusiness income (e.g., grain milling/trading)	13. Sales of firewood/charcoal	21. Other, specify ……..……....
7. Other business NET income (shops,	14. Brick making	
trade, tailor, sales of beverages, etc.)	15. Poles from own and communal forests	

Part J. Household Expenditure

(*Here, the person/s involved in purchases should be the principal respondent/s)*

Section 1: Food consumption

No.	Item	**Unit** (e.g., kg, liter, packet, bundle, number)	**Bought in the last 12 months**					
			Frequency of buying (e.g., once/ year, twice/year, etc.)	Average quantity each time (e.g., 2 kg; 4 bundles, etc.)	Total quantity /year	Average price/ unit **(Naira/Cedi)**	Total cost of purchase **(Naira/Cedi)**	
1	**2**	**3**	**4**	**5**	**6=4x5**	**7**	**8=6x7**	
	Staple foods							
1	Seed yam							
2	Ware yam							
3	Dried yam products							
4	Maize							
5	Wheat							
6	Barley							
7	Rice							
8	Sorghum							
9	Millet							
10	Cassava							
11	Potatoes							
12	Sweet potato							
13	Beans							
14	Cowpea							
15	Groundnut							
16	Soybean							
17	Pigeon pea							
18	Banana							
19	Plantain							
20	Egusi/Melon							
21	Other, specify.....							
	Beverages and drinks							
22	Tea (leaves)							
23	Tea (liquid)							
24	Coffee (powder)							
25	Coffee (liquid)							
26	Soft drinks							
27	Juices							
28	Local beer							
29	Bottled/clear beer							
30	Wine/Akpetshie/Dry Gin or hard drinks							
31	Drinking water							
32	Coffee beans							
33	Opaque beer (*chibuku/ pito*)							

Section 1. Food consumption (cont'd)

No.	Item	Unit (e.g., kg, liter, packet, bundle, number)	Bought in the last 12 months				
			Frequency of buying (e.g., once/year, twice/year)	Average quantity each time	Total quantity/ year	Average price/unit **(Naira/ Cedi)**	Total cost of purchase **(Naira/Cedi)**
1	**2**	**3**	**4**	**5**	**6=4x5**	**7**	**8=6x7**
	Fruits						
34	Orange						
35	Mango						
36	Pawpaw						
37	Pineapple						
38	Banana (ripe)						
39	Apple						
40	Guava						
41	Coconut						
42	Sugarcane						
43	Other.						
	Meat & other products						
44	Beef						
45	Goat meat						
46	Mutton						
47	Pork						
48	Chicken						
49	Turkey						
50	Duck						
51	Bush meat						
52	Fish						
53	Eggs						
54	Milk						
55	Cheese/Ghee						
56	Butter						
57	Yoghurt						
58	Honey						
59	Other.						
	Vegetables						
60	Tomato						
61	Onion						
62	Cabbage						
63	Spinach						
64	Kale						
65	Carrot						
66	Okra						
67	Pumpkin						
68	Egg plant						
69	Cucumber						
70	Pepper						
71	Garlic						

Section 1. Food consumption (cont'd)

No.	Item	Unit (e.g., kg, liter, packet, bundle, number)	Bought in the last 12 months				
			Frequency of buying (e.g., once/ year, twice/ year, etc.)	Average quantity each time	Total quantity/ year	Average price/ unit **(Naira/Cedi)**	Total cost of purchase **(Naira/Cedi)**
1	**2**	**3**	**4**	**5**	**6=4x5**	**7**	**8=6x7**
Fats, oils, sweeteners, snacks and others							
72	Cooking fat						
73	Margarine						
74	Groundnut oil						
75	Coconut oil						
76	Bread						
77	Biscuits						
78	Popcorn						
79	Cashew nuts						
80	Sugar						
81	Salt						
82	Chocolate						
83	Curry						
84	Ginger						
85	Macadamia nuts						

Section 2. Expenditure on non-food items in the last 12 months

No.	Expense Item	Unit (e.g. kg,, liter, packet, bundle, number)	Frequency of purchase (e.g., once/ year, twice/ year,)	Average quantity each time	Total quantity year	Average price/ unit **(Naira/ Cedi)**	Total cost of purchase **(Naira/ Cedi)**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8=6x7**
1	Clothing						
2	Shoes						
3	Blankets						
4	Bed sheets						
5	Soap/washing products						
6	Electricity						
7	Fuelwood						
8	Charcoal						
9	Kerosene						
10	Batteries						
11	School fees						
12	School books and supplies						
13	Health care						
14	Grain milling						
15	Land tax						
16	Church contributions						
17	Dowry						
18	Membership fees						
19	House building/construction						
20	Guard/security						
21	Newspapers, magazines, etc.						
22	Travel expenses						
23	Mobile phone air time (voucher)						
24	Radio/TV service charge						
25	Payment for extension services						
26	Kitchen utensils						
27	Personal care (toothpaste, nail, etc)						
28	Furniture (tables, chairs, beds, etc.)						
29	Home repairs						
30	Purchase of bicycle, motorcycle, etc						
31	Repairs for vehicles, bicycles, etc.						
32	Petrol and engine oil for cars						
33	House rent						
34	Utility bills (water, telephone, etc.)						
35	Cigarettes, tobacco, etc.						
36	Remittances paid						
37	Boxes of matches						
38	Debt payments						
39	Payment for land rent in cash						
40	Other, specify.....						

Part K. Access to Capital and Support Services

Section 1. Household credit needs and sources during last cropping season. If the credit is in non-cash form, indicate the cash equivalent or value.

Activity	Needed credit? ***Codes A***	If **No** in column 2, then why? ***Codes B***	If **Yes** in column 2, then did you get it? ***Codes A***	If **No** in column 4, then what was the main reason? (***codes C***)	If **Yes in column 4**		
					Source of credit, ***Codes D***	How much did you get? (***Naira/Cedi***)	Have you repaid the loan? ***Codes A***
1	2	3	4	5	6	7	8
1.Buying local seeds							
2. Buying new seeds							
3. Buying fertilizer							
4. Buying herbicide/pesticides							
5. Buying farm implements							
6. Buying livestock							
7. Investing in irrigation system							
8. Non-farm business or trade							
9. Buying food							
10. Medical expenses							
11. School fees							
12. Others:							

Codes A	***Codes B***	***Codes C***		***Codes D***	
0. No *1. Yes*	*1. Not cash constrained* *2. Activity is not profitable* *3. Never thought of this investment* *4. Other, specify.....*	*0. No reason* *1. Borrowing is risky* *2. Interest rate is high* *3. Too much paperwork/ procedures*	*4. Expected to be rejected, so did not try it* *5. I have no assets for collateral* *6. No money lenders in this area for this purpose*	*7. Lenders don't provide the amount needed* *8. No credit association available* *9. Not available on time* *10. Other, specify……*	*1. Money lender* *2. Farmer group/ coop.* *3. Merry-go-round* *4. Microfinance* *5. Bank*	*6. Savings and Credit* *7. Relative/friend /neighbor* *8. Other, specify……...*

Section 2. Access to extension/information services

Type of service	Did you receive training or information on [……] during the last cropping season? (***Codes A***)	If Yes in column 2, main source of information/training? (***Codes B***)	If Yes in column 2, number of contacts during the season? (***days/year***)
1. New varieties of yam			
2. New varieties of other crops			
3. Pest and disease control - yam			
4. Pest and disease control – other crops			
5. Soil and water management- yam			
6. Soil and water management-other crops			
6. Crop rotation including yam			
7. Output markets and prices			
8. Input markets and prices			
9. Livestock production			
10. Family health/planning			
11. Sanitation			
12. Food processing			

Codes A	***Codes B***				
0. No 1. Yes	1. Government's extension service 2. Farmers' Coops or groups 3. Neighbor/relative farmers	4. NGOs 5. Private company 6. Research center	7. Farmers' field school 8. Radio/TV 9. Newspaper	10. Mobile phone 11. Town hall meetings 12. Farmers' training center	13.Traders / Agro-dealers 14. Other specify.....

Annex 1. Crop Codes

Roots/Tubers/Banana/Plantain	Cereals	Grain legumes,Oil seeds, & Spices	Industrial Tree Crops
1 Yam	11 Maize	21 Cowpea	51 Cocoa
2 Cassava	12 Rice	22 Pigeon pea	52 Coffee
3 Cocoyam	13 Sorghum	23 Groundnut	53 Oil palm
4 Sweet potato	14 Millet	24 Bambara nut	54 Coconut
5 Irish potato	15 Wheat	25 Cotton seed	55 Rubber
6 Plantain	16 Beniseed	26 Soybean	56 Cola nut
7 Cooking banana	17 Guinea corn	27 Egusi/	57 Cashew
8 Frafra potato	18 Others……	28 Melon	58 Citrus
9 Others…….		29 Irvingia	59 Mango
		30 Sesame seeds	60 Other…….
		31 Calabash	Other industrial crops
		32 Ginger	61 Sugarcane
		33 Green grain	62 Sisal
		39 Others ……..	63 Tobacco
		40 Vegetables	64 Kenaf
			65 Cotton
			66 Other: _____

4. Community level questionnaire

International Institute of Tropical Agriculture (IITA)

Yam Improvement for Income and Food Security in West Africa (YIIFSWA)

COMMUNITY LEVEL QUESTIONNAIRE
Nigeria and Ghana

Part A. Interview Background

1. Country No. _____ ***(0 =Ghana; 1 = Nigeria)*** 2. State/Region: _____

3. LGA/District: _____ 4. Community/Village name _____

5. Survey date: Day _____; Mth _____ ; 20 _____

6. State of road from main city to community: _____ (*Use codes below of roads status*)

1 Tarmac, easily motorable in all seasons;	***4 Path, easily passable in all seasons;***	***7 Dirt road, easily motorablein all seasons;***
2 Tarmac, poorly motorable in all seasons;	***5 Path, barely passable in all seasons;***	***8 Dirt road, barely motorable in all seasons;***
3 Tarmac, not motorable in all seasons;	***6 Path, not passable in all seasons;***	***9 Dirt road, not motorable;***
		10 River or stream.

7. No. of people: _____ interviewed, comprising _____ men and _____women

8. ***GPS readings***

Latitude (N/S)	Longitude (W/E)	Altitude in meters
0	0	

Part B. Crops Grown

1. What are the main crops grown in this community? *(Rank first = most important)*

Crops* ranked by			
Overall importance	**Land area allocated**	**Volume of sales**	**Quantity consumed**
1	1	1	1
2	2	2	2
3	3	3	3

* ***Roots tubers and plantain***

1 Yam; 2 Cassava; 3 Cocoyam; 4 Sweet potato; 5 Irish potato; 6 Plantain; 7 Cooking banana; 8 Other roots/tubers

Cereals

11 Maize; 12 Rice; 13 Sorghum; 14 Millet; 15 Wheat; 16 Finger millet; 17 Other cereals

Grain legumes, oil seeds and vegetables

21 Cowpea; 22 Pigeon pea; 23 Groundnut; 24 Bambara nut; 25 Cotton seed; 26 Other beans/peas; 27Egusi/melon; 29 Sesame seed; 30 Calabash; 31 Ginger; 32 Sunflower; 33 Beniseed; 34 Tea; 35 Other legumes/oils; 40 Vegetables

2. Do you know anyone producing only seed yam? ____ ***(1 = Yes; 0 = No)***

2.a. If YES, are they many in this community? ___ ***(1 = Yes; 0 = No)*** Number? _____ male & _____ female

3. Do you have in this village any yam variety with extraordinary qualities? ___ ***(1 = Yes; 0 = No)***

3a. If Yes, what are they?

Variety1 Name _____; Qualities _____

Variety2 Name _____; Qualities _____

4. Have you faced scarcity of certain good yam varieties which existed in the past? __ ***(1=Yes; 0=No)***

If Yes, which ones?_____

5. Which other good yam varieties disappeared completely? _____

And why? _____

6. What has been the trend in yam production in the last 20 years? ___

(1 = Decreasing? 2 = No change? 3 = Increasing?)

Why? Explain _____

7. What has been the trend in yam production in the last 4 years with YIIFSWA interventions? ___ ***(1 = Decreasing? 2 = No change? 3 = Increasing?)***

8. Yam production goals. What is the most important objective for growing yam in this community? ___ ***(1 = Sale; 2 = Food; 3 = Other, specify: _____)***

9. Source of hired labor: Where does the hired labor in this community come mostly from? ___ ***(1=Within the community; 2=Neighboring community in the area; 3=Community far away (in other regions); 4=Nearest town; 5= Neighboring countries; 6=Not known)***

Part C. Risk Sources & Infrastructure

1. What are the major problems in the production of yam in the community?

1. _____

2. _____

3. _____

2. Where do farmers sell yam mostly? ___ ***(1 = Farm gate; 2 = Village market; 3 = Other market),***

specify: _____)

3. By what (most common means) do you carry yam to market? ____ ***(1 = Head load; 2 = Bicycle;***

3 = Barrow/Cart, 4=Lorry/Pickup/tractor/trailer; 5= Animal; 6=Motorcycle; 7=Other) specify: _____)

4. Where is your market located? _____ (***1=inside the village; 2=Outside the village)***

5. What is the frequency of market days? ***Every _____ days***

5.1 Rank by volume traded, the people who buy ware yam in this market.

People who buy (Rank 1=highest)

Consumers from this or nearby community? ___

Consumers from far away? ___

Small traders from this and nearby villages? ___

Small traders from far away? ___

Big traders from far away with lorries? ___

5.2 Rank by volume traded, the people who buy seed yam in this market.

People who buy (1=highest)

Consumers from this or nearby community? ___

Consumers from far away? ___

Small traders from this and nearby villages ___

Small traders from far away? ___

Big traders from far away with lorries ___

5.3 Rank by volume traded, the people who sell ware yam in this market.

People who sell (Rank 1=highest)

Farmers themselves? ___

Traders from this and nearby community? ___

Traders from far away? ___

5.4 Rank, by volume traded, the people who sell seed yam in this market.

People who sell (Rank 1=highest)

Farmers themselves? ___

Traders from this and nearby community? ___

Traders from far away? ___

6. How many vehicles (lorries) come into the market per market day? _____

5. Field level questionnaire

International Institute of Tropical Agriculture (IITA)

Yam Improvement for Income and Food Security in West Africa (YIIFSWA)

FIELD LEVEL QUESTIONNAIRE

Nigeria and Ghana

Part A. Interview Background

1. Survey date: Day ____ ;Mth _____ ; 20_____ Name of respondent: _____

2. Field location distance from residence: _____ (***in minimum walking time***)

3. ***GPS readings of the yam field***

Latitude (N/S)										Longitude (W/E)										Altitude in meters		
									0										0			

4. How old is your yam field?

4.a How many people have worked on this field? _____ And how many years has this land been put into use? _____

4.b How many years have you been using this same land? _____

5. Has your community benefited from YIIFSWA project? _____ ***(1=Yes; 0=No)***

6. If Yes from Question 5, indicate how. _____ ***(1= Training in minisett technique; 2= Training in vine cutting technologies; 3= Training in business plan development for pre-basic and basic seed producers; 4= Training in business plan development for seed producers; 5=Training in business plan development for yam producers; 6=Provided with seed tubers; 7=Provided with QDS/pre-basic/basic materials for seed production; 8=Provided with plantlets; 9=Training on high-ratio seed yam propagation techniques; 10=Production of certified seed yam; 11=Training in seed yam quality control and certification; 12=Improved yam storage facilities; 13= Others (specify: _____)***

7. Have you in this community put the benefit gained into use? ____ ***(1= Yes; 0= No)***

8. If Yes to question 7 above, how many have benefited from your community? _____

9. If Yes to question 7 above,, how has it helped you in this community?_____ ***(1= Yam production increased; 2=Area of yam produced increased; 3= Output per unit area increased; 4= Reduced losses; 5= Improved quality and safety of processed products; 6=Application of quality management protocols system in seed yam production; 7= Others (specify: _____)***

10. In which year did you start benefiting from YIIFSWA project in this community? _____ ***(1=2012, 2=2013; 3=2014; 4=2015)***

11. How satisfied are you with the project's benefit(s)? _____ ***(1= Very satisfied; 2= Satisfied; 3= Not satisfied)***

12. If not satisfied with the project benefit(s), why not? ____ (***1= Lack/shortage/unavailability of input; 2=Not enough time for learning; 3= Not convinced; 4= Poor quality of planting material received; Others, specify***: _____)

Part B. Yam & Other Crops Grown

1 How much did you spend on the seed yam you purchased? _____ Naira/Cedis

2 Did you sell any of the seed yam? _____ ***(1=Yes; 0=No)***

3 If Yes to question 2, for how much did you sell the own produced seed yam? _____ Naira/Cedis

4 If No to question 2, what is the main reason for not selling? ____ (***1=Not producing seed yam, 2=Not enough, 3=Not profitable, 4=Fear of bad luck from seed yam sale, 5=Fear of losing production supremacy, 6=Others,)specify:*** _____ _____)

Part C. Labor Input Use For Yam Grown

1 Land clearing

1.1Who did most of the land clearing in this field? ___ ***(1=Men mostly; 2=Women mostly; 3=Both equally;***

4=Children < 15; 5=Other, specify: _____)

1.2 If mostly by men:

1.2a How many men working full time would clear the entire field in one day? _____ men

1.2b What was the wage rate/man/day for the land clearing? _____ Naira/Cedis

1.3 If mostly by women:

1.3a How many women working full time would clear the entire field in one day? ____women

1.3b What was the wage rate/woman/day for the land clearing? _____ Naira/Cedis

1.4 If mostly by children < 15 years:

1.4a How many children <15 working full time would clear the entire field in one day? _____children

1.4b What was the wage rate/child/day for the land clearing? _____ Naira/Cedis

1.5 How much of the entire land clearing labor for this field was hired and how much was family? _____ ***(1=All family; 2=Mostly family; 3=Hired/family equally; 4=Mostly hired; 5=All hired)***

1.6 Was any of the land in this field mechanized? ___ (***1 = Yes; 0 = No***)

1.6a If Yes, was it mechanized, in full or in part? ____ (***1= Mechanized fully; 2 = Mechanized partly***)

Type of mechanization: _____

1.6b How much was paid for the mechanization? _____ Naira/Cedis

1.7 Did you apply herbicide? ___ (***1 = Yes; 0 = No***); If Yes, cost _____ Naira/Cedis

2 Seedbed Preparation

2.1Who did most of the seedbed preparation in this field? ___ ***(1=Men mostly; 2=Women mostly; 3=Both equally;***

4=Children < 15; 5=Other, specify: _____)

2.2 How much of the entire seedbed preparation labor for this field was hired and how much was family? _____
(1=All family; 2=Mostly family; 3=Hired/family equally; 4=Mostly hired; 5=All hired)

2.2b Was any of the seedbed preparation in this field mechanized? ___ (***1 = Yes; 0 = No***)

2.2c If mechanized, in full or in part: ____ (***1= Mechanized fully; 2 = Mechanized partly***)

Type of mechanization: _____

2.3 If mostly by men:

2.3a How many men working full time would prep. the seedbed in the entire field in one

day? _____ men

2.3b What was the wage rate/man/day for the seedbed preparation? _____ Naira/Cedis

2.4 If mostly by women:

2.4a How many women working full time would prepare the seedbed in the entire field in

one day? ____women

2.4b What was the wage rate/woman/day for the seedbed preparation? _____ Naira/Cedis

2.5 If mostly by children < 15 years:

2.5a How many children <15 working full time would prepare the seedbed in the entire field in one day? _____children

2.5b What was the wage rate/child/day for the seedbed preparation? _____ Naira/Cedis

2.6 If mechanized, in full or in part?

2.6a How much was paid? _____ Naira/Cedis

3 Planting

3.1Who did most of the planting in this field? ___ ***(1=Men mostly; 2=Women mostly; 3=Both equally; 4=Children < 15; 5=Other): specify:_____)***

3.2 How much of the entire planting labor for this field was hired and how much was family? _____ ***(1=All family; 2=Mostly family; 3=Hired/family equally; 4=Mostly hired; 5=All hired)***

3.3 If mostly by men:

3.3a How many men working full time would plant yam in the entire field in one

day? _____ men

3.3bWhat was the wage rate/man/day for the planting? _____ Naira/Cedis

3.4 If mostly by women:

3.4a How many women working full time would plant yam in the entire field in

one day? ____women

3.4bWhat was the wage rate/woman/day for the planting? _____ Naira/Cedis

3.5 If mostly by children< 15 years:

3.5a How many children <15 working full time would plant yam in the entire field in one day? _____children

3.5b What was the wage rate/child/day for the planting? _____ Naira/Cedis

4 Weeding

4.1Who did most of the different weedings done in this field?

4.1a For Weeding 1: ___ ***(1=Men mostly; 2=Women mostly; 3=Both equally; 4=Children < 15; 5=Other): specify:_____)***

4.1b For Weeding 2: ___ ***(1=Men mostly; 2=Women mostly; 3=Both equally; 4=Children < 15; 5=Other): specify:_____)***

4.1c For Weeding 3: ___ ***(1=Men mostly; 2=Women mostly; 3=Both equally; 4=Children < 15; 5=Other, specify:_____)***

4.2 How much of the entire weeding labor for this field for each weeding was hired and how much was family?

4.2a For Weeding 1: ___ ***(1=All family; 2=Mostly family; 3=Hired/family equally; 4=Mostly hired; 5=All hired)***

4.2b For Weeding 2: ___ ***(1=All family; 2=Mostly family; 3=Hired/family equally; 4=Mostly hired; 5=All hired)***

4.2c For Weeding 3: ___ ***(1=All family; 2=Mostly family; 3=Hired/family equally; 4=Mostly hired; 5=All hired)***

4.3 Did you weed with herbicide? ___ (***1 = Yes; 2 = No***); If Yes, what is the cost? _____ Naira/Cedis

4.4 For the weedings done mostly by men:

4.4a How many men working full time would weed the entire field in one day?

Weeding 1	Weeding 2	Weeding 3
_____ men	_____ men	_____ men

4.4b what was the wage rate/man/day for weeding?

Weeding 1	Weeding 2	Weeding 3
_____ Naira/Cedis	_____ Naira/Cedis	_____ Naira/Cedis

4.5 For the weedings done mostly by women:

4.5a How many women working full time would weed the entire field in one day?

Weeding 1	Weeding 2	Weeding 3
_____ women	_____ women	_____ women

4.5b What was the wage rate/woman/day for weeding?

Weeding 1	Weeding 2	Weeding 3
_____ Naira/Cedis	_____ Naira/Cedis	_____

4.6 For the weedings done mostly by children:

4.6a How many children working full time would weed the entire field in one day?

Weeding 1	Weeding 2	Weeding 3
_____ children	_____ children	_____ children

4.6b What was the wage rate/child/day for weeding?

Weeding 1	Weeding 2	Weeding 3
_____ Naira/Cedis	_____ Naira/Cedis	_____

5 Harvesting

5.1 Who did (would do) most of the harvesting in this field? ___ ***(1=Men mostly; 2=Women mostly; 3=Both equally; 4=Children < 15; 5=Other): specify: _____)***

5.2 How much of the entire harvesting labor for this field was hired and how much was family? _____

(1=All family; 2=Mostly family; 3=Hired/family equally; 4=Mostly hired; 5=All hired)

5.3 If mostly by men:

5.3a How many men working full time would harvest yam in the entire field in one

day? _____ men

5.3b What was the wage rate/man/day for the harvesting? _____ Naira/Cedis

5.4 If mostly by women:

5.4a How many women working full time would harvest yam in the entire field in

one day? ____women

5.4b What was the wage rate/woman/day for the harvesting? _____ Naira/Cedis

5.5 If mostly by children< 15 years:

5.5a How many children <15 working full time would harvest yam in the entire field in one day?

_____children

5.5b What was the wage rate/child/day for the harvesting? _____ Naira/Cedis

6 Transportation

6.1 Where did (would) you carry most of the yam harvested? ___ ***(1 = Home; 2 = Market;***

3=Other): specify: _____)

6.2 By what most common means did (would) you carry the yam harvested? ____ ***(1 = Head load;***

2 =Bicycle; 3 = Barrow/Cart, 4=Lorry/Pickup/tractor/trailer; 5= Animal; 6=Motorcycle; 7=Other): specify:

_____)

6.3 If mostly by head load (1)

6.3(a) Who did most of the carrying for the yam harvested? ___ ***(1=Men mostly; 2=Women mostly;***

3=Both equally; 4=Children < 15; 5=Other): specify:_____)

6.3(b) How many of the people would carry all the yam in one day? _____ people.

Part D. Non-Labor Input Use for Yam Grown

1 Have you used stakes? ___ ***(1 = Yes; 0 = No).*** *If Yes, h*ow much did you spend on stakes?_____ Naira/Cedis

2 Have you used chemical fertilizer? ___ ***(1 = Yes; 0 = No).*** *If Yes,* how much did you spend on it? _____

Naira/Cedis

3 Have you used other chemical 1? (specify: _____)? ___ ***(1 = Yes; 0 = No).***

If Yes , how much did you spend onit?_____ Naira/Cedis

4 Have you used other chemical 2 (specify: _____)? ___ ***(1 = Yes; 0 = No).***

If Yes, how much did you spend on it? _____ Naira/Cedis

Part E. Tenurial Arrangements

1 Who owns the yam in this field? ___ ***(1=Whole family; 2=Man or husband; 3=Woman or wife; 4=Son; 5=Daughter; 6=Other): specify: _____)***

2 How was this land acquired for use in producing yam? ___ (***1=Inherited; 2*=Loaned or Rented; 3=Borrowed; 4=Purchased; 5=Allocated by; 6=Other):, specify***: _____) * if option 2 from question 2, indicate the mode of payment: ___ (***1=Cash; 2=Kind; 3=Sharecrop; 4=Other*** _____)

3 If this field or land has been inherited, from who was it inherited? ___ ***(1=Father's (Husband's) family; 2=Mother's (wife's) family)***

Part F. Harvests & Uses of Yam Output

1 Total field area: _____ m^2.

2 Yam field sample **sizes**: Size 1 _____ sqm.; Size 2 _____ sqm.; Size 3 _____ m^2.

3 Number of **stands**/points: 1_____stands; 2 _____ stands; 3 _____ stands

4 Yield, Number of tubers per stand/point: 1 _____; 2 _____; 3 _____

5 Weight of tubers per stand/point: 1 _____total kg; 2 _____ total kg; 3 _____total kg

6 Is the field milked? ___ ***(1 = Yes; 0 = No)***

7 If you consider your yam harvest to be 10 parts, how many parts have you harvested early (July to September) and how many parts will you harvest later?

Harvest early _____ parts out of 10

Harvest later _____ parts out of 10

_____

Total 10

8 If you divide your expected yam output from this field into 10 parts, how many parts will you sell and how many parts will you use at home and as seed yam?

Sell _____ parts out of 10

Home use _____ parts out of 10

Used as seed yam _____ parts out of 10

_____

Total 10

9 If you divide yam to sell from this field into 10 parts, how many parts will you sell now and how many parts will you store and sell later?

Sell now _____ parts out of 10

Store to sell later _____ Parts out of 10; Store for how long? _____ months

_____

Total 10

Weighing records in kg

Series	1	2	3	4	5	6	**Total**
1							
2							
3							
Total							

10. Observation, if any special way of producing yam from this field_____

_____

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