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Unlocking the Potential for Integrated Agricultural Research for Development in the Savanna of West Africa

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A A Adekunle, A Ayanwale, A O Fatunbi, L O Olarinde, O Oladunni,

S Nokoe, J N Binam, A Y Kamara, K N Maman, C Dangbegnon and A Emechebe

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Forum for Agricultural Research in Africa (FARA)
12 Anmeda Street, Roman Ridge
PMB CT 173, Accra, Ghana
Tel: +233 302 772823 / 302 779421
Fax: +233 302 773676
Email: info@fara-africa.org
Website: www.fara-africa.org

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Acknowledgements

This book documents the proof of the Integrated Agricultural Research for Development (IAR4D) Concept that was developed by the Forum for Agricultural Research for Development in Africa (FARA). The IAR4D concept forms the basis for the Sub Saharan Africa Challenge Program (SSA CP) which is the only CGIAR Challenge Program that was limited to only one region in the world. The focus of the SSA CP program was to facilitate substantially greater impact from agricultural research for development leading to improved rural livelihoods, increased food security and sustainable natural resource management throughout Sub Saharan Africa. The SSA CP aims to fulfil this aim by developing and implementing the IAR4D approach that overcomes the shortcomings of traditional approaches used for agricultural research and development. From inception, the program faced challenges in its mission to conduct activities that will lead to the establishment of proof of the efficiency of the IAR4D conception in its first phase.

The SSA CP program implementation embraces an extensive and unprecedented partnership arrangement. The implementation was carried out in the three sub-regions, namely: west Africa, eastern and central Africa and southern Africa, covering a wide range of ecologies from which millions of Africans derive their livelihoods. Over 80 institutions were involved in the implementation of the program; 55% of these institutions were pure research-based, the others (45%) are development oriented agencies including civil society organizations (NGOs, private sectors, farmers' organizations and community-based organizations). The program implementation rallied the input of more than 243 researchers across the globe.

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The development partners that funded the SSA CP program from its inception, the European commission (EC) and the IFAD have been specially acknowledged for their unflinching funding support to the program. The Italian government, the government of Netherlands, the DfID and the USAID are similarly acknowledged.

The important contribution of the sub regional organizations in Africa agriculture viz., CORAF/WECARD and ASARECA, for coordination of the West Africa and the East and Central Africa pilot learning sites respectively, is acknowledged.

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Executive summary

The Integrated Agricultural Research for Development (IAR4D) is FARA's suggested approach as a response to the shortcomings of African Agricultural Research and Development (ARD) in terms of its failure to achieve impact beyond the localities in which it is conducted and the accumulation of so-called 'improved technologies' on research shelves rather than in farmers' fields. It is expected that the IAR4D will enable agricultural research to play a more effective role in catalysing development by embracing a broader system of agricultural innovation that will facilitate interaction and enhance the flow of knowledge between all key actors in agricultural systems and value chains.

The SSA CP is being implemented in three Pilot Learning Sites (PLS) across the continent. By applying IAR4D, SSA CP aims to reverse the underperformance of agricultural research in Africa by developing, testing and scaling up an approach for conducting agricultural research for development, which overcomes the shortcomings of conventional approaches. Each PLS defines the domain within which the project's research sites are sampled. This paper focuses on the *Kano, Katsina and Maradi (*KKM*)* PLS.

The SSA CP was mandated by the Science Council of the CGIAR (SC) to commence on a proof of the concept of Integrated Agricultural Research for Development with specific focus on three vital questions related to the performance of the concept in general and with specific reference to conventional approaches.

The three questions are:

- Does the IAR4D work?
- Does the IAR4D deliver more benefits than conventional R&D if given the same environment and resources?
- Can the IAR4D be scaled up and out?

Responses to these questions form the core of this report.

The report makes use of data collected from baseline and midline surveys organised using the quasi experimental approach with two sets of counterfactuals viz. the conventional (the traditional ARD), and the clean sites where it was assumed there was no ARD for at least two years prior to the commencement of the experiment.

Using propensity score and double-difference methods to control for project placement and self selection biases, we found that IAR4D increased participants' income, improved household assets and encouraged participation in research as well as adoption of research outputs.

The PSM results indicate that participants in the IAR4D are likely to be farmers with small household sizes, considerable farming experience and some level of productive assets, who reside near all-weather roads, have low level of education and are more likely to reside in the Northern Guinea Savanna agro-ecological zones but less likely to settle in the Sudan Savanna agro-ecological zone. Results further indicate that farmers in the conventional sites are likely to be female with considerable farming experience and productive assets who are mostly from the Sudan Savanna agro-ecological zone. However, it is only nearness to all-weather roads that formed the most important determinant for farmers in the clean sites. These results suggest that the IAR4D was targeted at vulnerable groups with low level of education, smaller household sizes, small level of assets and situated in remote locations.

Does the IAR4D work as a concept?

The answer to this question came from the homogenous result of the impact analysis. The answer is yes, the IAR4D works and creates a positive impact on the lives of the beneficiaries to the tune of $1,822 per annum or $4.99 per day. This amount lifts about 4,352 people well above the poverty level in the PLS using World Bank-defined parameters which define household spending less than $1.50 per day as 'poor'.

Does the IAR4D deliver more benefits than conventional R&D methods?

With the use of matching methods as well as the PSM and double difference approach we can safely conclude that the IAR4D delivers more benefits than the conventional R&D method. The results, while showing the positive impact for the IAR4D, reveal that under the same conditions, the conventional and the clean do not have a consistent positive impact on the non beneficiaries.

The analyses also show that the IAR4D has a positive impact on women's income (36%), research participation (70%) and food security (226%). Indeed, about 813 people successfully crossed the food insecurity line in the PLS. These results are consistently robust and reliable.

Household incomes improved substantially more for the IAR4D participants than for non beneficiaries in conventional and clean sites, with an average increase in real incomes resulting from participation of about 139 % which is not only better than the conventional and clean sites but well above the achievement levels of similar projects in the continent. For instance, the World Bank-sponsored Fadama II project in Nigeria which won the Banks' Regional Excellent Award had an income impact rate of about 60 %, a feat achieved in six years of operation.

Can the IAR4D be scaled out and up beyond the current area of operation?

The results of the Ex Ante analysis in line with the impact assessment analysis suggest that the concept can be successfully scaled up and out with potentially multiple positive impacts on the beneficiaries. Reports of the success story of the concept abound, showcasing how eager the neighbouring communities are to utilise the concept so as to better their lives.

The result of the Ex Ante report on the KKM PLS also confirms that the projected benefits of IAR4D not only surpass the cost of investment but that it is also superior to both the conventional and clean modes. Furthermore, the derived benefits vary based on task-forces (agro-ecological zones) in the sense that the Sahel Savanna zone gave the lowest benefits of the three. This could be the result of the higher level of moisture stress in the Sahel and possibly a lower level of education with larger family sizes than the other agro-ecological zones.

The project had a relatively large impact on the poorest beneficiaries and could have much greater impact in the future because of the lagged effect of the productive asset acquisition. Therefore, a follow-up study is needed to capture the longer-term effects of productive assets and other changes that farmers experienced as a result of participation in the IAR4D. This study was conducted at an early stage and does not capture its lagged impacts, especially the long-term benefits of productive asset acquisition and rural infrastructure development.

Key issues that need to be addressed in scaling up this success story include better targeting of poor and vulnerable groups, especially women, finding sustainable methods of promoting development of rural financial services and conscious inclusion of capacity building of IAR4D beneficiaries in the efficient management of productive assets.

As regards appropriate targeting, note should be taken of the fact that over the first two years of the project, the Gini coefficient of income for beneficiaries decreased by about 18 % compared with a decrease of 13 % for non-beneficiaries. This suggests that the project contributed to the reduction in income inequality, probably via targeting of poor and vulnerable groups. Consistent with this, the project also succeeded in raising the value of productive assets of the poorest tercile more significantly than for the other terciles. The non-significance of the impact on income for the other two terciles suggests appropriate targeting of poor and vulnerable groups.

Chapter 1

Introduction

The sustainable livelihoods of many African people depend directly on their ability to produce and market agricultural products. Consequently, agricultural growth in Sub Saharan Africa remains fundamental for poverty reduction and food security. It has been noted that without urgent revitalisation of the sector, the Millennium Development Goals (MDGs) to halve poverty and hunger as well as ensuring environmental sustainability by 2015 would be an elusive target. This realization provoked additional investments in agricultural research and innovation from different players across the world. However, it has been observed over time that the impact of some of the investments have been disappointing to investors. Expectations have not been fully met in critical areas including poverty reduction, food and

nutrition security attainment, and protection of the environment. This has largely been due to the underperformance of research in aiding development, a fact occasioned by the fact that approaches used have not permitted nor fostered the spread of benefits beyond the precincts of the study locations.

This problem and how to overturn it formed the basis of extensive consultations within FARA as soon as it was formed. The consultations revealed the limitations of the reductionist approach to research, and the use of linear approach of developing and disseminating technologies in the agricultural sector and concluded that for agricultural research to play a more effective role in catalysing development, it should embrace a broader system of agricultural innovation that will facilitate interaction and enhance flow of knowledge among all key actors in agricultural systems and value chains. Realizing that this necessitates the use of a more inclusive approach that would promote benefits from the collective strength of all players within the framework that permits research to be integrated with development, FARA developed and proposed the *Integrated Agricultural Research for Development* (IAR4D) as one approach meeting the required qualities that would enhance the development and spread of impact at a much faster rate and in greater quantity.

IAR4D seeks to transform the organizational architecture of R&D actors from a linear configuration (research→dissemination→adoption) to a network configuration comprising all actors in agricultural value chains and beyond (innovation system). The network configuration facilitates timely interaction and learning and aims at generating innovations (rather than mere research products). The innovation in this concept refers to the activities and processes associated with the generation, product distribution, adaptation and use of new technical and institutional/ organizational knowledge. It adds value to research generated products in order to catalyse the achievement of maximum development impact.

After the development of this approach, FARA integrated it into a proposal and presented it to the CGIAR as a Challenge Program. It was later accepted by the CGIAR as the Sub-Saharan Africa Challenge Program.

Objectives of the SSA CP

The objectives of SSA CP are to facilitate substantially greater impact from agricultural research for development leading to improved rural livelihoods, increased food security and sustainable natural resource management throughout SSA using IAR4D. The SSA CP is being implemented in three Pilot Learning Sites (PLS) across the continent. SSA CP aims to reverse the underperformance of agricultural research in Africa by developing, testing and scaling out/up an approach (IAR4D) for conducting agricultural research which overcomes the shortcomings of conventional approaches. Each PLS defines the domain within which the project's research outputs are sampled. This paper focuses on the *Kano*, *Katsina and Maradi* (*KKM*) PLS.

Expected outputs

Output 1: Principles, procedures and best practices for implementing IAR4D to generate technological, market, institutional, policy, gender and new product innovations appropriate to the needs and capacities of communities in the three PLS.

Output 2: IAR4D-derived technological, and institutional gender-sensitive innovations including those in market, policy and capacities for sustainably increasing agricultural productivity; value addition and access to agricultural markets by communities in the three PLS.

Output 3: An evaluation of the effect and cost-effectiveness of IAR4D on development impact relative to conventional ARD approaches and the replicability of IAR4D in the various contexts of the three PLS. This will provide empirical proof that IAR4D works in such contexts and is superior to conventional approaches in terms of the benefits it delivers against the costs it entails. The evidence will provide a rationale for reform of African ARD in order to reverse the decline in its impact and to increase the likelihood of achievement of the MDGs pertaining to poverty, hunger, empowerment of women and environmental sustainability.

In accordance with these objectives, the SSA CP was mandated by the Science Council of the CGIAR (SC) to commence on a project which aimed to answer three vital questions as to the validity of the effectiveness of IAR4D and its relatively better delivery ability as an R&D concept. These questions are:

Does the IAR4D work?

Does the IAR4D deliver more benefits than conventional R&D if given the same environment and resources?

Can the IAR4D be scaled up and out?

Responses to these questions form the core of this report. The report provides answers to these questions to provide the "proof" of the approach's efficiency as well as highlights its ability to deliver more benefits than conventional measures.

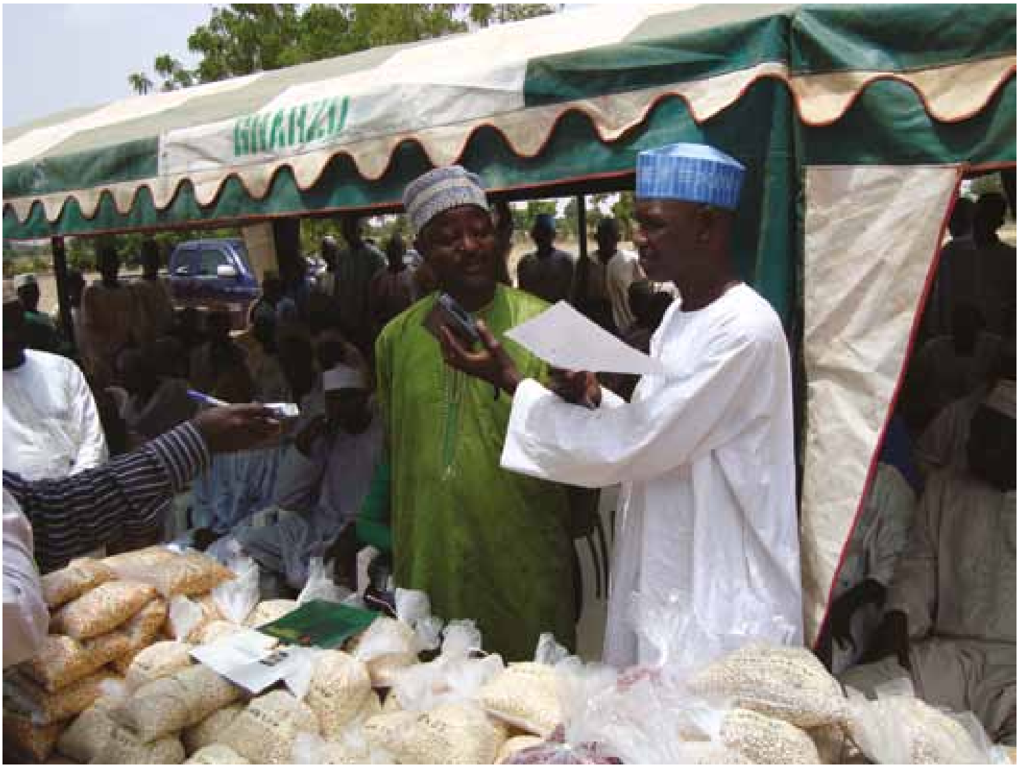
Chapter 2

Methodological framework

Study area

The SSA CP is being implemented in three PLS across the continent. The *Kano, Katsina and Maradi (KKM)* PLS covers 83,900 sq km and straddles Nigeria and Niger, covering an area which is home to about 18.3 million people.

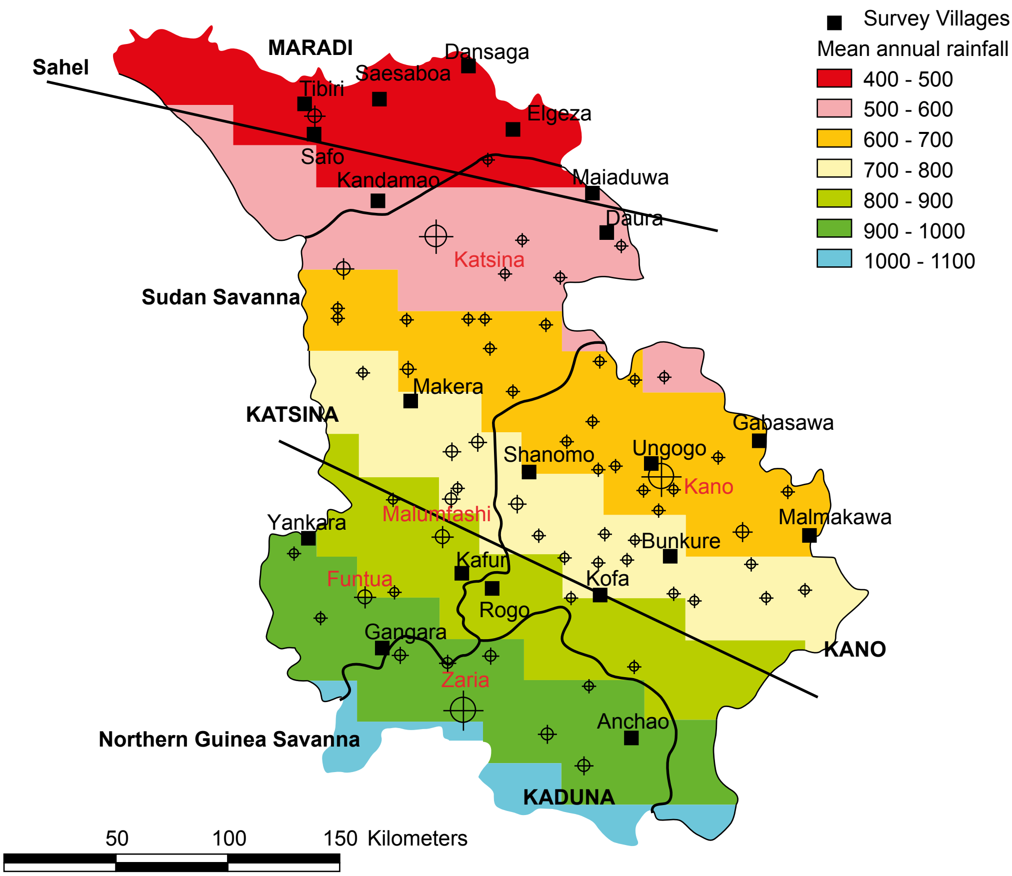
The SSA CP used the Innovation Platform (IP) as the framework for the implementation of the Integrated Agricultural Research for Development. The Innovation Platform is an inclusive physical and/or virtual forum that brings together all possible actors in the innovation sphere



covering the value chain and beyond, who are necessary for the generation of innovation for a commodity or system of focus, for constant interaction and joint learning on the development of innovation within the commodity chain, or value web of the system (Adekunle A.A, 2005).

The process of IP establishment in KKM was initiated at the first KKM PLS meeting held in Kano in March 2005 (CORAF, 2005a) at which a Pilot Learning Team (PLT) was formed to address priority problems identified in KKM communities. The PLT was made up of people from a variety of scientific disciplines (biophysical and social) and from diverse institutions (such as national agricultural research institutes, universities, CGIAR Centres and advanced research institutes; extension agencies; NGOs, community-based and farmers' organizations and the private sector). The PLT, led by IITA, appointed a team to conduct a validation study for constraints and possible entry points in all three agro-ecological zones of KKM (CORAF, 2005b). This team was drawn from a number of institutions, including those involved in research, extension, NGOs and the private sector to assess the situation at four levels: community, area, state and region. Over 90% of the time was to be spent at local community level and using participatory methods they worked in twenty villages selected as representative of the PLS (Figure 1).

Figure 1: Map of the Kano-Katsina-Maradi PLS



Similar studies were conducted in other PLS's in East and Central and Southern Africa. This report covers the aspect (PLS) of the SSA CP being implemented in the Western African sub-region. The project is sited on the Kano-Katsina-Maradi axis of Nigeria and Niger Republic. The project is made up of three Task Forces (TFs, Table 1), namely:

(i) The Northern Guinea Savanna, which has as theme 'multi-stakeholder approach to linking technical options, policy, and market access for improved land productivity in the Northern Guinea Savanna zone'.

(ii) The Sudan Savanna TF, which runs on the theme 'sustainable agricultural intensification and integrated natural resource management in the Sudan Savanna of West Africa'.

(iii) The Sahel Savanna TF which aims at 'improving rural livelihoods of rural population through intensification, access to markets, and sustainable management of natural resources in the Sahel agro-ecological zone.'

For all three TFs, the validated research entry points are:

(i) Identification and promotion of appropriate integrated pest management (IPM) and indigenous knowledge systems (IKS), technologies for both crop production and storage.

(ii) Promotion of appropriate labour saving devices e.g. traction and processing equipment.

(iii) Integrated soil fertility management.

(iv) Integrated crops-livestock production.

(v) Promotion of appropriate varieties of crops e.g. early maturing, drought tolerant, pest resistance.

(vi) Development of irrigation potential using appropriate technologies (FARA, 2006).

Table 1: Task forces and innovation platforms in the KKM PLS

	NORTHERN GUINEA SAVANNA TASK FORCE			
IP	Maize-legume	Rice	Vegetable	Livestock
LGA (district)	Ikara	Dandume	Kudan	Kubau
State	Kaduna	Katsina	Kaduna	Kaduna
Country	**Nigeria**	**Nigeria**	**Nigeria**	**Nigeria**
	SUDAN SAVANNA TASK FORCE			
IP	Maize-legume-livestock	Sorghum-legume-livestock	Maize-legume-livestock	Sorghum-legume-livestock
LGA (district)	Bunkure	Shanono	Musawa	Safana
State	Kano	Kano	Katsina	Katsina
Country	**Nigeria**	**Nigeria**	**Nigeria**	**Nigeria**
	SAHEL SAVANNA TASK FORCE			
IP	Groundnut	Cereal-legume	Vegetable	Livestock
LGA (district)	Madarounfa	Guidea Roumdji	Aguie	Zango Daura
State	Maradi	Maradi	Maradi	Katsina
Country	**Niger**	**Niger**	**Niger**	**Nigeria**

The objectives of the TFs' projects are developed and embedded in a framework that is meant to adequately capture the core concept of the IAR4D. As has been discussed in the introduction, the implementation of the IAR4D is structured within a system of IP which has informed the selection of project sites based on the peculiarities of the composition of the farming systems of each TF.

Sample selection

The data used in this report was taken from baseline and midline surveys of over 1,800 households across KKM PLS. The survey was conducted by TFs within the framework of the SSA CP coordinated by FARA with support from its donors, including the European Union (EU), UK Department for International Development (DfID) and the governments of Italy and Norway.

The sample frame was derived from different districts, selected to represent the three basic operational areas of the TFs in the KKM PLS. In each district, the representative households were selected by taking a sample of district wards, a random sample of villages within each ward and a random sample of households in each selected village. Finally, a household was retained in the sample if it belonged to one of the 180 villages selected within the clean, conventional or IP/action sites.

Baseline surveys for IP and community level characteristics

Baseline surveys, field observations and focus group discussions were conducted to benchmark pre-treatment characteristics of IPs, site characteristics and baseline levels of outcomes predicted under the IAR4D approach: the number, variety and time to develop innovations; knowledge and behavioural outcomes (adoption, input supply, input demand, volume of sales), market outcomes (output supply and consumption demand), and productivity outcomes (yields, technical and allocative efficiency, and profit). Impacts (incomes, livelihood assets and equity) were also treated in the same procedural manner. Several indicators were used to measure outcomes, which varied according to context. Questionnaires were designed for comparison within an IP over time and across IPs. To generate counterfactuals, surveys and field observations were conducted in the comparison sites and villages assigned to conventional and non-IAR4D-non-conventional treatments. Key players in the innovation systems—such as public and private agricultural researchers, extension, farmer leaders, traders, dealers, lenders and key informants—were interviewed to benchmark characteristics of innovation systems and baseline levels of outcomes for the IP sites.

Baseline survey for household and village community characteristics

Baseline surveys, observations and focus group discussions were conducted to collect data on household- and village-community-level characteristics and behavioural, efficiency, environmental and welfare outcomes. Surveys were used to track feedback, information diffusion, awareness and knowledge changes, adoption and market effects of innovations and spillovers using the Miguel and Kremer (2004) approach and other methodologies.

Evaluation surveys

Follow-up evaluation surveys and qualitative assessment studies were conducted in the third year (2010) of implementation to assess the process. The methods used to accomplish this included documenting all the intermediate steps of the research-to-impact pathway and conditioning factors, assessing participants' subjective reactions to IAR4D, identifying sub-groups experiencing greater or lesser impact than the sample as a whole and measuring changes in outcomes at the levels of the IP, household, community and market. Follow-up surveys used the indicators utilised in the baseline surveys to measure outcomes.

Data analysis

Assessing the impact of any intervention requires making an inference about the outcome that would have resulted had the program participants not participated. Following Heckman et al. (1997) and Smith and Todd (2001), let Y_1 be the mean of the outcome conditional on participation, that is, treatment group, and let Y_0 be the outcome conditional on non-participation, that is, the control group. The impact of participation in the program is the change in the mean outcome caused by participating in the program, which is given by:

$$\Delta Y = Y_1 - Y_0, \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

where Δ is the notation for the impact for a given household (1).

The fundamental problem with evaluating this individual treatment effect arises because for each household, only one of the potential outcomes either Y_1 or Y_0 can be observed, but Y_1 and Y_0 can never be observed for the same household simultaneously. This leads to a missing-data problem, which is the heart of the evaluation problem (Smith and Todd 2005). The unobservable component in equation (1), be it Y_1 or Y_0, is called the counterfactual outcome. Measuring impact as the difference in mean outcome between all households involved in the project and those not involved, even when controlling for program characteristics, may thus give a biased estimate of program impact. Since there will never be an opportunity to estimate individual treatment effects in (1) directly, one has to concentrate on population averages for the impacts of a treatment.

Two treatment effects are dominantly used in empirical studies. However, the most commonly used evaluation parameter is the so-called average impact of the treatment on the treated (ATT), which focuses explicitly on the effect on those for whom the program is actually introduced. In a random program assignment, the expected value of ATT is defined as the difference between expected outcome values with and without treatment for those who actually participated in treatment (Heckman et al. 1998b), which is given by:

$$\Delta Y_{ATT} = ATT\ (\Delta Y|\ X: Z = 1) = E(Y_1 - Y_0|, Z = 1) = E\ (Y_1|\ Z = 1) - E(\ Y_0|\ Z = 1)\ ..(2)$$

where Z is an indicator variable indicating whether a household i actually received treatment or not: Zi being equal to 1 if the household is a beneficiary and 0 otherwise. X denotes a vector of control variables.

Data on program beneficiaries identifies the mean outcome in the treated state $E(Y1|X, Z=1)$. The mean outcome in the untreated $E(Y0|X, Z=1)$ is not observed and a proper substitute for it has to be chosen in order to estimate ATT.

Various quasi-experimental and non-experimental methods have been used to address the bias problem (Heckman, Ichimura, Smith and Todd, 1998). One of the most commonly used quasi-experimental methods is propensity score matching (PSM), which selects project beneficiaries and non-beneficiaries who are as similar as possible in terms of observable characteristics expected to affect project participation as well as outcomes. The difference in outcomes between the two matched groups can be interpreted as the impact of the project on the beneficiaries (Smith and Todd, 2001). We used this method to estimate the ATT for impacts of the IAR4D on the key outcomes of the project (poverty/food security, factor productivity, market participation, awareness and adoption as well as natural resource management).

The PSM method matches project beneficiaries with comparable non-beneficiaries using a propensity score, which is the estimated probability of being included in the project. Only beneficiaries and non-beneficiaries with comparable propensity scores are used to estimate the ATT. Those who do not have comparable propensity scores are dropped from the comparison groups.

Among the advantages of PSM over econometric regression methods is that it only compares observation and does not rely on parametric assumption to identify the impacts of projects. However, PSM is subject to the problem of 'selection on unobservables', meaning that the beneficiary and comparison groups may differ in unobservable characteristics, even though they are matched in terms of observable characteristics (Heckman, Ichimura, Smith and Todd, 1998). Econometric regression methods devised to address this problem suffer from the setbacks previously noted. The bias resulting from comparing noncomparable observations can be much larger than the bias resulting from selection on unobservables, although they could not say whether that conclusion holds in general (Heckman, Ichimura, Smith and Todd, 1998).

In this study, we address the problem of selection of unobservables by combining PSM with the use of the Double-Difference (DD) estimator. The double-difference estimator compares changes in outcome measures (i.e. change from before to after the project) between project participants and non-participants, rather than simply comparing outcome levels at any one point in time:

$$DD = (Y_{p1} - Y_{p0}) - (Y_{np1} - Y_{np0}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

where Y_{p1} = outcome (e.g. income) of beneficiaries after the project started; Y_{p0} = outcome of beneficiaries before the project started; Y_{np1} = outcome of non-beneficiaries after the project started and Y_{np0} = outcome of non-beneficiaries before the project started.

The advantage of the double-difference estimator is that it nets out the effects of any additive factors (whether observable or unobservable) that have fixed (time-invariant) impacts on the outcome indicator (such as the abilities of the farmers or the inherent quality of natural resources), or that reflect common trends affecting project participants and non-participants equally (such as changes in prices or weather; Ravallion, 2005).

Thus, if project participants and non-participants are different in their asset endowments (mostly observable) or in their abilities (mostly unobservable), and if those differences have an additive and fixed effect on outcomes during the period studied, such differences will have no confounding effect on the estimated ATT.

In principle, the double-difference approach can be used to assess project impacts without using PSM and will produce unbiased estimates of impacts as long as these assumptions hold. However, if the project has differential impacts on people with different levels of wealth or observable characteristics, the simple double-difference estimator will produce biased estimates if participants and non-participant households differ in those characteristics (Ravallion, 2005). By combining PSM with the double difference estimator, controls for differences in pre-project observable characteristics can be established. A bias could still result from the heterogeneous or time-variant impacts of the unobservable differences between participants and non-participants. For example, communities and households that had participated in ARD may have different responses to IAR4D than those in clean environments because of the cumulative effects of social capital developed under the ARD, favourable or adverse experiences under ARD, or other factors. Such shortcomings are unfortunately inherent in all non-experimental methods of impact assessment (Duflo et.al. 2006). Although no solution to these potential problems is perfect, we believe the method we have used addresses these issues as well as possible in this case.

The standard errors estimated by the double-difference method may be inconsistent because of serial correlation or other causes of a lack of independence among the errors. In ordinary regression models, serial correlation can result from unobserved fixed effects, but by taking first differences, the double-difference method eliminates that source of serial correlation. However, serial correlation may still be a problem if more than two years of panel data are used (Duflo et al. 2004). In this study we used only two periods, before and after the project, due to which we do not have any concern about serial correlation among multiple periods. Another reason for the possible nonindependence of the errors is clustering of the sample. The propensity scores were computed using binary logit regression models. We estimated three probit models for three comparisons: (1) IAR4D beneficiaries compared with all non-beneficiaries; (2) IAR4D beneficiaries with conventional beneficiaries, and (3) IAR4D beneficiaries with non-beneficiaries in clean communities. The dependent variable in each module is a binary variable indicating whether the household was a beneficiary of the IAR4D project.

The explanatory variables used in computing the propensity scores are those expected to jointly determine the probability to participate in the project and the outcome. We focused on the determinants of income and productive assets when selecting the independent variables for computing the PSM.

The independent variables used in the regression are summarised in Table 2.

Table 2: Variables used to compute propensity scores and their expected signs

Variable	Expected impact on participation in IAR4D	Why?	Expected sign on income and wealth	Why?
Gender of respondent (male=1; female=0)	-	IAR4D is gender friendly	-	Women are usually poorer than men
Household size	+	Larger families could be associated with poverty or other vulnerabilities which make participation in IAR4D worthwhile	-	The larger the family, the poorer
Age of respondent	+/-	IAR4D supports both the young and old	+	Older respondents likely to be better off because of accumulation of wealth and experience over the life cycle
Level of education of respondent (years of formal education)	+	Some project requirements need a certain level of education	+	Education increases income opportunities, such as on-farm activities
Area of farmland cultivated (ha)	+/-	IAR4D concept encourages the cultivation of larger areas of land	+	Larger areas of land enable households to earn more income and more productive assets
Agro-ecological zone	+/-	The technologies promoted by IAR4D in each agro-ecology motivate participation	-	Zones closer to urban centres have greater potential for membership than remote ones
Distance to nearest all-weather road	+	Closeness to urban centre encourages participation since products are easily marketed	+	Access to improved road increases income opportunities and reduces transaction costs
Value of productive asset	+	Same as for land area	+	Same as for land area

Source: Data analysis 2012

Chapter 3

Results and discussion

Impact of IAR4D on household income

In 2008 the total average household income for treated (clean before intervention), conventional and the clean sites was $1312.71: $1966.52 and $1564.58 respectively. At midline, the average incomes were estimated to be $3096.68: $2274.78 and $2776.31 respectively (Table 4). The ATT was computed based on two alternative matching methods. The outcome variable is household income per year measured in US dollars. The z-statistics were based on bootstrapped standard errors with 50 replications which were used to verify whether the observed effect was significant or not.

The results show that the average household income of the treated (IAR4D farmers) sample due to participation in the IP activities based on the PSM (ATT) was $1821.75 in the case of Kernel (p<10%). The nearest neighbour matching estimates produced the same but insignificant amount of increase in average household income. A comparative analysis shows that the IP farmers are better than the farmers in the two counterfactuals of conventional and clean sites.

Estimation results of propensity scores

The importance of estimation of propensity scores is twofold: first, to estimate the ATT and, second, to obtain matched treated and non-treated observations. The results of the probit models are reported in Table 3. The results indicate that participants in the IAR4D will likely be farmers with small household sizes, and considerable farming experience, with some level of productive assets, who reside near all-weather roads, have low level of education and are more likely to reside in the Northern Guinea Savanna agro-ecological zones but less likely to be from the Sudan Savanna agro-ecological zone. Results further indicate that farmers in the conventional sites are likely to be female with considerable farming experience and productive assets who are mostly from the Sudan Savanna agro-ecological zone. However, it is only nearness to all-weather roads that was the most important determinant for farmers in the clean sites. These results suggest that the IAR4D was targeted at vulnerable groups with low level of education, smaller household sizes, smaller level of assets and based in remote locations.

These probit model results were used to compute the propensity scores that were used in the PSM estimation of ATT. Several methods are possible for selecting matching observations (Smith and Todd, 2001). We used the kernel matching method (using the normal density kernel), which uses a weighted average of 'neighbours' (within a given range in terms of the propensity score) of a particular observation to compute matching observations. Unlike the nearest-neighbor method, using a weighted average improves the efficiency of the estimator (Smith and Todd, 2001). Observations outside the common range of propensity for both groups (i.e. lacking 'common support') were dropped from the analysis. This requirement of common support eliminated about half of the total number of observations, indicating that many of the observations from various strata were not comparable.

Further testing of the comparability of the selected groups was done using a 'balancing test' (Dehejia and Wahba, 2002), which tests for statistical significant differences in the means of the explanatory variables used in the probit models between the matched groups of the IAR4D participants and non-participants. In all cases, that test showed statistically insignificant differences in observable characteristics between the matched groups (but not between the unmatched samples), supporting the contention that the PSM ensures the comparability of the comparison groups (at least in terms of observable characteristics).

We used bootstrapping to compute the standard errors of the estimated ATT, generating robust standard errors because the matching procedure matched control households to treatment households 'with replacement' (Abadie and Imbens, 2006).

Table 3: Probit regression of IAR4D participation (matched observations)

Explanatory variables	Treated (IAR4D)		Control (conventional)		Control (clean)	
	Coefficient	Standard error	Coefficient	Standard error	Coefficient	Standard error
Gender (1=male; 0=female)	0.819	0.215	-0.307	0.209*	0.243	0.211
Age of respondent (yrs)	-0.320	0.279	0.383	0.300	-0.073	0.263
Education of respondent (yrs)	-0.209	0.094**	0.134	0.126	0.140	0.087*
Household size	-0.213	0.130*	0.142	0.132	0.074	0.127
Farming experience (yrs)	-0.042	0.136	-0.191	0.135*	0.089	0.122
Assets (productive)	-0.133	0.048***	-0.122	0.048**	0.001	0.045
Roads	-0.234	0.131**	0.134	0.126	0.140	0.087*
Taskforce dummy (NGS)	0.355	0.180**	-0.149	0.180	-0.120	0.172
Taskforce dummy (Sahel)						
Taskforce dummy (Sudan)	-0.586	0.258**	0.371	0.222**	0.023	0.214
Constant	2.606	1.024	-2.868	1.060	-0.914	0.957
Sample size (n)	378		378		378	
R^2	0.072		0.041		0.016	
Prob > χ^2	0.000		0.022		0.543	
Log likelihood	-209.777		-228.741		-248.640	

Source: Data analysis (2012)

The experimental design of the project is such as to allow an examination of spillover effect of the IAR4D by comparing the changes in income of the participants with those of non-participants living within and outside the communities with the project. The homogenous results suggest that non-participants may have benefited from spillover of the project. For example, non-participants used the innovations and research knowledge made available to the participants. In addition, some services made available to participants could also be available to non-participants, such as the storage facilities and shredding machine. Employment could also be made available to non-participants.

It is likely that the impact of the project on incomes will be larger than currently captured because of lagged effects of investments on productive assets, infrastructure and other project investments. The results in Table 4 show the homogenous impact of the IAR4D on the participants' income. The result shows that participation in IAR4D had positive and significant impact on the beneficiaries at the 10 % level. The quantum of the impact made the beneficiaries about 139 % better than the baseline condition. In fact, the income of about 4,400 people was improved as a result of their participation in the programme. However, the counterfactual situations (both conventional and clean) were not statistically significant.

Table 4: Impact of IAR4D on farmers' income across types of respondents

	Income per farmer (US $)			% change due to participation in IAR4D
	Before IAR4D	After participation in IAR4D	ATT	
IAR4D (n=544)	1310.29 (2423.39)	3091.37 (4700.28)	1821.75* (1058.56)	139.03
Conventional (n= 513)	1936.26 (2895.13)	2274.78 (5807.36)	-3195.81 (11422.99)	NS
Clean (n=514)	1561.09 (2562.39)	2778.31 (34100.41)	1700.35 (1414.58)	
Agro-ecological zones				
NGS	2769.06 (3743.12)	3685.39 (4466.91)	7433.19* (4544.82)	268.44
IAR4D (n=29)	3731.00 (4294.38)	3010.16 (6837.08)	-9305.05 (4757.13)	
Conv (n=29)	2878.67 (3960.29)	3325.16 (64274.75)	-	
Clean (n=29)				
Sahel	542.71 (1234.74)	3142.17 (673.93)	1188.07* (993.09)	
IAR4D (n=140)	1243.19 (1662.10)	2351.83 (6855.91)	-1962.01 (1075.84)	
Conv (n=140)	1105.42 (859.20)	2387.38 (6121.41)	819.68 (1542.35)	
Clean (n=140)				
Sudan	783.09 (1392.84)	2451.04 (2879.31)	1821.75* (1263.70)	232.64
IAR4D (n=169)	1079.15 (1614.97)	2165.40(4087.03)	-3286.79 (1619.64)	
Conv (n=169)	825.45 (1243.22)	1781.55 (5346.59)	1823.86 (1868.81)	
Clean (n=169)				
Gender (Female only)				
IAR4D (n=21)	1099.10 (1486.96)	3131.89 (5107.29)	174.93*** (68.61)	35.91
Conv (n=21)	4315.95 (5581.62)	3016.96 (5893.47)	-132.49 (62.99)	
Clean (n=13)	1481.98 (2578.53)	2048.91 (37667.47)	-102.06 (54.52)	
Research				
IAR4D (n= 34)	1809.41 (2263.09)	2435.10 (1337.47)	882.11*** (365.08)	70.40
Conv (n=34)	2143.20 (3596.33)	2069.87 (2982.69)	-595.01 (414.41)	
Clean (n=34)	1609.47 (687.07)	1381.69 (2582.37)	-662.17 (239.38)	
Food security				
IAR4D (n=104)	1040.05 (2158.57)	3041.13 (5878.42)	2337.29** (1239.33)	225.69
Conv (n=107)	1693.30 (2337.18)	2149.39 (5340.33)	-2618.76 (686.97)	
Clean (n=102)	1432.33 (2327.02)	2039.64 (4348.15)	-207.02 (1487.56)	
Tercile 1 (poorest)				
IAR4D (n=28)	72.34 (113.02)	574.97 (5856.35)	940.84 ** (515.29)	1306.58
Conv (n=40)	69.77 (110.90)	477.03 (4173.16)	-833.13 (635.63)	
Clean (n=32)	90.33 (114.69)	202.49 (4840.92)	74.85 (477.54)	
Tercile 2 (poor)				
IAR4D (n=66)	1249.68 (228.14)	3069.48 (3309.15)	1017.45 (782.97)	81.41
Conv (n=72)	760.67 (248.14)	1556.30 (9154.02	-2100.84 (1262.79)	
Clean (n=61)	742.86 (232.03)	1834.39 (6996.88)	637.20* (388.88)	

	Income per farmer (US $)		ATT	% change due to participation in IAR4D
	Before IAR4D	After participation in IAR4D		
Tercile 3 (non-poor)				
IAR4D (n=25)	5999.44 (3298.30)	14736.34 (3757.65)	8028.03 (8775.25)	133.81
Conv (n=27)	3364.24 (3345.06)	4126.55 (5204.27)	-110503.54 (9838.59)	
Clean (n=24)	2982.38 (3212.54)	8280.49 (49643.32)	19963.40*** (5290.99)	

Source: Data analysis 2012

Note: Numbers in brackets are standard deviations from the corresponding mean.

$ATT = (Y_{p1}-Y_{p0})-(Y_{np1}-Y_{np0})$. 'Before project' is the situation before the IAR4D in 2008, while 'After project' is two years after the project started in 2010.

'ATT' and the corresponding '%' refers to the change in measured household income resulting from participation in the IP of the IAR4D. Per cent net change due to participation at the platform = $(ATT/Y_{p0})*100$.

Significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.

Photo 1: Drill marker fabricated to improve rice planting methods in the NGS IP

The effect of the IAR4D varied across the major agro-ecological zones of the PLS. The project had significant impact (at p= 0.10) in both the NGS and the Sudan Savanna zones, while the impact at the Sahel Savanna zone although positive, was not statistically significant. Participation in the project at the NGS and Sudan Savanna led to 268% and 233% increase in income respectively. The large net increase in income in the dry NGS and Sudan Savanna could be due to the intense capacity building of the participants at the IP levels which address major production and marketing constraints in the zones.

Gender issues have come to the forefront in development programmes in recent times both for the acknowledged role that women play in agriculture as well as because of the potential that women have in improving the overall welfare of the household. The results in the table show that participation in the IAR4D increased the income of women participants by about 36% at the midline relative to baseline condition. The result was positive and significant at the 1% level, showing that the programme is well-targeted at women. By encouraging women, the project may have enabled the women participants to catch up with men in terms of income. Additionally, the income change for participants is better than for the counterfactuals which were not significant. Hence we can conclude that IAR4D is gender friendly.

One of the main advantages of the IP is the free exchange of research ideas from all the stakeholders and the almost immediate adoption of the same by participants. Research ideas do not come from the scientists alone, but also from indigenous sources aimed at addressing the acknowledged challenges confronting the stakeholders at the IP. Results from the table show that participation in research activities improved the income of beneficiaries positively and significantly (at p<0.01) by about 70%. This is very instructive, especially in terms of the potential of IPs in the IAR4D zones. The prompt generation and adoption of research ideas definitely helps the beneficiaries of the IAR4D.

Obviously, one of the major outcomes of the IAR4D is to address the perennial problem of food insecurity among the `rural people in the project area. The project was designed to boost food security among the participants. Results in the table show that participation in the project boosts food security among the beneficiaries. There is a positive and statistically significant (p=0.01) increase in food security among the beneficiaries even to a substantial tune of about 225% increase. This result shows that participants at the IPs are better able to cope with food security than non participants. Actually, about 813 people were able to cross the food insecurity line in the PLS.

Concerning the effects of IAR4D on the three income terciles, the beneficiaries in the lowest tercile (the poorest) increased their income by over 1300% indicating a positive and significant (at p=0.05%) impact of the project on the beneficiaries. This is very important, suggesting that the project appropriately targeted the poorest of the poor in the choice of beneficiaries. The result also shows that both counterfactuals (the conventional and the clean) do not have significant impact. This indicates that IAR4D have immediate impact on poverty reduction among the poorest households.

Table 5: Impact of IAR4D on income distribution

Treatment type	Gini coefficient at baseline	Gini coefficient at midline	% Gini coefficient change
All respondents	0.639	0.605	-5.32
IAR4D beneficiaries	0.672	0.552	-17.86
Conventional	0.621	0.540	-13.04
Clean	0.619	0.685	10.66

Source: Data analysis 2012

In summary, the IAR4D has caused beneficiaries to realise significant increases in income. Using the PSM and double difference methods, our results allowed us, with considerable confidence, to attribute the income increases among the beneficiaries to participation in the project. However, the impact of IAR4D was different across agro-ecological zones. The impact of the IAR4D on income was not statistically significant in all the counterfactual sites as had been expected. It should be noted that the full impact of the project cannot be said to have been captured by this study because the project had only operated for two years at most in the PLS and thus our results do not capture the lagged impacts of the rural infrastructure, productive assets and other project interventions.

The IAR4D targets the poor and vulnerable groups like women, youth and the elderly. This is likely to reduce income inequality. The impact of this targeting was examined by considering the change in income inequality over the two years of the project. We computed the Gini coefficient of income of the respondents for this objective. The results are displayed in Table 5. Indeed the results from the table show that the Gini coefficient of the beneficiaries decreased by about 18 %, suggesting that the project contributed to reduction of income inequality. Income inequality was reduced in the whole project area as shown by the value of the Gini coefficient being 5.32 %. However, in the clean zone, there was an increase in income inequality by about 11 %.

The largest decrease in income inequality is among the IAR4D beneficiaries, showing a figure of about 18% relative to a figure of 13% for the conventional sites. This is consistent with the result which showed that the income of the poorest increased more significantly than the middle and upper terciles.

Results of the ex ante impact analysis of the KKM

The study examined the likely economic impact of the IAR4D concept in the KKM PLS of the SSA CP. Specifically, we evaluated the benefits accruable through adoption and operation of IP innovations embedded in the IAR4D concept for the farmers in the three TFs of the PLS at the farm level as well as an estimation of the economic impacts due to IAR4D research at the macro level.

The study employed gross margin analysis and economic surplus model to analyse the data collected via baseline survey in 2008 and the secondary data available on the development of the concept, research and extension of the approach to other areas in the agro-ecological zones of Sudan and Northern Guinea Savanna of Nigeria and the Sahel Savanna of Niger Republic. In the gross margin analysis, the estimates were not based on an assumption of 100 % adoption – that the farmer would adopt the IAR4D, instantaneously and completely. This is an extreme assumption and probably unreasonable and this was the reason for using an adoption rate of 30 % for the first year. This was done because adoption is expected to evolve over time with the development of information and knowledge of the innovations.

To assess the potential economic benefits from adoption of the IAR4D approach we estimated the yield gains and the unit production cost reduction, defined the socioeconomic domains of the priority crops production for extrapolation to other areas and examined the adoption pathway and used the economic surplus model to evaluate the potential economic impact of the IAR4D concept. Moreover, a sensitivity analysis was undertaken to evaluate the robustness of the estimated benefits with respect to model assumptions and certain parameter values. Apart from the model assumption (closed economy), the analysis focused on assessing the effects of: (1) halving the expected adoption rates and (2) doubling the extension costs.

The results of gross margin analysis indicated that under a reasonable set of assumptions, and using baseline data for 2008 as well as secondary data, we found that if the technology had been available at the baseline year and priced appropriately so that it could be adopted comprehensively, benefits obtainable by farmers in the PLS would have been US$1,034 million in that year. The benefit was US$116 million (11%) in the Sahel Savanna TF and US$292 million (28%) in the NGS TF and US$626 million (61%) in the SS TF.

In terms of benefit obtainable per hectare, maize yielded the highest benefit in the SS TF with a value of US$89.23, millet yielded US$115.04 in the SS TF and rice US$13.03 in the NGS TF while groundnut yielded US$127.89 in the Sahel TF. These estimates may be understated for several reasons. First, we used average values for the generation of the figures. It is clear that some TFs would have obtained above average benefits while others may have been below average. However, the nature of the technology and the prevailing environment determines the actual value of benefit obtained.

The results of the potential economic surplus model show that Sudan Savanna gains an estimated US$12 million per year from the adoption of IAR4D approach for maize production. Out of these benefits, present producer surplus was about US$306 million (about 60%) – equivalent to annual benefits of about US$9 million. However, an annual consumer benefit due to maize production as a result of adoption of IAR4D was about US$4 million. The results demonstrate that IAR4D research and extension yields a rate of return of 38% and a benefit: cost ratio of 44 to 1. The average annual present producer surplus and present consumer surplus for millet are US$4.1 million and US$1.6 million respectively in the Sudan Savanna. The results further demonstrate that in millet production, IAR4D approach research and extension yields a rate of return of 29% and a benefit: cost ratio of 20 to 1. Similarly, the average annual present producer surplus and present consumer surplus, with respect to sorghum, are US$6.7 million and US$2.7 million, respectively. The results further demonstrate that in sorghum production, IAR4D approach research and extension yields a rate of return of 35% and a benefit: cost ratio of 33 to 1.

In the Northern Guinea Savanna, the average annual present producer surplus and present consumer surplus due to IAR4D in maize production are US$3.1 million and US$1.7 million, respectively. It also indicates that in maize production, IAR4D approach research and extension yields a rate of return of 27% and a benefit: cost ratio of 15 to 1. However, in the same zone, the average annual present producer surplus and present consumer surplus, with respect to rice, are about US$13 million and US$5 million respectively. The results further demonstrate that in rice production, IAR4D approach research and extension yields a rate of return of 42% and a benefit: cost ratio of 67 to 1. Also, the average annual present producer surplus and present consumer surplus in regard to sorghum are about US$3.2 million and US$1.3 million, respectively. The results further reveal that in sorghum production, IAR4D approach research and extension yields a rate of return of 27% and a benefit: cost ratio of 16 to 1.

The results of the Sahel Savanna are also similar to what obtains in the previous agro-ecological zones. With respect to millet, the average annual present producer surplus and present consumer surplus are about US$7 million and US$3 million respectively and a rate of return of 35% and a benefit: cost ratio of 34 to 1. On the other hand, the average annual present producer surplus and present consumer surplus with respect to sorghum are about US$2.6 million and US$1 million respectively but with the rate of return of 24% while a benefit: cost ratio of 12 to 1. Similarly, the average annual present producer surplus and present consumer surplus in regard to groundnut are about US$6.1 million and US$2.4 million respectively and a rate of return of 33% and a benefit: cost ratio of 29 to 1.

The estimated benefits are sensitive to expected adoption rates but much less so to changes in research and extension costs. However, the estimates indicate that the production of all the crops is socially profitable under the IAR4D option. Our results were consistent with earlier economic analyses which showed that IAR4D was more productive, profitable and acceptable to farmers than the conventional R&D approach. Overall, while the potential economic gains are considerable, realisation of these gains depends on the efficiency and effectiveness of extension, co-operation and understanding among the stakeholders as well as input supply and output marketing systems. Concerted extension efforts are needed to stimulate adoption of IAR4D option, using extensive participatory demonstrations, and because the IAR4D option is knowledge-intensive, considerable technical advice is also needed to get farmers on board.

Chapter 4

Conclusions and policy implications

The proof of concept exercise set out with three questions to establish the IAR4D not only as a concept but as a viable alternative to the traditional R&D, which will take Africa's agriculture to the desired level where the research outputs will be of benefit to the remote and immediate environment as well as improve the livelihood of rural farmers in Africa.

The answers to these questions are given below:

Does the IAR4D work as a concept?

The answer to this question is in the homogenous result of the impact analysis. The answer is yes, the IAR4D works and impacts positively on the lives of the beneficiaries to the tune of

$1822 per annum or $4.99 per day per participant. This amount lifts the household well above the poverty level.

Does the IAR4D deliver more benefits than conventional R&D methods?

With the use of matching methods as well as the PSM and double difference approach we can safely conclude from the results that the IAR4D delivers more benefits than the conventional R&D method. For example, the concept is 36 per cent more gender sensitive, encourages the smallholders to enjoy benefits of research by about 70 per cent and ensures that the participants are 230 per cent more food secured than the others involved in conventional methods. The results, while showing the positive impact for the IAR4D, reveal that under the same conditions, the conventional and the clean do not impact consistently positively on the non-beneficiaries.

The analyses also show that the IAR4D impacts on women's income, research participation and food security. These results are consistently robust and reliable.

Can the IAR4D be scaled out and up beyond the current area of operation?

The results of the ex ante analysis in line with the impact assessment analysis suggest that the concept can be successfully scaled up and out with potentially multiple positive impacts on the beneficiaries. Indeed, reports of the success story of the concept abound as to how eager the neighbouring communities are to key into the concept so as to better their lives.

The IAR4D concept had been on the ground for about two years in the KKM PLS, during which time the project realised significant positive impacts on household income, food security, gender and research participation. Using propensity score and double-difference methods to control for project placement and self selection biases, we found that IAR4D increased participants' income, improved household assets and encouraged participation in research as well as adoption of research outputs.

Household incomes improved substantially more for the IAR4D participants than for non beneficiaries in conventional and clean sites, with an average increase in real incomes resulting from participation of about 139% which is not only better than the conventional and clean sites but well above the achievement of similar projects in the continent. For instance, the World Bank-sponsored Fadama II project in Nigeria which won the Banks' Regional Excellent Award had an income impact rate of about 60%, a feat achieved in six years of operation.

This result is in line with the ex ante report on the KKM PLS in which the projected benefits of IAR4D not only surpass the costs of investments but are also superior to both the conventional and clean modes. Furthermore, the benefits derivable vary by TFs (agro-ecological zones) in the sense that the Sahel Savanna zone gave the least quantum of benefits of the three. This could be as a result of the higher level of moisture stress in the Sahel and possibly a lower level of education with larger family sizes than the other agro-ecological zones.

The project had bigger impact on the poorest beneficiaries and could have much greater impact in the future because of the lagged effect of the productive asset acquisition. Thus, a follow-up study is needed to capture the longer-term effects of productive assets and other changes that farmers experienced as a result of participation in the IAR4D. This study was conducted at an early stage of the project and does not capture its lagged impacts, especially the long-term benefits of productive asset acquisition and rural infrastructure development.

Key issues that need to be addressed in scaling up this success story include, among others, better targeting of poor and vulnerable groups, especially women, finding sustainable methods of promoting development of rural financial services and conscious inclusion of capacity building of IAR4D beneficiaries in efficient management of productive assets.

As far as appropriate targeting goes, recall that over the first two years of the project's operation, the Gini coefficient of income for beneficiaries decreased by about 18% compared with a decrease of 13 % for non-beneficiaries and an increase for other categories of non-beneficiaries. This suggests that the project contributed to the reduction in income inequality, probably through targeting poor and vulnerable groups. Consistent with this, the project also succeeded in raising the value of productive assets of the poorest tercile more significantly than for the other terciles. The non-significance of the impact on income for the other two terciles suggests appropriate targeting of the poor and vulnerable groups.

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Acronyms and abbreviations

ADP	Agricultural Development Program
AEZ	Agro-Ecological Zone
AFAN	All Farmers' Association of Nigeria
ARD	Agricultural Research and Development
CBO	Community Based Organization
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Center for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Center
CORAF/WECARD	West and Central African Council for Agricultural Research and Development
CP	Challenge Program
CRST	Cross Site Research Support Team
DfID	Department for International Development
EU	European Union
FADAMA II	Second National Fadama Development Project of the Federal Ministry of Agriculture and Water Resources Nigeria
FARA	Forum for Agricultural Research in Africa
FEPSAN	Fertilizer Producers and Suppliers Association of Nigeria
GIS	Geographical Information Systems
GNP	Gross National Product
IAR	Institute for Agricultural Research (Nigeria)
IAR4D	Integrated Agricultural Research for Development
ICRAF	International Center for Research on Agro-Forestry
ICRISAT	International Crop Research Institute for Semi Arid Tropics
IFDC	International Fertilizer Development Center
IFPRI	International Food Policy Research Institute
SSA CP	Sub-Saharan Africa – Challenge Program
MTP	Medium Term Plan 2009-10
MDG	Millenium Development Goals

IITA	International Institute for Tropical Agriculture
ILRI	International Livestock Research Institute
INRAN	Institut National de Recherche Agronomique de Niger
IP	Innovation Platform
IPG	International Public Good
ISFM	Integrated Soil Fertility Management
KTARDA	Katsina State Agricultural and Rural Development Authority
KKM	Kano Katsina Maradi
LCRI	Lake Chad Research Institute (Nigeria)
LK	Lake Kivu
MOU	Memorandum of Understanding
MTP	Medium Term Plan
MLL	Maize Legume Livestock IP
NAERLS	National Agricultural Extension Research Liaison Service (Nigeria)
NAPRI	National Animal Production Research Institute (Nigeria)
NARS	National Agricultural Research System
NGO	Non Governmental Organization
NGS	Northern Guinea Savanna
NIHORT	National Institute for Horticultural Research and Training (Nigeria)
NRM	Natural Resources Management
NSS	National Seed Service
PCU	Program Coordination Unit
PLAR	Participatory Learning and Action Research
PLS	Pilot Learning Site
PLT	Pilot Learning Team
PM&E	Planning, Monitoring, and Evaluation
RPG	Regional Public Goods
R&D	Research and Development
SLL	Sorghum Legume Livestock IP
SRO	Sub Regional Organization
SS	Sudan Savanna
SSA	Sub Saharan Africa
TF	Taskforce
ZMM	Zimbabwe Mozambique Malawi

SSA CP Key Support Institutions

SSA CP Donors

SSA CP KKM PLS Task Force Institutions

About FARA

FARA is the Forum for Agricultural Research in Africa, the apex organization bringing together and forming coalitions of major stakeholders in agricultural research and development in Africa.

FARA is the technical arm of the African Union Commission (AUC) on rural economy and agricultural development and the lead agency of the AU's New Partnership for Africa's Development (NEPAD) to implement the fourth pillar of the Comprehensive African Agricultural Development Programme (CAADP), involving agricultural research, technology dissemination and uptake.

FARA's vision: reduced poverty in Africa as a result of sustainable broad-based agricultural growth and improved livelihoods, particularly of smallholder and pastoral enterprises.

FARA's mission: creation of broad-based improvements in agricultural productivity, competitiveness and markets by supporting Africa's sub-regional organizations (SROs) in strengthening capacity for agricultural innovation.

FARA's Value Proposition: to provide a strategic platform to foster continental and global networking that reinforces the capacities of Africa's national agricultural research systems and sub-regional organizations.

FARA will make this contribution by achieving its *Specific Objective* of sustainable improvements to broad-based agricultural productivity, competitiveness and markets.

Key to this is the delivery of five *Results,* which respond to the priorities expressed by FARA's clients.

These are:

1. Establishment of appropriate institutional and organizational arrangements for regional agricultural research and development.
2. Broad-based stakeholders provided access to the knowledge and technology necessary for innovation.
3. Development of strategic decision-making options for policy, institutions and markets.
4. Development of human and institutional capacity for innovation.
5. Support provided for platforms for agricultural innovation.

FARA will deliver these results by supporting the SROs through these Networking Support Functions (NSFs):

NSF1/3. Advocacy and policy

NSF2. Access to knowledge and technologies

NSF4. Capacity strengthening

NSF5. Partnerships and strategic alliances

FARA's donors are the African Development Bank (AfDB), the Canadian International Development Agency (CIDA), the Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), the Danish International Development Agency (DANIDA), the Department for International Development (DFID), the European Commission (EC), the International Development Research Centre (IDRC), the Syngenta Foundation, the United States Department of Agriculture (USDA), the World Bank and the Governments of Italy and the Netherlands.

Forum for Agricultural Research in Africa
12 Anmeda Street, Roman Ridge
PMB CT 173, Accra, Ghana
Telephone: +233 302 772823 / 302 779421
Fax: +233 302 773676 / Email: info@fara-africa.org
www.fara-africa.org