WEST AFRICA AGRICULTURAL RODUCTIVITY PROJECT
AGRICULTURAL RESEARCH COUNCIL OF NIGERIA

THE BASELINE STUDY OF THE WEST AFRICA AGRICULTURAL PRODUCTIVITY PROJECT

(WAAPP-1B) NIGERIA COMPONENT

DRAFT REPORT

By

Dayo Phillip[1], Adunni S. Sanni[2], Noble J. Nweze[3], Patrick Ogunji-Sobulo[4]

1Dept of Agricultural Economics and Extension, Nasarawa State University, Keffi, Lafia Campus
2Dept of Agricultural Economics and Rural Sociology, Ahmadu Bello University, Zaria
3Dept of Agricultural Economics, University of Nigeria, Nsukka
4Private Consultant, Lagos

(After the lead author, co-authors are arranged alphabetically by first names)

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Acronyms and Abbreviations

ADPs	Agricultural Development Programmes
CAADP	Comprehensive Africa Agricultural Development Program
CRIN	Cocoa Research Institute of Nigeria
ECOWAS	Economic Community of West African States
FCAs	Federal Colleges of Agriculture
FCHORT	Federal College of Horticulture
FGN	Federal Government of Nigeria
GDP	Gross Domestic Product
IAR	Institute for Agricultural Research
IAR&T	Institute for Agricultural Research & Training
LCRI	Lake Chad Research Institute
NAERLS	National Agricultural Extension Research & Liaison Services
NAPRI	National Animal Production Research Institute
NARIs	National Agricultural Research Institute
NC	North Central
NCOS	National Centers of Specialization
NCRI	National Cereal Research Institute
NE	North East
NEPAD	New partnership for Africa's Development
NGOs	Non-governmental Organizations
NIFFR	National Institute for Fresh-Water Fisheries Research
NIFOR	Nigerian Institute for Oil-Palm Research
NIHORT	National Horticultural Research Institute
NIOMR	Nigerian Institute for Oceanography & Marine Research
NRCRI	National Root Crops Research Institute
NSPRI	Nigerian Stored Products Research Institute
NVRI	National Veterinary Research Institute
NW	North West
RRIN	Rubber Research Institute of Nigeria
SE	South East
SS	South South
SSP	Single Super phosphate
SW	South West
WAAPP	West African Agricultural Productivity Program

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Executive summary

The Nigerian agriculture engages at least 70% of the rural labour and on the average, contributes at least 40% of the Gross Domestic Product (GDP) per annum. It is estimated that 70% or more of the Nigerian population lives on less than US$1.25 per day, suggesting high incidence of poverty, despite the vast oil wealth. Poverty is especially pronounced among households who earn income and livelihood primarily from agriculture. Equally of concern is that the growth rate of agriculture remains less than the population growth rate. Nonetheless, agriculture remains the mainstay of the Nigerian economy, in spite of its seeming relegation in terms of export earrings and terms of trade.

The growth in the Nigerian oil sector has not stimulated a concomitant growth of the agricultural sector. Indeed, the failure to invest in agriculture, the deterioration in the exchange rates, and inconsistent macroeconomic policies have all led to declining agricultural productivity and loss of the competitiveness of the agricultural sector over the years. Other factors accounting for low or declining productivity of the Nigerian agricultural sector include poorly funded agricultural research and extension systems, inadequate availability and distribution of key inputs (fertilizers, chemicals, machinery and improved seed), poor access to livestock inputs and veterinary services, and poor or lack of access to financial services for the procurement of needed inputs and services. The current global position is that growth of agriculture is core to achieving overall economic growth, poverty reduction and enhancement of food security among the rural poor (World Bank, 2007).

Increasing agricultural production in West Africa primarily by area expansion is believed to be unsustainable in the long run. Agricultural growth is directly related to growth in agricultural productivity, which in turn is driven by investments in agricultural research and technology dissemination. Investment in agricultural research must address the new challenges posed by climatic changes, towards developing yield-increasing varieties that also tolerate local climatic stress. The problems of agriculture are similar across the West Africa sub-region, calling therefore for integration of regional efforts aimed at promoting increase in productivity, technology generation, technology dissemination and ultimate attainment of agricultural growth.

The priority commodities identified in this regard across the West African states include Yam, Cassava, Rice, Maize, Sorghum, Poultry, Goats, Sheep and Aquaculture. These commodities have the highest potential of responding to regional investments in research and translating to increase in agricultural growth, food security and poverty reduction during the program implementation period.

The Goal of WAAPP is to contribute to sustained agricultural productivity growth in the ECOWAS region's top priority commodity subsectors. WAAPP's Development Objective (PDO) is to generate and accelerate adoption of improved technologies in the participating countries' top agricultural commodity priority areas that are aligned with the subregion's top agricultural commodity priorities as outlined in the ECOWAP.

WAAPP's outcome Indicators are:

(i) Total direct beneficiaries of the project have reached 2,000,000;
(ii) At least three improved technologies have been released by each center of specialization;
(iii) For all the released technologies there will be improvement in yield by at least 15% over the control technology;
(iv) A total area of 800,000 hectares covered by the improved technologies disseminated by the project; and
(v) An adoption of improved varieties by at least one-third of the beneficiaries of the project.

WAAPP's outcomes at the end of 10-year implementation period are:

(i) 30% productivity increase (farmers' yield) achieved over the control technology in at least two of the region's top priority commodity subsectors in each participating country; and
(ii) Adoption of improved varieties by at least 70% of the beneficiaries of the project , with clear spill-over effects across participating countries.

The broad objective of the baseline study is to collect, analyze and describe the data on the status and trends of agricultural productivity of selected commodities in Nigeria that are among the priority commodities of ECOWAS.

The specific objectives are to:
(i) analyze the situation of agriculture in Nigeria, especially with regard to priority commodities;
(ii) identify the production resources available to the farmers (disaggregated according to gender);
(iii) identify the socio-economic characteristics of the farmers and determine their income levels (living conditions of households and their developments over the past decade, agricultural assets, changes in prices of agricultural products, access to financial services (credit, savings) incidence of disease such as AIDs on households, etc, to be disaggregated according to gender);
(iv) identify productivity levels of priority commodities in Nigeria;
(v) assess adoption levels of key available technologies for the priority commodities
(vi) identify the various factors that determine adoption of the various technologies by farmers;
(vii) take stock of past research to: (i) identify the key problems of agricultural production (ii) identify the problems for which solutions are already available and those that require additional research efforts; (iii) the state of current research; (iv) identify technologies available elsewhere and can be adapted to the Nigerian context;
(viii) analyze the constraints and opportunities for increased productivity, competitiveness and market access in the priority commodities with emphasis on the dynamics of the value chains;
(ix) make relevant recommendations.

The baseline study was designed to cover Nigeria's six (6) geo-political zones, namely North East, North West, North Central, South East, South West and South South and all the agro-ecological zones. The priority commodities covered include Yam, Cassava, Rice, Maize, Sorghum, Poultry, Goats, Sheep and Aquaculture.

Primary data were collected from farming households using carefully structured questionnaire and other interview guides.

Primary data were collected from three strata of farming households and communities, namely Adopted villages, Non-adopted villages within the LGA(s) of the adopted villages (for spillover monitoring) and Non-adopted villages outside the LGA(s) of the adopted villages (control).

For subsequent mentions, Non-adopted villages within the LGA(s) of the adopted villages will be referred to simply as Non-adopted villages (near), while Non-adopted villages outside the LGA(s) of the adopted villages will be referred to Non-adopted villages (remote). The two core information that guided the sampling are that (i) each National Agricultural Research Institute (NARI) has 2 adopted villages and 2 secondary schools, and (ii) 13 states host all the existing NARIs and /or Federal Colleges of Agriculture (FCAs).

Through some weighting procedures, a total sample of 1200 households were planned for the baseline survey, distributed as adopted village (359), non-adopted village, near (359) and non-adopted village, remote (482). The survey eventually ended up with a total of 1219 households as sample.

Baseline data is typically collected to quantify all the relevant performance or outcome indicators, against which to compare future values. Thus, the rigour of analysis at baseline is somewhat limited. The tools employed for this baseline analysis are largely descriptive. From the viewpoint of project impact evaluation, it is important to quantify some indices of prevailing poverty at baseline, which would be compared to corresponding values at either midline or endline of the project. We employed the poverty decomposition method proposed by Foster et al (1984). This method disaggregates poverty into incidence or head count, poverty gap and poverty severity. These indices will, in turn, be compared across different village and gender strata.

In the Sahel/Sudano-Sahel zone only Sorghum, maize, rice, goats, sheep and poultry are raised by at least 40% of the households across the three village strata. On the other hand, priority commodities with low incidence in the Sahel/Sudano-Sahel zone include cassava, yam, and aquaculture. In the Northern Guinea Savanna zone, there is improved incidence of Sorghum, Rice and maize across the three village strata. Also, goats, sheep and poultry are raised by at least 40% of the households across the three village strata. Priority commodities with low incidence in the Northern Guinea Savanna zone include cassava, yam, and aquaculture.

In the Southern Guinea Savanna zone, there is improved incidence of Sorghum, Rice and maize and even cassava which are raised by at least 40% of the households across the three village strata. However, priority commodities with low incidence in the Southern Guinea Savanna zone

now include yam, goats, sheep and aquaculture across the three village strata. In the Derived Savanna zone, only maize, cassava and goats are raised by at least 40% of the households across the three village strata. All other priority commodities under study maintains low incidence.

In the Rain Forest zone, there is improved incidence of maize, cassava and yams, which are raised by at least 40% of the households across the three village strata. All other priority commodities under study maintains varying but low incidence. In the Swamp Forests zone, only aquaculture prevails among at least 40% of the households across the three village strata. All other priority commodities under study maintains low incidence. In the Brackish Water zone, there is not much to report because only one households featured in the survey from this zone. In the Coastal Marine zone, all the households, located in the adopted- and non-adopted village (near) strata raises aquaculture, which again is broadly consistent with expectations.

Consistent with the results already presented, at least 90% of the households in the Derived Savanna, Rain Forests, Swamp Forests, Brackish Water, and Coastal Marine zones rate sorghum as 'not relevant to the zone'. However, at least 50% of the households in the Sahel/Sudano-Sahel, Northern Guinea Savanna and Inland Fisheries rate sorghum as "high" or "medium" in terms of ecological relevance. At least 90% of the households in the Derived Savanna, Rain Forests, Swamp Forests, Brackish Water, and Coastal Marine zones rates sorghum as 'not relevant to the zone'. However, at least 50% of the households in the Inland Fisheries and Southern Guinea Savanna rates rice as "high" or "medium" in terms of ecological relevance.

At least 40% of the households in the Southern Guinea Savanna, Derived Savanna, Rain Forests, Swamp Forests, Brackish Water, and Coastal Marine zones rates maize as 'not relevant to the zone'. However, at least 50% of the households in the Northern Guinea Savanna and Inland Fisheries rates maize as "high" in terms of ecological relevance. At least 30% of the households in the Sahel/Sudano-Sahel and Southern Guinea Savanna rates maize as "medium" or "high". Consistent with earlier results in this report, at least 70% of the households in the Sahel/Sudano-Sahel, Northern Guinea Savanna, Inland Fisheries, Southern Guinea Savanna, Swamp Forests, Brackish Water, and Coastal Marine rate cassava as 'not relevant to the zone'. However, at least 40% of the households in the Derived Savanna and Rain Forests rate cassava as "high" in terms of ecological relevance.

Across all the zones, at least 50% of the households rate yam as 'not relevant to the zone'. At least 60% of the households in the Southern Guinea Savanna , Derived Savanna, Rain Forests, Swamp Forests, Brackish Water, and Coastal Marine zones rate goats as 'not relevant to the zone'. However, at least 50% of the households in the Sahel/Sudano-Sahel, Northern Guinea Savanna, and Inland Fisheries rate goats as "high" in terms of ecological relevance.

At least 80% of the households in the Inland Fisheries, Southern Guinea Savanna, Derived Savanna, Rain Forests, Swamp Forests, Brackish Water, Coastal Marine zones rate sheep as 'not relevant to the zone'. However, at least 30% of the households in the Sahel/Sudano-Sahel and Northern Guinea Savanna rates sheep as "medium" or "high" in terms of ecological relevance. At least 70% of the households in the Southern Guinea Savanna, Derived Savanna, Rain Forests, Swamp Forests, Brackish Water, Coastal Marine zones rate poultry as 'not

relevant to the zone'. However, at least 30% of the households in the Sahel/Sudano-Sahel, Northern Guinea Savanna and Inland Fisheries rate poultry as "medium" or "high" in terms of ecological relevance.

At least 70% of the households in the Sahel/Sudano-Sahel, Northern Guinea Savanna, Inland Fisheries, Southern Guinea Savanna, Derived Savanna, and Rain Forests rate aquaculture as 'not relevant to the zone'. This is consistent with the results in the previous section. The rating of aquaculture as not relevant to zone by the lone household in the Brackish Water zone is probably a data problem. However, at least 50% of the households in the Swamp Forests and Coastal Marine rate aquaculture as "medium" or "high" in terms of ecological relevance.

Both mono- and mixed or inter-cropping prevail across all zones. However, mixed cropping appears to dominate in the Sahel/Sudano-Sahel and Northern Guinea Savanna while mono-cropping dominates in the Southern Guinea Savanna and Derived Savanna zones. Inter-cropping prevails in the Rain Forests while mono-cropping dominates in the Derived Savanna. The results for Inland fisheries and Swamp forests zones appear compromised by data problems.

Across all village strata, at least 40% of all households sell their maize and cassava in the market. All priority crop commodities are sold, but the percentage of households selling sorghum, rice and yam are lower. The sale of improved livestock (goats, sheep or chicken) is virtually non-existent. Even for the local livestock, there was none that more than 40% of the households sold in the market.

The dominant option for crop sales is the local or village market. Some of the factors conditioning this situation are analyzed with further results in subsequent sections in the report. For local goats, sheep and chicken, the village market provides a strong sale medium, as we saw for crop sale. However, unlike the priority crops, the sale of improved chicken and fish relies strongly on direct on-farm visit by consumers and middlemen.

With the exception of the non-adopted village (near), at least 40% of all households in each village strata and gender groups belong to one association or another. In the adopted village, most of the female respondents belong to women only groups and mixed groups, while the males belong to male only groups and mixed groups. In the non-adopted village (near), the female respondents again mainly belong to women only groups and mixed groups, while the males belong to male only groups and mixed groups. In a rather unusual development, most of the female respondents in the non-adopted village (remote) belong to men only group. However, most of the men in the non-adopted village (remote) belong to mixed groups.

Across all village strata and different groups, the most prevalent group activity is agricultural production (primary). In a less consistent manner, the next important group activity is savings and credit. Across the village strata, most groups have at least 30 members, on the average. To the nearest whole number, the average length of association membership mostly varies from 7 to 10 years.

As probably expected, wives are mostly the ones registered in women only groups, while husbands are the ones primarily registered in men only groups. In the mixed and cooperative

groups, husbands are shown to be more registered as members than wives. And, in a less consistent manner, the registration of both wife and husband in each of the group types are somewhat prevalent. Across all village strata, the results show strong participation in group activities by members. Indeed, at least 90% of all households in each village stratum indicate at least moderate participation in group activities. In the women only group, the ratings of benefits are mixed across the village strata. However, in the other types of groups, more than 70% of households across the village strata rate group membership as either beneficial or very beneficial.

Across 5 ponds per household and three village strata, the dominant production system is monoculture. Households were surveyed for four types of fish, namely Tilapia, Catfish, Heterobranchus and Clarias, to know if they buy fingerlings for fish production. Less than 10% of the respondents across gender and village strata purchase fingerlings as inputs for fish production. The dominant feeding regime in aquaculture among the households is the intensive system, which is practiced by at least 70% of households across the village strata. In a less than consistent manner, the semi-intensive feeding system is next in importance among the aquaculture households.

The upland on the average dominates other types of land across the village strata and gender groups. Looking further at the total of all types of land, we see that in each village stratum, men have access to larger amount of lands than women. The husband owns farmlands, according to more than 60% of the respondents in each village stratum. At least 60% of the households say that farmlands are operated by the husband.

At least 70% of the respondents pitched in favour of NPK fertilizer, followed by Urea across the village strata. The quantities of usage for each crop is low especially on kilogramme basis, and could be further depressed when denominated by land area (i.e, Kg/ha). This scenario points only in the direction of low productivity even when improved varieties of the priority crops are adopted. In each stratum, the amount of fertilizer usage for different types of fertilizer is not consistently lower for the female respondents. This aspect of the results is mixed for different crops and fertilizer types.

Across the village strata and for each priority crop, the quantity of seed used by men was higher than for women. It is not clear whether this was due to differential seed access or the fact that men have access to more land, as earlier shown in this report. Across gender and village strata, at least 80% of the households hire labour, which attests to the shortage or inadequacy of conventional family labour for farm production. Relative to the legalized daily minimum wage of N600.00 (or N18,000 per month), labour has grown to become a significant component of the overall farm production costs. Furthermore, the ability to source and pay for the needed labour is likely to inform technology adoption decisions among potential adopters.

Across village and gender strata, the amount of labour utilized for each farm operation is, on the average, higher for men, whether family or hired. Since this is true even for family labour, the cause is probably related more to differential access to land than ability to pay for labour.

For each of the ponds and village strata, the top source of fingerlings is private hatchery, followed by private fish farms and government fish farms in that order. It is significant that

aquaculture is largely private sector led, which offers good opportunities for developing a competitive sub-sector as time passes. Higher percentage of men than women own ponds. Also, it appears that aquaculture management among the households occur more in non-pond production systems, since far less than 20% of the households raise fish through ponds.

Across the five ponds surveyed, pond ownership strongly accrues to either the husband or both husband and wife. Pond ownership by wife only was of lower occurrence. On the average, the number of ponds owned varies from 2 to 6 irrespective of gender or village strata. However, with the exception of the non-adopted village (near), men have more ponds than women.

Using the non-adopted village (near) as our guide for discussion, we see that on the average, men have larger pond sizes than women. Across the various ponds, village and gender strata, the dominant pond type is one made of concrete, followed consistently by earthen ponds.
Across the various ponds, village and gender strata, the dominant fish type are Catfish. Across all gender and village strata, less than 5% of the respondents own fish hatchery. This is consistent with the earlier results that fingerlings are obtained mainly from private farms and government fish farms.

Across the village strata, at least 30% of the households have no formal education. While attainment of tertiary education is low among the households, at least 50% of all households in each village stratum complete a minimum of primary education. At least 90% of the households in each village stratum are male-headed. The ages of the respondents are quite comparable across gender and village strata, varying within a narrow range of 43 to 50 years. The dependency ratios are particularly informative. Across the village strata, it has been shown that the dependency ratio (total) is quite high, and mainly accounted for by the children.

The dominant roofing material is iron sheets, while the most important wall materials are mud and cement, across all village strata. And the major flooring materials are tiles and bricks, followed in terms of preference by straws. In the context of endline project evaluations, it will be useful comparing these baseline living conditions with their endline results, in the hope to detecting at least qualitative changes.

The agricultural assets which at least 20% of the households consistently own across the village strata include: Machetes/ Cutlasses/Hoes, Knapsack sprayers, Wheelbarrows, and Tube wells. The incidence of ownership of non-agricultural assets is higher among the households across all the village strata. As presented, there are no consistent differences in between the number of assets owned by men and women. Across all village strata, there is no asset except mobile phone which more than 5% of the respondents attribute control of usage to the wife. This means that even assets that are strongly owned by wives are apparently under the control of the husbands.

Ownership of improved goats and sheep were virtually non-existent, but ownership of improved chicken is mostly in the order of 10-13% of responding households across the village and gender strata. Local goats, sheep and chicken were owned by at least 20% of all respondents across gender and village strata. We also note that, consistently, more women than men indicated ownership of local goats, sheep and chicken across the village strata. On the average, men own

more of the livestock types shown than women. That is, the higher percentages of livestock ownership by women do not translate into higher number of livestock for women. This may probably be related to control, as previously seen in earlier tables in this section.

Across both gender and all village strata, less than 40% of the respondents showed tendency to borrow money. A further look at the table shows that, male respondents consistently showed higher incidence of borrowing than their female counterparts. Relatives and friends present the most popular source of borrowing to households who borrowed. Closely following relatives and friends as sources of credit is informal savings and credit group. In a less consistent manner, Commercial banks / Micro-finance banks is presented as the third most patronized source of credit by the households. The amount borrowed does not consistently favour any of the gender groups when examined for each credit source and across the village strata. The broad indication is that borrowing from the various credit sources was done mostly by husbands than wives.

The lowest physical and monetary productivities in the adopted villages are associated with the maize varieties while the highest productivities are associated with cassava varieties. In non-adopted villages, near the physical and monetary productivities are somewhat mixed, but the values for maize are still inferior to those of sorghum and TMS varieties of cassava. And, with the exception of Oba Super variety of maize the observed superior productivities of sorghum and TMS varieties of cassava are retained relative to those of maize varieties. With the exception of the non-adopted village (near), male respondents maintained higher livestock productivity than that of female respondents, per capita. Secondly, it broadly seems that livestock income per capita was higher than crop income per capital among the households.

In descending order of importance, the topmost indicated sources of household income are the crops, livestock and running of own businesses, respectively. The sale of other products such as firewood, honey, etc. constitutes the 4th most important source of income to the households. As expected, there is a close link between household income and productivity. Specifically, the amount of income from crop sale ranked 1st only among the female respondents in the adopted village. However, and remarkably, livestock income value ranked 2nd consistently across the rest of the gender and village strata. Other sources of income appear to push back crop farming in terms of value and this have significant policy implications for project design and implementation. Strictly focusing on crop agriculture as a basis for welfare improvement among target and spillover beneficiaries may lead to under-achievement of project objectives unless a holistic approach is adopted.

With the exception of the non-adopted village (near), male respondents on the average outspent the female respondents using the average total expenditure as basis for comparison. Second, food was the largest expenditure item among the various categories surveyed, followed fairly consistently by education. Some studies have ranked expenditure data higher than income data as a measure of household welfare, because of the tendency of households to report on the former more accurately.

Poverty incidence tops 80% across all village and gender strata at the $1.00 poverty line, and clearly worsens at $1.25 per day. Also of significance is that, at each poverty line, the poverty incidence is higher among female respondents across all village strata.

The results relating to the adoption of the technologies found with the household survey are presented using two main conventions. First, we computed adoption rates using the traditional approach that takes adoption rate as the percentage of respondents/households 'using' a technology. Secondly, we computed adoption rate of a technology in the case of crop as the area under the technology of interest as a fraction of the total area accruing all the technologies arrogated to the crop. In the case of livestock, we computed the adoption rate as the number of animals benefiting from the technology of interest as a fraction of the total number of the livestock type under study. Normally, the traditional and the latter approach will not yield the same results.

With the exception of rice in the non-adopted village (near) and sorghum in the non-adopted village (remote), at least 30% of the respondents grow improved varieties of the priority crops. Some technologies are adopted by less than 20% of the respondents. These include mulching, water harvesting, trenches/terraces, irrigation, conservation tillage, fungicide, botanical pesticides, composting and organic residue management, cover crops, improved storage facilities, and commodity grading. Technologies for which at least 30% of the respondents consistently indicate usage are herbicide, herbicides, insecticide use on field, insecticide use for storage, row planting, planting density, thinning, inorganic fertilizer (NPK, Urea, DAP, SSP, others), animal manure, and farm equipments.

We again tried to classify the results according to the strength of adoption observed. The technologies that are adopted by less than 20% of the respondents include improved goats, improved sheep, aquaculture feeds, and aquaculture drugs. Technologies for which at least 30% of the respondents consistently indicate usage are goat drugs, goat supplementary feed, sheep drugs, sheep supplementary feed, improved chicken (broilers or layers), chicken drugs, and chicken supplementary feed.

In the adopted village stratum, varieties with at least 30% adoption rates include farafara/sorghum, kaura/sorghum, faro/rice, hybrid/maize, and Nwabibi/cassava. In the non-adopted village (near), varieties with at least 30% adoption rates include farafara/sorghum, kaura/sorghum, hybrid/maize, Oba super/maize, premier/maize, TMS/cassava and Nwabibi/cassava. And, in the non-adopted village (remote), varieties with at least 30% adoption rates include farafara/sorghum, kaura/sorghum, hybrid/maize, and TMS/cassava.

Components of the technologies for which about 30% or more adoption rates are associated in at least one village stratum are herbicide, row planting, planting density, thinning, inorganic fertilizer application and method of fertilizer application. Most of the other technologies in the table have adoption rates that are much lower than 20% across the village strata. The technologies for which about 30% or more adoption rates are associated in at least one village stratum are goat drugs, goat supplementary feed, sheep drugs, sheep supplementary feed, improved chicken (broilers or layers). All other livestock technologies in the table have adoption rates that are much lower than 20% across the village strata.

Knowledge or awareness of a technology is expected to positively influence adoption decision. Technologies for which at least 30% of the respondents are aware across all village and gender

strata are herbicide use, insecticide use on field, insecticide use for storage, irrigation, row planting, mulching, planting density, thinning, inorganic fertilizer application, animal manure, legume-cereal rotation, method of fertilizer application, and improved crop variety. And, technologies for which less than 30% of the respondents are aware across all village and gender strata are water harvesting, conservation tillage, composting and organic residue management, cover crops, and commodity grading. It is of great interest that all the livestock technologies indicated in the table are known by at least 30% of the respondents across all village and gender strata.

The technologies which 30-45% of the households asked for in at least one village stratum are herbicide use, insecticide use on field, insecticide use for storage, row planting, planting density, thinning, inorganic fertilizer application and method of fertilizer application. With the exception improved goats and sheep, all other livestock technologies in the table are asked for by at least 30% of the households in at least one village stratum.

While improved varieties/ planting materials was high in the extension agenda and every village and gender strata benefited from it during the preceding 12 months, households did not seem to benefit from extension contact for such technologies as organic fertilizer, soil water management practices (e.g. mulching), post-harvest technologies and all the livestock services listed during the same period. Secondly, male respondents received higher number of extension contacts than their female counterparts across all village strata.

The dominant response across the village strata is that male extension agents visit the female respondents more than female agents. This is of crucial policy relevance because in situations where male extension agents have limited or no access to female farmers, delivery of extension messages will have to rely on male members of the households. This may create inherent message delivery problems.

Households were asked to indicate the major providers of agricultural research services in respect of twelve (12) technology items, namely, improved varieties/ planting material, chemical fertilizer, organic fertilizer, spacing, soil water management practices (e.g. mulching), plant protection, weed control, post-harvest technologies, livestock breeds, livestock pasture/feeds, veterinary services, and aquaculture at least 70% of the respondents across the village and gender strata credit the national research organizations with research support for the listed technologies. The balance of the research support has been credited to private/local and international research organizations.

Households were further asked to indicate the major providers of agricultural research services in respect of improved varieties/ planting material, chemical fertilizer, organic fertilizer, spacing, soil water management practices (e.g. mulching), plant protection, weed control, post-harvest technologies, livestock breeds, livestock pasture/feeds, veterinary services, and aquaculture. the Agricultural Development Programmes (ADPs) remains the dominant source of extension services among the agencies listed, namely Agricultural Development Programmes (ADPs), Non-governmental Organizations (NGOs), Private extension organizations, Farmer to farmer contacts and National agricultural research institutes. At least 70% of the respondents credit the Agricultural Development Programmes (ADPs) with extension support for the listed

technologies. It is important to stress that, farmer-to-farmer interactions provided the next most extension support among the other options surveyed.

The dominant research design is the Farmer-managed on-farm trial (farmer guided by researchers) across all 12 technologies, village and gender strata. In the case of aquaculture, both Farmer-managed on-farm trial (farmer guided by researchers) and On-farm trial (researcher-managed) were approximately evenly important to the households across the village and gender strata.

The most important extension method is the visit of the extension agents to farmers. This method is followed, but not closely by the use of demonstration plots, among the options surveyed. We sought to know the most important extension agencies with respect to the technologies presented to the households. Most households across the village and gender strata selected the ADPs. But, we also asked households to indicate their principal source of knowledge/awareness about crop and livestock technologies. The options presented to households were Government extension workers, Farmer group members, NGOs, Other farmers, Radio and Demonstration / research sites. The surprising result is that 'other farmers' now dominate all other sources of awareness (even government extension workers) about the crop and livestock technologies presented. This is of great policy significance because the rating of government agencies as the most important extension bodies has not translated into households relying on them as their most important source of knowledge about technologies.

With the exception of the male respondents in the adopted village, less than 45% of the households participated in research or extension demonstrations across the village strata. This is surprising, given the relatively strong weight attached to demonstration plots for both research and extension services in our earlier results. The broad indication is that at least 30% of responding households participated in the listed research demonstrations, in at least one village and gender strata.

Farmers play limited roles in deciding the type of agricultural technologies to be demonstrated to them across the village strata. Responsibilities for this decision largely reside within the research and extension establishments, thus reechoing the well known top-down intervention syndrome.

The general indication is that at least 50% of the respondents in at least one village and gender strata adopted the listed technologies based on the various research and extension activities exposed to them.

In the adopted village at least 30% of all respondents indicate extension services to be demand-driven. However, while similar results are found in the non-adopted village (near) and non-adopted village (remote), there is notably some strata in which no household requested/asked for the extension services provided.

Except for the non-adopted village (near), at least 30% of the respondents across village and gender strata participated in subject matter trainings. Also, the trainings were asked for by at least 30% of the respondents in at least one village and gender strata. Crop management attracted most of the households, followed but not closely by livestock management across the village

strata. Significantly, across all village and gender strata, at least 70% of all respondents rate the training methods as either good or very good.

The inputs which at least 50% of the households rated as either medium access or easy/high access include Inorganic Fertilizer, Herbicides, Insecticides, Manure, Post harvest insect control, Farm equipments, Livestock supplementary feed, and Livestock drugs. Also, the inputs which at least 50% of the households rated as no access or low access include Fungicides, Certified seed, Seed dressing chemicals, Water pumps, Livestock drugs, Aquaculture feeds and Aquaculture drugs.

The inputs which are 12 km or longer from the households in at least one village strata are those previously rated as no access or low access namely, Fungicides, Certified seed, Seed dressing chemicals, Water pumps, Livestock drugs, Aquaculture feeds and Aquaculture drugs. It is also to be noted that, with the exception of manure, none of the inputs listed is accessible within 3km of the households' villages. Specifically, with the exception of manure, the distance to virtually all the listed inputs is rated as either far or very far by at least 50% of all households across the village and gender strata.

With the exception of manure, the cost of all other inputs in the list are rated as either medium cost or high cost by at least 50% of households across the village and gender strata, again in close relationship with the perception or data about distances to the inputs. Across the village and gender strata, the ratings of crop market distance appears to cluster around 'near' or 'far', and less so for 'very far' among the households. A similar trend in the distribution of the households is shown for the perception about distance to priority livestock and fish markets. It is particularly noteworthy that in the case of chicken (local or improved) and fish, there is a strong cluster of responses around 'near' ratings of market distance, possibly underlining some perishability problem.

Virtually all the priority crops are sold as harvested (raw) or in shelled/peeled form. Little or no processing takes place, resulting in poor financial rewards to the primary producers.

The prevalent method of commodity sale is individual rather than collective efforts. Collective efforts to marketing are expected to share and spread associated risks and costs of marketing, and possibly rewarding individual members beyond accruals to individual efforts.

Virtually all the aquaculture managers in the survey depend on commercial fish feed for feeding their fish. Viewed against prevailing labour costs and wage rates fish feeding appears to account for the largest portion of the overall variable costs in aquaculture management among the households

This trend has negative implications for the efficiency and competitiveness of the aquaculture management, having noted previously that feeds and drugs are poorly accessed and fish are disposed primarily at village /nearby markets. The prevalent fish feeding regime is the intensive option This, together with poor access to feeds (in terms of costs and distance) is expected to affect the productivity and competitiveness of the aquaculture sector.

1. Introduction

1.1 Nigeria Agricultural Sector Issues

The Nigerian agriculture engages at least 70% of the rural labour and on the average, contributes at least 40% of the Gross Domestic Product (GDP) per annum. It is estimated that 70% or more of the Nigerian population lives on less than US$1.25 per day, suggesting high incidence of poverty, despite the vast oil wealth. Poverty is especially pronounced among households who earn income and livelihood primarily from agriculture. Equally of concern is that the growth rate of agriculture remains less than the population growth rate. Nonetheless, agriculture remains the mainstay of the Nigerian economy, in spite of its seeming relegation in terms of export earrings and terms of trade.

The growth in the Nigerian oil sector has not stimulated a concomitant growth of the agricultural sector. Indeed, the failure to invest in agriculture, the deterioration in the exchange rates, and inconsistent macroeconomic policies have all led to declining agricultural productivity and loss of the competitiveness of the agricultural sector over the years. The current global position is that growth of agriculture is core to achieving overall economic growth, poverty reduction and enhancement of food security among the rural poor (World Bank, 2007).

Several programs have been formulated by the Federal Government of Nigeria (FGN), in the hope to using agriculture as the vehicle for poverty alleviation and attainment of food security. But, there are significant challenges to overcome. These challenges include the gradual loss in the quality or fertility of the agricultural lands, implying that expansion of agricultural production in the recent years has been largely more of area expansion than yield improvement. Other factors accounting for low or declining productivity of the Nigerian agricultural sector include poorly funded agricultural research and extension systems, inadequate availability and distribution of key inputs (fertilizers, chemicals, machinery and improved seed), poor access to livestock inputs and veterinary services, and poor or lack of access to financial services for the procurement of needed inputs and services.

1.2 Regional Agricultural Issues and Rationale for Project

Increasing agricultural production in West Africa primarily by area expansion is believed to be unsustainable in the long run. Agricultural growth is directly related to growth in agricultural productivity, which in turn is driven by investments in agricultural research and technology dissemination. Investment in agricultural research must address the new challenges posed by climatic changes, towards developing yield-increasing varieties that also tolerate local climatic stress. The problems of agriculture are similar across the West Africa sub-region, calling therefore for integration of regional efforts aimed at promoting increase in productivity, technology generation, technology dissemination and ultimate attainment of agricultural growth. The New partnership for Africa's Development (NEPAD) aims to achieve 3% growth in agricultural productivity through technology generation and dissemination. The fourth pillar of NEPAD's Comprehensive Africa Agricultural Development Program (CAADP) is concerned with technology generation, dissemination and adoption. The WAAPP is designed to support the generation and adoption of improved agricultural technologies across the West African sub

region. Thus, WAAPP seeks to implement the agricultural policy of the West African states (ECOWAP), and by extension, the fourth pillar of CAADP.

The West African Agricultural Productivity Program (WAAPP) is a World Bank assisted Project for members of the Economic Community of West African States (ECOWAS). The first stage of the WAAPP project was approved by the Bank's Board of Governors in March 2007 and has provided some funds to three countries – Senegal, Mali and Ghana – for agricultural research in their national agricultural research systems and in the context of regional research coordination and monitoring through CORAF. One of the goals of the WAAPP is to encourage integrated development of agricultural research into the Technology Generation and Dissemination (TGD) continuum throughout the West African sub-region. Additional countries, including Nigeria, have been invited to join the program.

The priority commodities identified in this regard across the West African states **include Yam, Cassava, Rice, Maize, Sorghum, Poultry, Goats, Sheep and Aquaculture.** These commodities have the highest potential of responding to regional investments in research and translating to increase in agricultural growth, food security and poverty reduction during the program implementation period.

1.3 Goal of WAAPP

To contribute to sustained agricultural productivity growth in the ECOWAS region's top priority commodity subsectors.

1.4 WAAPP Development Objective (PDO)

To generate and accelerate adoption of improved technologies in the participating countries' top agricultural commodity priority areas that are aligned with the subregion's top agricultural commodity priorities as outlined in the ECOWAP.

WAAPP Outcome Indicators:

(vi) Total direct beneficiaries of the project have reached 2,000,000;
(vii) At least three improved technologies have been released by each center of specialization;
(viii) For all the released technologies there will be improvement in yield by at least 15% over the control technology;
(ix) A total area of 800,000 hectares covered by the improved technologies disseminated by the project; and
(x) An adoption of improved varieties by at least one-third of the beneficiaries of the project.

1.5 **Program outcome at the end of 10-year implementation period**:

(iii) 30% productivity increase (farmers' yield) achieved over the control technology in at least two of the region's top priority commodity subsectors in each participating country; and
(iv) Adoption of improved varieties by at least 70% of the beneficiaries of the project , with clear spill-over effects across participating countries.

1.7. Project components:

Component 1: Enabling conditions for sub-regional cooperation in the generation, dissemination and adoption of agricultural technologies;
Component 2: National Centers of Specialization (NCOS);
Component 3: Funding of demand-driven technology generation and adoption;
Sub-component 3.1: Demand-driven technology generation;
Sub-component 3.2: Support to accelerated adoption of released technologies;
Sub-component 3.3: Facilitating access to improved genetic material
Sub-component 3.4: Developing a yield prediction tool to help farmers on crop choices
Component 4: Project Coordination, management, Monitoring and Evaluation

1.8. Study Objectives

The broad objective of the baseline study is to collect, analyze and describe the data on the status and trends of agricultural productivity of selected commodities in Nigeria that are among the priority commodities of ECOWAS.

The specific objectives are to:

(i) analyze the situation of agriculture in Nigeria, especially with regard to priority commodities;
(ii) identify the production resources available to the farmers (disaggregated according to gender);
(iii) identify the socio-economic characteristics of the farmers and determine their income levels (living conditions of households and their developments over the past decade, agricultural assets, changes in prices of agricultural products, access to financial services (credit, savings) incidence of disease such as AIDs on households, etc, to be disaggregated according to gender);
(iv) identify productivity levels of priority commodities in Nigeria;
(v) assess adoption levels of key available technologies for the priority commodities
(vi) identify the various factors that determine adoption of the various technologies by farmers;
(vii) take stock of past research to: (i) identify the key problems of agricultural production (ii) identify the problems for which solutions isare already available and those that require additional research efforts; (iii) the state of current research; (iv) identify technologies available elsewhere and can be adapted to the Nigerian context;

(viii) analyze the constraints and opportunities for increased productivity, competitiveness and market access in the priority commodities with emphasis on the dynamics of the value chains;
(ix) make relevant recommendations.

2.0 Methodology

2.1 Scope of the study

The baseline study was designed to cover Nigeria's six (6) geo-political zones, namely North East, North West, North Central, South East, South West and South South and all the agro-ecological zones. The priority commodities covered include Yam, Cassava, Rice, Maize, Sorghum, Poultry, Goats, Sheep and Aquaculture.

2.2 Nature and sources of data

Primary data were collected from farming households using carefully structured questionnaire and other interview guides.

2.3 Sampling considerations

Primary data were collected from farming households and communities situated as follows:

1. Adopted villages
2. Non-adopted villages within the LGA(s) of the adopted villages (for spillover monitoring)
3. Non-adopted villages outside the LGA(s) of the adopted villages (control)

For subsequent mentions, Non-adopted villages within the LGA(s) of the adopted villages will be referred to simply as Non-adopted villages (near), while Non-adopted villages outside the LGA(s) of the adopted villages will be referred to Non-adopted villages (remote).
The two core information that guided the sampling are that (i) each National Agricultural Research Institute (NARI) has 2 adopted villages and 2 secondary schools, and (ii) 13 states host all the existing NARIs and /or Federal Colleges of Agriculture (FCAs). With this information, the zonal arrangement for the study was as follows:

North East and North West:
(i) Kaduna (NAERLS, IAR, NAPRI)
(ii) Gombe (FCHORT Technical)
(iii) Borno (LCRI, FC of Fisheries Technical)
(iv) Kano (Fed. Produce college)

North Central and South West:
(i) Kwara (NSPRI)

(ii) Plateau (NVRI + 2 FCAs)
(iii) Niger (NCRI, NFFRI + 1 FCA)
(iv) Lagos (NIOMR, 1 FCA)
(v) Oyo (CRIN, IAR&T, NIHORT, 2 FCAs)
(vi) Ondo (FCA Akure)

South East and South South:
(i) Abia (NRCRI)
(ii) Ebonyi (FCA Isiagu)
(iii) Edo (NIFOR + RRIN)

Table 2.1 shows the derivation of the weighted samples for NW/NE, SW/NC and SE/SS, respectively. The weights were constructed based on the number of NARIs and number of priority commodities in each zone. The derived samples for each zone are presented in the last column of Table 2.1. Table 2.2 distributes the zonal samples among the strata of villages.

Table 2.1: Approximate sampling plan for WAAPP baseline study

Zone	No. of NARIs	No. of adopted villages	No. of mandate priority commodities	Weights (mandate priority commodities)	Weights (No. of NARIs)	Weights, adopted villages	Average sampling weight	Weighted zonal sample
NW	3	14	5	.50	.26	.27	.34	408
NE	1		0					
SW	4	30	1	.30	.54	.58	.47	564
NC	4		2					
SE	1	8	2	.20	.20	.15	.19	228
SS	2		0					
Total	15	52	10	1.00	1.00	1.00	1.00	1200

Table 2.2: Distribution of samples across the three village strata:

Primary strata	NW/NE	SW/NC	SE/SS	Row total
Adopted villages (wt=.3)	122	169	68	359
Non-adopted villages in LGA of adopted villages (wt=.3)	122	169	68	359
Non-adopted villages (outside LGA of adopted villages (wt=.4)	164	226	92	482
Total (1.0)	408	564	228	1200

2.4 Selection of survey villages and households

In each of the survey zones (e.g. NE/NW), households were selected from samples of the adopted villages of either the NARIs or the FCAs (to a maximum of 50% of the zonal total), while other strata (i.e., number of non-adopted villages (near) and number of non-adopted villages (remote)) were decided based on logistic realities on ground. As a guide, however, a minimum of 10 households were selected for survey per village in each village stratum, noting also that separate sampling frames were prepared for prospective male and female respondents to ensure at least 20% female representation in each strata. Table 2.3 shows the agro-ecological distribution of the respondents across village and gender strata. The survey eventually ended up with a total of 1219 households as sample.

Table 2.3: Survey sampling implementation for WAAPP baseline survey

Agro-ecological zones	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Sahel/Sudano-Sahel (108)	11(25.5)	32(74.4)	5(27.8)	13(72.2)	12(25.5)	35(74.5)
Northern Guinea Savanna (462)	39(29.5)	93(70.5)	46(30.1)	107(69.9)	29(16.4)	148(83.6)
Inland Fisheries (2)	0	0	0	2(100.0)	0	0
Southern Guinea Savanna (42)	0	12(100.0)	0	15(100.0)	0	15(100.0)
Derived Savanna (184)	19(27.50	50(72.5)	19(33.3)	38(66.7)	17(29.3)	41(70.7)
Rain Forests (360)	43(40.6)	63(59.4)	31(32.3)	65(67.7)	37(23.4)	121(76.6)
Swamp Forests (33)	3(42.9)	4(57.1)	1(10.0)	9(90.0)	1(6.3)	15(93.7)
Brackish Water (1)	0	1(100.0)	0	0	0	0
Coastal Marine (21)	0	13(100.0)	2(25.0)	6(75.0)	0	0

Note: for each x(y) in the table, x is the number of respondents in an agro-ecological zone in a village stratum/type, y is the corresponding percentage

2.5 Data analysis

Baseline data is typically collected to quantify all the relevant performance or outcome indicators, against which to compare future values. Thus, the rigour of analysis at baseline is somewhat limited. The tools employed for the baseline analysis are largely descriptive.

From the viewpoint of project impact evaluation, it is important to quantify some indices of prevailing poverty at baseline, which would be compared to corresponding values at either midline or endline of the project. We employed the poverty decomposition method proposed by Foster et al (1984). This method disaggregates poverty into incidence or head count, poverty gap

and poverty severity. These indices will, in turn, be compared across different village and gender strata.

The proposition at the level of individual household i is that:

$P_\alpha = \{\max [(1-x_i/y), 0]\}^\alpha \quad , \alpha = 0,1,2$

where x_i is the income level of household i, y is the poverty line agreed upon and α is some non-negative parameter conditioning poverty index P. An alternative proposition of the formula is that

$P_\alpha = n^{-1}\sum[1-x_i/y]^\alpha ,$

where n is the number of poor households in the sample. An α value of 0 essentially reduces the formula to the proportion of the households that are below the poverty line or are poor. For α=1, P_1 is the poverty gap while, P_2, corresponding to α=2, is the severity of poverty. Only P_0 is computed in this baseline study across all village and gender strata.

3. RESULTS AND DISCUSSION

3.1 SITUATION OF AGRICULTURE IN NIGERIA

In an attempt to describe the situation of agriculture in Nigeria, one of two options are possible, namely the review of existing literature and /or the use of the primary data at our disposal. We have relied on aspects of the household data from this study to largely describe the situation of agriculture in Nigeria. Some of the issues described include the agro-ecological spread of priority commodities, cropping systems, marketing practices with priority commodities, social organizations, to list a few.

Agro-ecological spread of priority commodities

Table 3.1.1 shows the percentages of households raising each of the priority commodities in the Sahel/Sudano-Sahel zone. Being the extreme northern part of Nigeria, only Sorghum, maize, rice, goats, sheep and poultry are raised by at least 40% of the households across the three village strata. On the other hand, priority commodities with low incidence in the Sahel/Sudano-Sahel zone include cassava, yam, and aquaculture.

Table 3.1.1: Percentage of respondents raising priority commodity, Sahel/Sudano-Sahel (% yes)

Village type	Priority commodities								
	Sorghum	Rice	Maize	Cassava	Yam	Goats	Sheep	Poultry	Aquaculture
Adopted village (43)	65.1	39.5	44.2	0.0	2.3	58.1	48.8	67.4	9.3
Non-adopted village (near) (18)	44.4	55.6	16.7	0.0	0.0	72.2	55.6	61.1	0.0
Non-adopted village (remote) (47)	80.9	19.1	53.2	0.0	0.0	78.7	57.4	72.3	2.1

Table 3.1.2 shows the percentages of households raising each of the priority commodities in the Northern Guinea Savanna zone. Being southerly relative to the Sahel, there is improved incidence of Sorghum, Rice and maize across the three village strata. Also, goats, sheep and poultry are raised by at least 40% of the households across the three village strata. Priority

commodities with low incidence in the Northern Guinea Savanna zone include cassava, yam, and aquaculture.

Table 3.1.2: Percentage of respondents raising priority commodity, Northern Guinea Savanna (% yes)

Village type	Priority commodities								
	Sorghum	Rice	Maize	Cassava	Yam	Goats	Sheep	Poultry	Aquaculture
Adopted village (132)	56.1	31.8	76.5	2.3	5.3	55.3	40.2	62.1	10.6
Non-adopted village (near) (153)	68.0	47.7	79.7	7.2	5.9	55.6	39.2	64.1	15.0
Non-adopted village (remote) (177)	74.6	48.6	80.2	6.2	9.0	62.1	43.5	64.4	7.3

In Table 3.1.3 , which is supposed to show the incidence of the priority commodities in the Inland Fisheries zone, there is not much to report because only two households featured in the survey from this zone (see Table 2.3 under the methodology section of the report). Just for noting, the two households located in the non-adopted village (near), raises sorghum, rice and maize.

Table 3.1.3: Percentage of respondents raising priority commodity, Inland Fisheries (% yes)

Village type	Priority commodities								
	Sorghum	Rice	Maize	Cassava	Yam	Goats	Sheep	Poultry	Aquaculture
Adopted village	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-adopted village (near) (2)	100.0	100.0	100.0	0.0	0.0	100.0	0.0	100.0	0.0

Non-adopted village (remote)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 3.1.4 shows the percentages of households raising each of the priority commodities in the Southern Guinea Savanna zone. Being southerly relative to the Northern Guinea Savanna, there is improved incidence of Sorghum, Rice and maize and even cassava which are raised by at least 40% of the households across the three village strata. However, priority commodities with low incidence in the Southern Guinea Savanna zone now include yam, goats, sheep and aquaculture across the three village strata.

Table 3.1.4.: Percentage of respondents raising priority commodity, Southern Guinea Savanna (% yes)

Village type	Priority commodities								
	Sorghum	Rice	Maize	Cassava	Yam	Goats	Sheep	Poultry	Aquaculture
Adopted village (12)	75.0	91.7	66.7	0.0	8.3	0.0	0.0	0.0	0.0
Non-adopted village (near) (15)	60.0	73.3	53.3	53.3	0.0	6.7	13.3	6.7	6.7
Non-adopted village (remote) (15)	66.7	100.0	33.3	46.7	6.7	0.0	0.0	0.0	0.0

Table 3.1.5 shows the percentages of households raising each of the priority commodities in the Derived Savanna zone. Based strictly on this survey, only maize, cassava and goats are raised by at least 40% of the households across the three village strata. All other priority commodities under study maintains low incidence.

Table 3.1.5: Percentage of respondents raising priority commodity, Derived Savanna (% yes)

Village type	Priority commodities								
	Sorghum	Rice	Maize	Cassava	Yam	Goats	Sheep	Poultry	Aquaculture
Adopted village (69)	11.6	1.4	40.6	59.4	13.0	42.0	20.3	4.3	1.4
Non-adopted village (near) (57)	8.8	0.0	40.4	61.4	12.3	42.1	31.6	3.5	0.0
Non-adopted village (remote) (59)	8.5	3.4	39.0	64.4	18.6	15.3	3.4	5.1	0.0

Table 3.1.6 shows the percentages of households raising each of the priority commodities in the Rain Forest zone. There is improved incidence of maize, cassava and yams, which are raised by at least 40% of the households across the three village strata. All other priority commodities under study maintains varying but low incidence.

Table 3.1.6: Percentage of respondents raising priority commodity, Rain Forests (% yes)

Village type	Priority commodities								
	Sorghum	Rice	Maize	Cassava	Yam	Goats	Sheep	Poultry	Aquaculture
Adopted village (106)	0.0	17.0	65.1	81.1	49.1	20.8	3.8	24.5	1.9
Non-adopted village (near) (96)	0.0	31.3	65.6	87.5	67.7	33.3	12.5	32.3	3.1
Non-adopted	0.0	5.7	51.9	74.7	48.1	8.2	0.6	18.4	12.7

village (remote) (158)									

Table 3.1.7 shows the percentages of households raising each of the priority commodities in the Swamp Forests zone. Only aquaculture prevails among at least 40% of the households across the three village strata. All other priority commodities under study maintains low incidence.

Table 3.1.7: Percentage of respondents raising priority commodity, Swamp Forests (% yes)

Village type	Priority commodities								
	Sorghum	Rice	Maize	Cassava	Yam	Goats	Sheep	Poultry	Aquaculture
Adopted village (7)	0.0	0.0	14.3	0.0	0.0	0.0	0.0	0.0	71.4
Non-adopted village (near) (10)	0.0	10.0	0.0	10.0	10.0	0.0	0.0	0.0	80.0
Non-adopted village (remote) (16)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3

In Table 3.1.8, which is supposed to show the incidence of the priority commodities in the Brackish Water zone, there is not much to report because only one households featured in the survey from this zone. Just for noting, this household, located in the adopted village stratum, raises aquaculture, which is broadly consistent with expectations.

Table 3.1.8: Percentage of respondents raising priority commodities, Brackish Water (% yes)

Village type	Priority commodities								
	Sorghum	Rice	Maize	Cassava	Yam	Goats	Sheep	Poultry	Aquaculture
Adopted village (1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Non-adopted village (near)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-adopted village (remote)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 3.1.9 shows the incidence of the priority commodities in the Coastal Marine zone. All the households, located in the adopted- and non-adopted village (near) strata raises aquaculture, which again is broadly consistent with expectations. All other priority commodities under study maintain low or no incidence.

Table 3.1.9: Percentage of respondents raising priority commodities , Coastal Marine (% yes)

Village type	Priority commodities								
	Sorghum	Rice	Maize	Cassava	Yam	Goats	Sheep	Poultry	Aquaculture
Adopted village (13)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Non-adopted village (near) (8)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Non-adopted village (remote)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Perception of ecological relevance of priority commodities:

The results presented in the sections that follow essentially seek to assess the relevance of each priority commodity to the agro-ecological zones from the perspective of the households. The results here are expected to mirror the results already presented in Table 3.1.1 to Table 3.1.9.

Table 3.1.10 shows the perception of relevance of sorghum to the indicated agro-ecologies among the households. Consistent with the results already presented, at least 90% of the households in the Derived Savanna, Rain Forests, Swamp Forests, Brackish Water, and Coastal Marine zones rate sorghum as 'not relevant to the zone'. However, at least 50% of the households in the Sahel/Sudano-Sahel, Northern Guinea Savanna and Inland Fisheries rate sorghum as "high" or "medium" in terms of ecological relevance.

Table 3.1.10: Percentage distribution of households by their perception of the ecological relevance of priority crops (Sorghum)

Agro-ecological zone	Perception of priority crops			
	Not relevant to zone	Low	Medium	High
Sahel/Sudano-Sahel (108)	3.7	9.3	34.3	52.8
Northern Guinea Savanna (462)	21.6	4.8	20.1	53.5
Inland Fisheries (2)	0.0	0.0	50.0	50.0
Southern Guinea Savanna (42)	28.6	2.4	38.1	31.0
Derived Savanna (185)	90.3	2.2	4.9	2.7
Rain Forests (360)	100.0	0.0	0.0	0.0
Swamp Forests (33)	100.0	0.0	0.0	0.0
Brackish Water (1)	100.0	0.0	0.0	0.0
Coastal Marine (21)	100.0	0.0	0.0	0.0
All agro-ecologies (1214)				

Note: for each agro-ecology, percentages sums up to 100 across the columns

Table 3.1.11 shows the perception of relevance of rice to the indicated agro-ecologies among the households. At least 90% of the households in the Derived Savanna, Rain Forests, Swamp Forests, Brackish Water, and Coastal Marine zones rates sorghum as 'not relevant to the zone'. However, at least 50% of the households in the Inland Fisheries and Southern Guinea Savanna rates rice as "high" or "medium" in terms of ecological relevance.

Table 3.1.11: Percentage distribution of households by their perception of the ecological relevance of priority crops (Rice)

Agro-ecological zone	Perception of priority crops			
	Not relevant to zone	Low	Medium	High
Sahel/Sudano-Sahel (108)	19.4	31.5	21.3	27.8
Northern Guinea Savanna (462)	27.1	14.1	30.3	28.6
Inland Fisheries (2)	0.0	0.0	50.0	50.0
Southern Guinea Savanna (42)	11.9	0.0	16.7	71.4
Derived Savanna (185)	97.8	0.0	0.5	1.6
Rain Forests (360)	86.7	2.5	5.0	5.8
Swamp Forests (33)	97.0	0.0	3.0	0.0
Brackish Water (1)	100.0	0.0	0.0	0.0
Coastal Marine (21)	100.0	0.0	0.0	0.0
All agro-ecologies (1214)				

Note: for each agro-ecology, percentages sums up to 100 across the columns

Table 3.1.12 shows the perception of relevance of maize to the indicated agro-ecologies among the households. At least 40% of the households in the Southern Guinea Savanna , Derived Savanna, Rain Forests, Swamp Forests, Brackish Water, and Coastal Marine zones rates maize as 'not relevant to the zone'. However, at least 50% of the households in the Northern Guinea Savanna and Inland Fisheries rates maize as "high" in terms of ecological relevance. At least 30% of the households in the Sahel/Sudano-Sahel and Southern Guinea Savanna rates maize as "medium" or "high".

Table 3.1.12: Percentage distribution of households by their perception of the ecological relevance of priority crops (Maize)

Agro-ecological zone	Perception of priority crops			
	Not relevant to zone	Low	Medium	High
Sahel/Sudano-Sahel (108)	5.6	33.3	22.2	38.9
Northern Guinea Savanna (462)	13.9	5.2	14.7	66.2
Inland Fisheries (2)	0.0	0.0	0.0	100.0
Southern Guinea Savanna (42)	47.6	19.0	31.0	2.4
Derived Savanna (185)	58.9	3.8	10.3	27.0
Rain Forests (360)	43.1	7.8	21.1	28.1
Swamp Forests (33)	97.0	0.0	0.0	3.0
Brackish Water (1)	100.0	0.0	0.0	0.0
Coastal Marine (21)	100.0	0.0	0.0	0.0
All agro-ecologies (1214)				

Note: for each agro-ecology, percentages sums up to 100 across the columns

Consistent with earlier results in this report, Table 3.1.13 shows at least 70% of the households in the Sahel/Sudano-Sahel, Northern Guinea Savanna, Inland Fisheries, Southern Guinea Savanna, Swamp Forests, Brackish Water, and Coastal Marine rate cassava as 'not relevant to the zone'. However, at least 40% of the households in the Derived Savanna and Rain Forests rate cassava as "high" in terms of ecological relevance.

Table 3.1.13: Percentage distribution of households by their perception of the ecological relevance of priority crops (Cassava)

Agro-ecological zone	Perception of priority crops			
	Not relevant to zone	Low	Medium	High
Sahel/Sudano-Sahel (108)	70.4	25.0	4.6	0.0
Northern Guinea Savanna (462)	62.3	26.8	8.9	1.9
Inland Fisheries (2)	100.0	0.0	0.0	0.0
Southern Guinea Savanna (42)	64.3	7.1	23.8	4.8
Derived Savanna (185)	40.0	2.2	11.4	46.5
Rain Forests (360)	22.8	4.4	16.7	56.1
Swamp Forests (33)	93.9	0.0	0.0	6.1
Brackish Water (1)	100.0	0.0	0.0	0.0
Coastal Marine (21)	100.0	0.0	0.0	0.0
All agro-ecologies (1214)				

Note: for each agro-ecology, percentages sum up to 100 across the columns

Table 3.1.14 shows the perception of relevance of Yam to the indicated agro-ecologies among the households. Across all the zones, at least 50% of the households rate yam as 'not relevant to the zone'. While these are consistent with our earlier results, it contradicts the results in Table 3.1.6 for the Rain Forests zone.

Table 3.1.14: Percentage distribution of households by their perceptions of the ecological relevance of priority crops (Yam)

Agro-ecological zone	Perception of priority crops			
	Not relevant to zone	Low	Medium	High
Sahel/Sudano-Sahel (108)	97.2	0.9	0.9	0.9
Northern Guinea Savanna (462)	81.8	11.9	3.9	2.4
Inland Fisheries (2)	100.0	0.0	0.0	0.0
Southern Guinea Savanna (42)	95.2	4.8	0.0	0.0
Derived Savanna (185)	85.4	1.6	2.7	10.3

Rain Forests (360)	51.9	15.3	20.8	11.9
Swamp Forests (33)	93.9	0.0	0.0	6.1
Brackish Water (1)	100.0	0.0	0.0	0.0
Coastal Marine (21)	100.0	0.0	0.0	0.0
All agro-ecologies (1214)				

Note: for each agro-ecology, percentages sums up to 100 across the columns

Table 3.1.15 shows the perception of relevance of goats to the indicated agro-ecologies among the households. At least 60% of the households in the Southern Guinea Savanna , Derived Savanna, Rain Forests, Swamp Forests, Brackish Water, and Coastal Marine zones rate goats as 'not relevant to the zone'. However, at least 50% of the households in the Sahel/Sudano-Sahel, Northern Guinea Savanna, and Inland Fisheries rate goats as "high" in terms of ecological relevance.

Table 3.1.15: Percentage distribution of households by their perceptions of the ecological relevance of priority livestock (Goats)

Agro-ecological zone	Perception of priority livestock			
	Not relevant to zone	Low	Medium	High
Sahel/Sudano-Sahel (108)	4.6	2.8	24.1	68.5
Northern Guinea Savanna (462)	22.9	7.6	19.7	49.8
Inland Fisheries (2)	0.0	0.0	0.0	100.0
Southern Guinea Savanna (42)	97.6	2.4	0.0	0.0
Derived Savanna (185)	69.7	18.4	8.1	3.8
Rain Forests (360)	77.8	6.4	7.8	8.1
Swamp Forests (33)	100.0	0.0	0.0	0.0
Brackish Water (1)	100.0	0.0	0.0	0.0
Coastal Marine (21)	100.0	0.0	0.0	0.0
All agro-ecologies (1214)				

Note: for each agro-ecology, percentages sum up to 100 across the columns

In Table 3.1.16 , at least 80% of the households in the Inland Fisheries, Southern Guinea Savanna, Derived Savanna, Rain Forests, Swamp Forests, Brackish Water, Coastal Marine zones rate sheep as 'not relevant to the zone'. However, at least 30% of the households in the Sahel/Sudano-Sahel and Northern Guinea Savanna rates sheep as "medium" or "high" in terms of ecological relevance.

Table 3.1.16: Percentage distribution of households by their perception of the ecological relevance of priority livestock (Sheep)

Agro-ecological zone	Perception of priority livestock			
	Not relevant to zone	Low	Medium	High
Sahel/Sudano-Sahel (108)	6.5	7.4	45.4	40.7
Northern Guinea Savanna (462)	31.4	5.6	29.0	34.0
Inland Fisheries (2)	100.0	0.0	0.0	0.0
Southern Guinea Savanna (42)	92.9	2.4	0.0	4.8
Derived Savanna (185)	82.2	12.4	1.6	3.8
Rain Forests (360)	93.9	3.6	1.9	0.6
Swamp Forests (33)	100.0	0.0	0.0	0.0
Brackish Water (1)	100.0	0.0	0.0	0.0
Coastal Marine (21)	100.0	0.0	0.0	0.0
All agro-ecologies (1214)				

Note: for each agro-ecology, percentages sums up to 100 across the columns

In Table 3.1.17 , at least 70% of the households in the Southern Guinea Savanna, Derived Savanna, Rain Forests, Swamp Forests, Brackish Water, Coastal Marine zones rate poultry as 'not relevant to the zone'. However, at least 30% of the households in the Sahel/Sudano-Sahel, Northern Guinea Savanna and Inland Fisheries rate poultry as "medium" or "high" in terms of ecological relevance.

Table 3.1.17: Percentage distribution of households by their perception of the ecological relevance of priority livestock (Poultry)

Agro-ecological zone	Perception of priority livestock			
	Not relevant to zone	Low	Medium	High
Sahel/Sudano-Sahel (108)	8.3	23.1	38.0	30.6
Northern Guinea Savanna (462)	20.1	10.0	32.9	37.0
Inland Fisheries (2)	0.0	0.0	0.0	100.0
Southern Guinea Savanna (42)	95.2	0.0	0.0	4.8
Derived Savanna (185)	97.3	0.5	0.0	2.2
Rain Forests (360)	78.6	4.4	6.7	10.3
Swamp Forests (33)	100.0	0.0	0.0	0.0
Brackish Water (1)	100.0	0.0	0.0	0.0

Coastal Marine (21)	100.0	0.0	0.0	0.0
All agro-ecologies (1214)				

Note: for each agro-ecology, percentages sums up to 100 across the columns

In Table 3.1.18 , at least 70% of the households in the Sahel/Sudano-Sahel, Northern Guinea Savanna, Inland Fisheries, Southern Guinea Savanna, Derived Savanna, and Rain Forests rate aquaculture as 'not relevant to the zone'. This is consistent with the results in the previous section. The rating of aquaculture as not relevant to zone by the lone household in the Brackish Water zone is probably a data problem. However, at least 50% of the households in the Swamp Forests and Coastal Marine rate aquaculture as "medium" or "high" in terms of ecological relevance.

Table 3.1.18: Percentage distribution of households by their perceptions of the ecological relevance of aquaculture

Agro-ecological zone	Perception of priority livestock			
	Not relevant to zone	Low	Medium	High
Sahel/Sudano-Sahel (108)	86.1	6.5	5.6	1.9
Northern Guinea Savanna (462)	81.2	5.6	5.6	7.6
Inland Fisheries (2)	100.0	0.0	0.0	0.0
Southern Guinea Savanna (42)	97.6	0.0	2.4	0.0
Derived Savanna (185)	99.5	0.0	0.5	0.0
Rain Forests (360)	93.3	0.3	1.4	5.0
Swamp Forests (33)	12.1	6.1	15.2	66.7
Brackish Water (1)	100.0	0.0	0.0	0.0
Coastal Marine (21)	0.0	23.8	57.1	19.0
All agro-ecologies (1214)				

Note: for each agro-ecology, percentages sums up to 100 across the columns

Cropping systems in different agro-ecological zones:

In this section we examine the prevailing cropping systems across the various agro-ecologies. Both mono- and mixed or inter-cropping prevail across all zones. However, as shown in Table 3.1.19, mixed cropping appears to dominate in the Sahel/Sudano-Sahel and Northern Guinea Savanna while mono-cropping dominates in the Southern Guinea Savanna and Derived Savanna zones. Inter-cropping prevails in the Rain Forests while mono-cropping dominates in the Derived Savanna. The results for Inland fisheries and Swamp forests zones appear compromised by data problems.

Table 3.1.19: Percentage distribution of respondents by cropping system practiced

Agro-ecological zone	Cropping system	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Sahel/Sudano-Sahel	Mono-cropping	39.0	44.4	27.7
	Inter or mixed cropping	61.0	55.6	72.3
		100.0(41)	100.0(18)	100.0(47)
Northern Guinea Savanna	Mono-cropping	33.9	48.1	44.2
	Inter or mixed cropping	66.1	51.9	55.8
		100.0(115)	100.0(135)	100.0(165)
Inland Fisheries	Mono-cropping		100.0(2)*	
	Inter or mixed cropping		0.0	
Southern Guinea Savanna	Mono-cropping	90.9	83.3	93.3
	Inter or mixed cropping	9.1	16.7	6.7
		100.0 (11)	100.0(12)	100.0(15)
Derived Savanna	Mono-cropping	100.0	98.2	100.0
	Inter or mixed cropping	0.0	1.8	0.0
		100.0(66)	100.0(56)	100.0(58)
Rain Forests	Mono-cropping	42.7	37.8	39.3
	Inter or mixed cropping	57.3	62.2	60.7
		100.0(96)	100.0(90)	100.0(140)
Swamp Forests	Mono-cropping	100.0	66.7	0.0
	Inter or mixed cropping	0.0	33.3	0.0
		100.0(1)*	100.0(3)*	
Brackish Water	Mono-cropping	**	**	**
	Inter or mixed cropping	**	**	**
Coastal Marine	Mono-cropping	**	**	**
	Inter or mixed cropping	**	**	**

*abysmally low sample of respondents; **no data for computation.

Commodity marketing:

The essence of this section is to describe the extent to which households are market oriented, specifically in terms of selling portions of their commodities for income. This is important to the extent that commodity market will be difficult to develop unless there is a culture of selling among the households.

Table 3.1.20 shows that across all village strata, at least 40% of all households sell their maize and cassava in the market. All priority crop commodities are sold, according to the table, but the percentage of households selling sorghum, rice and yam are lower. In some other sections of the report, some of the factors responsible are described with relevant results.

Table 3.1.20: Percentage of households who sell priority crops (% yes)

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Sorghum	27.5	34.9	20.3	37.5	29.5	41.7
Rice	9.1	28.8	20.5	40.0	26.2	31.6
Maize	50.6	59.0	47.0	66.3	61.3	66.4
Cassava	40.9	31.8	40.9	43.1	40.5	38.2
Yam	16.3	10.7	18.7	27.6	13.8	22.5

Table 3.1.21 shows the percentage of households who sell livestock. Due to factors to be presented later in the report, the sale of improved livestock (goats, sheep or chicken) is virtually non-existent. Even for the local livestock, there was none that more than 40% of the households sold in the market. In the aggregate, Table 3.1.20 and Table 3.1.21 suggest a possible prevalence of subsistence among the households surveyed. Breaking out of this scenario will require substantial technical change in the production system.

Table 3.1.21: Percentage of households who sell priority livestock and fish (% yes).

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Improved goats	2.6	0.0	1.4	1.2	0.0	0.8
Local goats	37.1	39.9	40.0	38.0	48.5	38.7
Improved sheep	0.0	0.6	0.0	1.2	0.0	0.8
Local sheep	32.9	23.9	27.7	20.7	24.2	22.0

Improved chicken (broilers and layers)	18.8	11.9	15.8	12.4	1.6	11.5
Local chicken	34.6	28.4	38.5	31.3	29.7	29.7
Fish	11.5	14.1	16.7	11.2	12.7	15.6

Types of markets for priority crops :

Table 3.1.22 shows the existing options for marketing the priority crop commodities. Looking across the crops and the three village strata, we see that the dominant option for crop sales is the local or village market. Some of the factors conditioning this situation are analyzed with further results in subsequent sections in the report.

In Table 3.1.23, the results for the livestock sale options are presented. For local goats, sheep and chicken, the village market provides a strong sale medium, as we saw for crop sale. However, unlike the priority crops, the sale of improved chicken and fish relies strongly on direct on-farm visit by consumers and middlemen.

Table 3.1.22: Percentage distribution of households by options for selling priority crops

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Sorghum	On-farm to consumers	4.4	4.7	0.8
	On-farm to middlemen	14.3	16.5	13.2
	On the road side			1.6
	Local/village market	63.7	50.6	71.3
	District town	11.0	16.5	7.8
	Distant market	6.6	11.8	5.4
Rice	On-farm to consumers	7.9	8.0	2.9
	On-farm to middlemen	7.9	13.6	13.5
	On the road side			
	Local/village market	58.7	52.3	65.4
	District town	15.9	17.0	14.4
	Distant market	9.5	9.1	3.8

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Sorghum	On-farm to consumers	4.4	4.7	0.8
Maize	On-farm to consumers	4.8	5.7	1.3
	On-farm to middlemen	15.8	20.0	12.2
	On the road side		1.1	1.3
	Local/village market	64.8	53.1	66.4
	District town	9.1	11.4	11.8
	Distant market	5.5	8.6	7.1
Cassava	On-farm to consumers	11.8	19.8	9.2
	On-farm to middlemen	13.7	17.5	15.0
	On the road side		1.6	
	Local/village market	69.6	49.2	60.8
	District town	3.9	7.9	10.5
	Distant market	1.0	4.0	4.6
Yam	On-farm to consumers	6.7	22.2	1.4
	On-farm to middlemen	26.7	7.9	5.8
	On the road side		3.2	
	Local/village market	50.0	55.6	85.5
	District town	13.3	7.9	2.9
	Distant market	3.3	3.2	4.3

Table 3.1.23 Percentage distribution of households by options for selling priority livestock and fish

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Local goats	On-farm to consumers	11.4	10.0	10.7
	On-farm to middlemen	19.0	20.0	28.2

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
	On the road side	2.9	2.0	0.8
	Local/village market	61.0	57.0	50.4
	District town	3.8	9.0	7.6
	Distant market	1.9	2.0	2.3
Local sheep	On-farm to consumers	1.5	3.5	4.3
	On-farm to middlemen	29.4	26.3	24.3
	On the road side	2.9	1.8	
	Local/village market	58.8	56.1	60.0
	District town	7.4	8.8	10.0
	Distant market		3.5	1.4
Improved chicken (broilers and layers)	On-farm to consumers	54.5	39.4	30.0
	On-farm to middlemen	15.2	6.1	23.3
	On the road side			
	Local/village market	24.2	45.5	26.7
	District town	3.0	6.1	10.0
	Distant market	3.0	3.0	10.0
Local chicken	On-farm to consumers	15.8	23.2	18.6
	On-farm to middlemen	34.2	28.0	24.5
	On the road side	1.3	1.2	3.9
	Local/village market	46.1	41.5	47.1
	District town	2.6	4.9	5.9
	Distant market		1.2	
Fish	On-farm to consumers	31.4	31.3	15.2
	On-farm to	45.7	46.9	52.2

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
	middlemen			
	On the road side		3.1	2.2
	Local/village market	11.4	18.8	21.7
	District town	11.4		8.7
	Distant market			

Note: improved goats and sheep results are omitted in this table in view of their virtual non-existence in Table 3.1.20 and Table 3.1.21.

Association membership:

In this section, some space is devoted to describing the households' association memberships. Associations or groups are evidently strong vehicles for farm and non-farm labour, credit, agro-processing and other group mutual assistance. Table 3.1.24 shows the percentage of households that are members of associations or groups. With the exception of the non-adopted village (near), at least 40% of all households in each village strata and gender groups belong to one association or another.

Table 3.1.24: Percentage of households by membership of association (% yes)

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
	Female	53.3	20.5	45.3
	Male	68.0	36.4	51.4

Table 3.1.25 shows the percentage distribution of households by gender composition of groups /associations. In the adopted village, most of the female respondents belong to women only groups and mixed groups, while the males belong to male only groups and mixed groups. In the non-adopted village (near), the female respondents again mainly belong to women only groups and mixed groups, while the males belong to male only groups and mixed groups. In a rather unusual development, most of the female respondents in the non-adopted village (remote) belong to men only group. However, most of the men in the non-adopted village (remote) belong to mixed groups.

Table 3.1.25: Percentage distribution of households by gender composition of groups /associations

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
	Women only group	45.2	2.5	38.9	3.7	23.3	2.0
	Men only group	4.8	29.4	0.0	40.2	76.7	25.7
	Mixed group	38.7	51.5	33.3	45.1		62.8
	Cooperative society	11.3	16.6	27.8	11.0		9.5

Table 3.1.26 shows the distribution of households by types of activities of groups /associations. Across all village strata and different groups, the most prevalent group activity is agricultural production (primary). In a less consistent manner, the next important group activity is savings and credit.

Table 3.1.26: Percentage distribution of households by types of activities of groups /associations

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Women only group	Production	61.3	70.0	70.0
	Processing	16.1		20.0
	Social	12.9		
	Savings and credit	9.7	30.0	10.0
	Kinship			
Men only group	Production	92.0	90.9	82.1
	Processing			
	Social	6.0	3.0	15.4
	Savings and credit	2.0	3.0	2.6
	Kinship		3.0	
Mixed group	Production	66.4	79.1	97.4
	Processing	2.8		
	Social			0.9
	Savings and credit	30.8	20.9	1.8
	Kinship			

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Cooperative society	Production	75.0	84.6	92.3
	Processing			
	Social			7.7
	Savings and credit	25.0	15.4	
	Kinship			

Table 3.1.27 shows the average membership size for different groups. Across the village strata, most groups have at least 30 members, on the average. Table 3.1.28 shows the average length of association membership among the households. To the nearest whole number, the average length of association membership mostly varies from 7 to 10 years, with exceptions of 3, 6 and 12 years, respectively.

Table 3.1.27: average membership size of groups /associations

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Women only group		38.9	26.3	30.5
Men only group		31.7	49.5	73.1
Mixed group		41.6	78.8	32.3
Cooperative society		31.7	18.9	57.2

Table 3.1.28: average length of membership of groups (years)

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Women only group		3.4	8.1	12.0
Men only group		7.1	7.5	9.9
Mixed group		8.1	7.1	6.0
Cooperative society		6.9	7.2	9.1

Table 3.1.29 shows the distribution of households by registration status in groups /associations. As probably expected, wives are mostly the ones registered in women only groups, while husbands are the ones primarily registered in men only groups. In the mixed and cooperative groups, husbands are shown to be more registered as members than wives. And, in a less consistent manner, the registration of both wife and husband in each of the group types are somewhat prevalent.

Table 3.1.29: Percentage distribution of households by registration status of members in groups /associations

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Women only group	Husband	3.1	30.0	11.1
	Wife	84.4	70.0	77.8
	Both husband and wife	12.5		11.1
	Other household member			
Men only group	Husband	90.2	87.9	81.6
	Wife	2.0	3.0	
	Both husband and wife	2.0	6.1	
	Other household member	5.9	3.0	18.4
Mixed group	Husband	55.6	45.2	55.2
	Wife	11.1	4.8	6.0

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
	Both husband and wife	19.4	33.3	33.6
	Other household member	13.9	16.7	5.2
Cooperative society	Husband	50.0	35.7	76.9
	Wife		7.1	
	Both husband and wife	23.5	35.7	7.7
	Other household member	26.5	21.4	15.4

Table 3.1.30 shows the distribution of households by degree of participation in groups. Across all village strata, the results show strong participation in group activities by members. Indeed, at least 90% of all households in each village stratum indicate at least moderate participation in group activities.

Table 3.1.30: Percentage distribution of households by degree of participation in groups

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Women only group	Low/participate only in a few meetings and activities	6.3		10.0
	Moderate/participate in most meetings and activities	50.0	30.0	70.0
	High/participate in all meetings and activities	21.9	20.0	10.0
	Group leader/official	21.9	50.0	10.0
Men only group	Low/participate only in a few meetings and activities	5.9	6.0	
	Moderate/participate in most meetings and activities	31.4	39.4	31.6

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
	High/participate in all meetings and activities	37.3	33.3	50.0
	Group leader/official	25.5	21.2	18.4
Mixed group	Low/participate only in a few meetings and activities	1.8		1.8
	Moderate/participate in most meetings and activities	31.5	46.5	47.4
	High/participate in all meetings and activities	47.2	41.9	31.0
	Group leader/official	19.4	11.6	19.8
Cooperative society	Low/participate only in a few meetings and activities	5.9	7.1	
	Moderate/participate in most meetings and activities	20.6	50.0	35.7
	High/participate in all meetings and activities	64.7	35.7	42.9
	Group leader/official	8.8	7.1	21.4

Table 3.1.31 shows how the benefits of group membership are rated by households. In the women only group, the ratings of benefits are mixed across the village strata. However, in the other types of groups, more than 70% of households across the village strata rate group membership as either beneficial or very beneficial.

Table 3.1.31: Percentage distribution of households by perception of benefit of group membership

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Women only group	Not beneficial			10.0
	Not sure	21.9	20.0	20.0
	Fairly beneficial	43.8	10.0	40.0
	Beneficial	18.8	40.0	10.0
	Very beneficial	15.6	30.0	20.0
Men only group	Not beneficial	2.0	6.3	2.6
	Not sure	3.9	12.5	2.6
	Fairly beneficial	15.7	3.1	2.6
	Beneficial	45.1	50.0	57.9
	Very beneficial	33.3	28.1	34.2
Mixed group	Not beneficial	2.8		0.9
	Not sure		7.0	3.4
	Fairly beneficial	2.8	11.6	8.6
	Beneficial	59.3	55.8	62.1
	Very beneficial	35.2	25.6	25.0
Cooperative society	Not beneficial	2.9		14.3
	Not sure			
	Fairly beneficial	5.9	35.7	28.6
	Beneficial	35.3	57.1	35.7
	Very beneficial	55.9	7.1	21.4

Aquaculture management:

Away from crop and livestock systems, aquaculture was given substantial attention in this study. Table 3.1.32 shows the households' distribution between alternative aquaculture production systems. Across 5 ponds per household and three village strata, the dominant production system is monoculture.

Table 3.1.32: Percentage distribution of respondents by type of stocking

Pond	Type of stocking	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
1	Monoculture	81.6	81.3	95.7
	Polyculture	18.4	18.8	4.3
		100.0(38)	100.0(32)	100.0(47)
2	Monoculture	75.0	81.8	93.8
	Polyculture	25.0	18.2	6.3
		100.0(28)	100.0(22)	100.0(32)
3	Monoculture	68.2	77.8	90.9
	Polyculture	31.8	22.2	9.1
		100.0(22)	100.0(18)	100.0(22)
4	Monoculture	56.3	76.9	100.0
	Polyculture	43.8	23.1	
		100.0(16)	100.0(13)	100.0(14)
5	Monoculture	50.0	57.1	100.0
	Polyculture	50.0	42.9	
		100.0(14)	100.0(7)	100.0(6)

Note: The results with small n may be unstable due to low response.

Market access to fingerlings:

Households were surveyed for four types of fish, namely Tilapia, Catfish, Heterobranchus and Clarias, to know if they buy fingerlings for fish production. As shown in Table 3.1.33, less than 10% of the respondents across gender and village strata purchase fingerlings as inputs for fish production.

Table 3.1.33: Percentage of respondents who buy fingerlings (% yes)

Type of fish	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Tilapia	1.3(77)	2.9(174)	0.0(73)	1.2(172)	1.6(61)	0.4(257)
Catfish	3.9(76)	8.0(174)	2.7(73)	6.3(174)	3.3(61)	6.2(258)
Heterobranchus	1.3(77)	0.0(173)	0.0(73)	0.6(173)	0.0(61)	0.8(257)
Clarias	1.3(77)	2.3(175)	2.7(75)	5.1(178)	1.6(61)	7.1(266)

Note: for each x(y), x=percentage, y= number responding

Feeding regime in aquaculture:

As shown in Table 3.1.34, the dominant feeding regime in aquaculture among the households is the intensive system, which is practiced by at least 70% of households across the village strata. In a less than consistent manner, the semi-intensive feeding system is next in importance among the aquaculture households.

Table 3.1.34: Percentage distribution of respondents by feeding regime practised

	Adopted village (37)	Non-adopted village (near) (31)	Non-adopted village (remote) (42)
Intensive	94.6	74.2	71.4
Extensive	2.7	6.5	4.8
Semi-intensive	2.7	19.4	23.8

3.2 AVAILABLE AGRICULTURAL PRODUCTION RESOURCES

The traditional theory of production assumes production to depend on a set of resources or inputs. Thus, in this section, we describe the agricultural production resources that exist at the household level across our village strata. This exercise is important to the extent that technology adoption and the scale of adoption will ultimately depend on the amount of resources accessible to the household.

Access to and ownership of land

Tables 3.2.1 and le 3.2.2 show the average size of land declared by households during the survey. In each of these tables, the upper panel shows data relating to different types of land: homestead, upland and wetland, respectively. The lower panel in each table shows the distribution of the three types of land among various tenurial/access arrangements. Table 3.2.1 disaggregates the land data by gender and village strata while Table 3.2.2 only shows the result by village strata.

In Table 3.2.1, the upland on the average dominates other types of land across the village strata and gender groups. Looking further at the total of all types of land, we see that in each village stratum, men have access to larger amount of lands than women. Similar patterns can be seen in Table 3.2.2 in terms of the dominance of the upland resources over the other land types.

Table 3.2.1: Average sizes of land types owned, by gender and village strata (ha)

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Types of land:						
Homestead land	1.76	1.84	2.76	2.24	2.65	2.32
Upland	2.49	3.94	4.05	6.24	2.35	5.38
Wetland	2.58	2.09	3.59	3.05	1.82	4.01
Total land Owned (all types)	3.38	4.25	4.98	6.46	3.26	6.25
Land access arrangements:						
Total land Rented from others	1.54	2.19	3.89	3.15	1.18	2.41
Total land Rented out	1.44	5.50	3.67	5.21	2.00	3.77
Total land Sharecropped in	1.22	4.13	3.33	3.02	2.00	3.33
Total land Sharecropped out	3.00	3.40		8.10	0.70	
Total land Borrowed in	0.84	1.50	2.09	3.54	2.16	3.81
Total land Borrowed out	10.00	2.20	2.00	3.67	2.00	7.60
Total land (all arrangements)	3.15	4.63	5.21	7.31	2.87	6.73

Note: averages computed based on only those who responded.

Table 3.2.2: Average sizes of land types owned, by village strata (without gender disaggregation)

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Types of land:			
Homestead land	1.82	2.38	2.36
Upland	3.53	5.65	4.77
Wetland	2.18	3.16	3.78
Total land Owned (all types)	4.04	6.05	5.75
Land access arrangements:			
Total land Rented from others	2.05	3.26	2.12
Total land Rented out	3.81	4.96	3.70
Total land Sharecropped in	2.47	3.13	3.00
Total land Sharecropped out	3.20	8.10	0.70
Total land Borrowed in	1.00	2.75	3.15

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Types of land:			
Total land Borrowed out	3.50	3.25	6.67
Total land (all arrangements)	4.21	6.71	5.94

Note: averages computed based on only those who responded.

Structure of land ownership and operation:

Tables 3.2.3 and 3.24 show the distribution of the households by ownership and operational structures. In Table 3.2.3, the husband owns farmlands, according to more than 60% of the respondents in each village stratum. In Table 3.2.4, at least 60% of the households say that farmlands are operated by the husband.

Table 3.2.3: Percentage distribution of ownership of farmland among households

	Adopted village (329)	Non-adopted village (near) (321)	Non-adopted village (remote) (426)
Husband	67.5	68.8	70.0
Wife only	7.6	11.8	7.5
Husband and wife	5.5	3.1	2.8
Entire household	7.9	5.3	8.9
Household members other than husband or wife	0.0	0.9	0.7
Non-household member	11.6	10.0	10.1

Table 3.2.4: Percentage distribution of household members by who operates farmland

	Adopted village (383)	Non-adopted village (near) (321)	Non-adopted village (remote) (427)
Husband	58.2	65.7	61.1
Wife only	8.2	9.3	8.7
Husband and wife	15.5	5.3	7.0
Entire household	14.2	13.7	18.3
Household members other than husband or wife	0.9	4.4	3.0
Non-household member	3.0	1.6	1.9

Types and usage of fertilizers:

Table 3.2.5 shows the distribution of households by usage of the fertilizer type the household considers to be most important. As shown, at least 70% of the respondents pitched in favour of NPK fertilizer, followed by Urea across the village strata.

Table 3.2.5: Percentage distribution of households by usage of fertilizers, by most important type **(% yes)

	Adopted village (259)	Non-adopted village (near) (235)	Non-adopted village (remote) (325)
Urea	18.1	23.4	23.1
SSP	0.0	3.0	0.9
NPK	81.5	73.6	75.1
Ammonium sulphate	0.0	0.0	0.6
Potash	0.4	0.0	0.3

**this inquiry was framed to minimize multiple responses.

Table 3.2.6 shows a wide array of information concerning fertilizer usage by the households. Fertilizer usage has been disaggregated by quantity, type, priority crop, gender and village strata. The quantities of usage for each crop is low especially on kilogramme basis, and could be further depressed when denominated by land area (i.e, Kg/ha). This scenario points only in the direction of low productivity even when improved varieties of the priority crops are adopted. We shall revisit this issue in later sections. A final point of note in this section is that in each stratum, the amount of fertilizer usage for different types of fertilizer are not consistently lower for the female respondents. This aspect of the results is mixed for different crops and fertilizer types.

Table 3.2.6: Average quantity of fertilizer used, by type, priority crop and gender

Priority crop	Fertilizer (Kg)	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
Sorghum	Urea	34.0	24.3	5.7	58.0	43.3	14.1
	SSP					5.0**	2.0**
	NPK	11.7	17.7	11.0	16.6	8.6	27.0
	Ammonium sulphate						
	Potash						
Rice	Urea	7.5	5.9	2.6	46.9	2.5	107.4
	SSP			3.0	4.3		
	NPK	2.5	4.6	3.8	19.6	6.0	15.1

Priority crop	Fertilizer (Kg)	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
	Ammonium sulphate						
	Potash						
Maize	Urea	6.5	11.9	1.7	7.2	103.3**	46.5
	SSP				352.0**		14.0**
	NPK	20.6	79.9	18.2	66.8	48.1	117.5
	Ammonium sulphate						75.0**
	Potash						75.0**
Cassava	Urea	3.0	20.4	22.1	39.7		3.0**
	SSP						
	NPK	20.3	20.5			10.2	12.4
	Ammonium sulphate						
	Potash	100.0**					
Yam	Urea						
	SSP						
	NPK						
	Ammonium sulphate						
	Potash						

Note: spaces in the table are those for which no data was available for computation. **these results may be unstable due to low sample response (n<<10)

Seed usage:

Table 3.2.7 shows the average seed usage disaggregated by priority crop and gender among the households. One major point of significance from the table is that across the village strata and for each priority crop, the quantity of seed used by men was higher than for women. It is not clear whether this was due to differential seed access or the fact that men have access to more land, as earlier shown in this report.

Table 3.2.7: Average quantity of seed used, disaggregated by priority crop and gender (Kg)

Priority crop	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Sorghum	8.1	30.1	8.1	21.4	11.1	23.9
Rice	14.4	38.2	79.0	198.4	61.1	111.6
Maize	20.2	28.4	12.2	42.4	11.7	31.4

Types and usage of labour:

Labour has been shown by studies to be the chief determinant of the scale of farm production, especially during the peak work season. Farm labour is traditionally acquired from family members and through hiring. Table 3.2.8 shows the distribution of respondents who hire labour. Across gender and village strata, at least 80% of the households hire labour, which attests to the shortage or inadequacy of conventional family labour for farm production. Table 3.2.9 shows the average wage rates prevailing among the households. Relative to the legalized daily minimum wage of N600.00 (or N18,000 per month), it is obvious from Table 3.2.9 that labour has grown to become a significant component of the overall farm production costs. Furthermore, the ability to source and pay for the needed labour is likely to inform technology adoption decisions among potential adopters.

Table 3.2.8: Percentage of respondents who hire labour (% yes)

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Female	83.7 (115)	86.4 (81)	91.9 (86)
Male	90.3 (227)	89.9 (218)	84.7 (326)

Note: for each x(y), x= percentage, y=number responding.

Table 3.2.9: average wage rate (Naira/manday)

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Female	916.44 (76)	1111.94 (67)	2248.63 (73)
Male	885.02 (205)	876.65 (197)	2779.84 (275)

Table 3.2.10 shows the average labour utilization among the households, disaggregated by type, operations and gender. It is significant that across village and gender strata, the amount of labour utilized for each farm operation is, on the average, higher for men, whether family or hired. Since this is true even for family labour, the cause is probably related more to differential access to land than ability to pay for labour.

Table 3.2.10: Average quantity of labour used by type, operations and gender (mandays)

Labour (man-days)	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female (115)	Male (268)	Female (104)	Male (255)	Female (96)	Male (380)
total family labour, land preparation	2.5	12.3	4.3	12.9	2.7	11.2
total hired labour, land preparation	9.0	15.2	7.8	22.7	7.9	19.2
total family labour, weeding	5.3	16.4	4.4	18.1	4.5	15.9
total hired labour, weeding	14.4	24.8	14.1	37.5	14.6	35.5
total family labour, inorganic fertilizer application	1.9	7.5	1.7	7.4	1.4	5.3
total hired labour, inorganic fertilizer application	2.6	2.9	0.9	3.1	1.1	2.2
total family labour, organic fertilizer application	1.5	4.8	1.7	5.1	1.2	5.9
total hired labour, organic	0.9	1.9	0.5	3.3	0.4	2.4

Labour (man-days)	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female (115)	Male (268)	Female (104)	Male (255)	Female (96)	Male (380)
fertilizer application						
total family labour, pesticide application	0.6	1.5	0.3	1.7	0.3	1.3
total hired labour, pesticide application	0.8	2.5	0.9	2.6	1.0	1.4
total family labour, harvesting	4.3	12.8	4.5	12.9	5.9	13.4
total hired labour, harvesting	13.5	18.2	8.7	32.7	9.1	29.7
total family and hired labour, all operations	57.3	120.7	49.9	160.2	50.2	143.4

Note: the figures in bracket are the sample sizes over which averaging was done.

Resources in aquaculture management:

Fingerlings:

Table 3.2.11 shows the distribution of households by source of fingerlings, surveyed across five ponds per household. For each of the ponds and village strata, the top source of fingerlings is private hatchery, followed by private fish farms and government fish farms in that order. It is significant that aquaculture is largely private sector led, which offers good opportunities for developing a competitive sub-sector as time passes.

Table 3.2.11: Percentage distribution of households by source of fingerlings

Pond No.	Fingerlings source	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
1	Government fish farm	12.8	15.2	12.8
	Private fish farm	15.4	36.4	42.6
	Private hatchery	61.5	45.5	38.3

Pond No.	Fingerlings source	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
	Natural water bodies	7.7	0.0	0.0
	Other	2.6	0.0	6.4
		100.0(39)	100.0(33)	100.0(47)
2	Government fish farm	17.2	8.3	6.1
	Private fish farm	10.3	33.3	51.5
	Private hatchery	69.0	58.3	36.4
	Natural water bodies			
	Other	3.4		6.1
		100.0(29)	100.0(24)	100.0(33)
3	Government fish farm	18.2	10.5	
	Private fish farm	4.5	26.3	54.5
	Private hatchery	77.3	63.2	40.9
	Natural water bodies			
	Other			4.5
		100.0(22)	100.0(19)	100.0(22)
4	Government fish farm	5.9	7.7	
	Private fish farm	5.9	15.4	50.0
	Private hatchery	82.4	76.9	35.7
	Natural water bodies			7.1
	Other	5.9		7.1
		100.0(17)	100.0(13)	100.0(14)
5	Government fish farm		28.6	
	Private fish farm	42.9		60.0
	Private hatchery	50.0	71.4	40.0
	Natural water bodies			
	Other	7.1		
		100.0(14)	100.0(7)	100.0(5)

Pond ownership:

Table 3.2.12 shows the percentage of respondents by pond ownership. Higher percentage of men than women own ponds, as shown in the table. Also, it appears that aquaculture management

among the households occur more in non-pond production systems, since far less than 20% of the households raise fish through ponds.

Table 3.2.12: Percentage of respondents by pond ownership (% yes)

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Female	4.5(111)	7.7(104)	5.2(96)
Male	9.1(264)	9.8(255)	10.8(379)

Table 3.2.13 shows the distribution of respondents by who owns fish ponds within the household. Across the five ponds surveyed, pond ownership strongly accrues to either the husband or both husband and wife. Pond ownership by wife only was of lower occurrence.

Table 3.2.13: Percentage distribution of respondents by who own fish ponds

Pond No.	Pond owner	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
1	Husband	42.1	71.9	59.6
	Wife	5.3		4.3
	Husband and wife	52.6	29.1	36.2
		100.0(38)	100.0(32)	100.0(47)
2	Husband	34.5	66.7	69.7
	Wife	3.4	29.2	3.0
	Husband and wife	62.1	4.2	27.3
3	Husband	30.4	57.9	68.2
	Wife		5.3	4.5
	Husband and wife	69.6	36.8	27.3
		100.0(23)	100.0(19)	100.0(22)
4	Husband	15.8	50.0	60.0
	Wife	10.5	14.2	6.7
	Husband and wife	73.7	35.7	33.3
		100.0(19)	100.0(14)	100.0(15)
5	Husband	10.5	33.3	33.3
	Wife	26.3	41.7	58.3
	Husband and wife	63.2	25.0	8.3

Note: frequency classifications based on only responding households.

Although pond ownership was surveyed over 5 ponds per household, not every household owned pond or five ponds. Table 3.2.14 shows that, on the average, the number of ponds owned varies from 2 to 6 irrespective of gender or village strata. However, with the exception of the non-adopted village (near), men have more ponds than women.

Table 3.2.14: average number of ponds owned per household, disaggregated by gender

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Female	2.2	5.9	2.8
Male	4.6	3.4	3.8

Table 3.2.15 shows the approximate size of ponds among the households, disaggregated by gender and village strata. We can only give limited interpretation of the results in the table because of data problem. The data problem is not about data quality, but about the low number of female respondents owning ponds. Using the non-adopted village (near) as our guide for discussion, we see that on the average, men have larger pond sizes than women.

Table 3.2.15: pond size by gender category (m^2)

Pond number	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
1	28.0**	75.1	62.1	390.7	55.8**	47.9
2	40.0**	50.6	42.4	520.2	42.5**	49.3
3		44.4	39.4	759.6	60.0**	53.6
4		45.1	44.0	44.2	60.0**	48.0
5		45.8	27.3	50.0**		45.6
All ponds	41.3**	173.5	187.1	1047.5	107.0**	130.3

Note: no data to support computing the empty spaces. **figures computed based on small number of responses (n<<10); may be unstable for robust discussion.

Table 3.2.16 shows the distribution of respondents by types of pond owned. Across the various ponds, village and gender strata, the dominant pond type is one made of concrete, followed consistently by earthen ponds. However, we must caution that, due to low number of pond ownership, some of the frequency distributions are only indicative.

Table 3.2.16: Percentage distribution of respondents by types of pond owned

Pond number	Type of pond	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
1	Earthen	22.2	23.3	62.5	44.0	40.0	45.2
	Concrete	66.7	50.0	37.5	48.0	60.0	54.8
	Fibre glass		3.3				
	Plastic tanks	11.1	16.7		8.0		
	Undrainable earthen		6.7				
		100.0(9)	100.0(30)	100.0(8)	100.0(25)	100.0(5)	100.0(42)
2	Earthen		8.7	50.0	31.3	33.3	33.3
	Concrete	100.0	65.2	50.0	62.5	66.7	60.0
	Fibre glass		4.3				
	Plastic tanks		13.0		6.3		6.7
	Undrainable earthen		8.7				
		100.0(6)	100.0(23)	100.0(8)	100.0(16)	100.0(3)	100.0(30)
3	Earthen		11.1	50.0	27.3	100.0	33.3
	Concrete	100.0	66.7	50.0	63.6		61.9
	Fibre glass		5.6				
	Plastic tanks		16.7		9.1		4.8
	Undrainable earthen						
		100.0(4)	100.0(18)	100.0(8)	100.0(11)	100.0(2)	100.0(21)
4	Earthen		7.7	50.0	14.3		15.4
	Concrete	100.0	69.2	50.0	71.4	100.0	76.9
	Fibre glass		7.7				
	Plastic tanks		15.4		14.3		
	Undrainable earthen						7.7
		100.0(4)	100.0(13)	100.0(6)	100.0(7)	100.0(1)	100.0(13)
5	Earthen		10.0	25.0	33.3		
	Concrete		40.0	75.0	66.7		100.0
	Fibre glass		10.0				
	Plastic tanks		10.0				
	Undrainable earthen	100.0	30.0				
		100.0(4)	100.0(10)	100.0(4)	100.0(3)		100.0(5)

Pond number	Type of pond	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male

Note: The figures in brackets are the number of responding households to a question. The results with n<<10 may be unstable for robust discussion. Also, empty spaces in the table are those for which no data was available for computation.

Table 3.2.17 shows the distribution of respondents by types of fish stocked, disaggregated by gender. Across the various ponds, village and gender strata, the dominant fish type are Catfish. However, we must caution that, due to low number of pond ownership, some of the frequency distributions are only indicative.

Table 3.2.17: Percentage distribution of respondents by type of fish stocked, disaggregated by gender

Pond number	Type of fish	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
1	Tilapia	11.1	16.7	12.5	12.0	20.0	7.1
	Catfish	88.9	76.7	87.5	60.0	60.0	76.2
	Heterobranchus				8.0		2.4
	Clarias		6.7		20.0	20.0	14.3
	Carp						
		100.0(9)	100.0(30)	100.0(8)	100.0(25)	100.0(5)	100.0(42)
2	Tilapia		4.3		6.3		3.3
	Catfish	83.3	95.7	100.0	68.8	66.7	86.7
	Heterobranchus						6.7
	Clarias	16.7			25.0	33.3	3.3
	Carp						
		100.0(6)	100.0(23)	100.0(8)	100.0(16)	100.0(3)	100.0(30)
3	Tilapia				9.1		5.0
	Catfish	100.0	94.4	87.5	90.9	100.0	90.0
	Heterobranchus		5.6				
	Clarias						5.0
	Carp			12.5			
		100.0(4)	100.0(18)	100.0(8)	100.0(11)	100.0(2)	100.0(20)
4	Tilapia						
	Catfish	100.0	92.3	83.3	100.0	100.0	92.3
	Heterobranchus						
	Clarias		7.7	16.7			7.7

Pond number	Type of fish	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
	Carp						
		100.0(4)	100.0(13)	100.0(6)	100.0(7)	100.0(1)	100.0(13)
5	Tilapia			25.0			
	Catfish		60.0	75.0	100.0		100.0
	Heterobranchus						
	Clarias						
	Carp	100.0	40.0				
		100.0(4)	100.0(10)	100.0(4)	100.0(3)		100.0(5)

Note: The figures in brackets are the number of responding households to a question. The results with abysmally small n may be unstable for robust discussion. Also, empty spaces in the table are those for which no data was available for computation.

Table 3.2.18 shows the percentage of respondents who own fish hatchery. Across all gender and village strata, less than 5% of the respondents own fish hatchery. This is consistent with the earlier results that fingerlings are obtained mainly from private farms and government fish farms. Table 3.2.19, which shows the percentages of respondents who produce own fingerlings, shows consistency with Table 3.2.18.

Table 3.2.18: Percentage of respondents who own fish hatchery (% yes)

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Female	3.5(115)	1.0(104)	1.0(96)
Male	3.0(268)	0.8(255)	1.6(380)

Table 3.2.19: Percentage of respondents who produce own fingerlings (% yes)

Type of fish	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Tilapia	0.0(4)	0.0(8)		50.0(2)	0.0(1)	0.0(5)
Catfish	0.0(4)	50.0(8)	100.0(1)	66.7(3)	100.0(1)	100.0(6)
Heterobranchus	100.0(4)	75.0(4)		50.0(2)		0.0(1)
Clarias	0.0(4)	11.1(9)		50.0(2)	0.0(1)	20.0(5)

Note: for each x(y), x=percentage, y= number responding. Also, results may not be stable because they were derived from small samples of hatchery owners (n<10).

3.3 SOCIO-ECONOMIC CHARACTERISTICS OF HOUSEHOLDS

Agricultural technology adoption is expected to be decided and promoted in relation to the technical, social, and economic environment of the potential adopters. Thus, a good documentation of the socio-economic characteristics of the households is highly relevant to this type of study. More so, in the project impact assessment sense, it will be important to match households with similar socio-economic characteristics from the adopted and non-adopted villages so that project impacts can be neatly attributed to interventions.

Education and selected Demographics:

Table 3.3.1 shows the distribution of levels of education among households. Across the village strata, at least 30% of the households have no formal education. While attainment of tertiary education is low among the households, at least 50% of all households in each village stratum complete a minimum of primary education.

Table 3.3.1: Percentage distribution of levels of education among households

Educational levels	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
no formal education (395)	32.0	32.5	35.1
adult literacy training (48)	5.3	4.9	2.4
some primary education (114)	10.1	9.5	9.3
completed primary education (186)	17.1	15.8	14.5
some secondary education (95)	8.8	9.8	6.1
completed secondary education (165)	13.3	14.7	13.9
some tertiary education (79)	5.3	6.6	7.8
completed tertiary education (102)	8.0	6.3	10.8
Sample total (1184)	375	348	461

Table 3.3.2 shows the distribution of households by type of headship. As shown, at least 90% of the households in each village stratum are male-headed.

Table 3.3.2: Percentage distribution of households by type of headship

Type of headship of household	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Female headed	33(8.9)	35(10.0)	39(8.4)
Male headed	337 (91.1)	314(90.0)	425(91.6)
Sub-sample total	370 (100.0)	349(100.0)	464(100.0)

Table 3.3.3 shows the average age of respondents across the village strata. The ages of the respondents are quite comparable across gender and village strata, varying within a narrow range of 43 to 50 years.

Table 3.3.3: Average age of respondents, by gender categories (years)

Village type	Gender	Mean age (years)
Adopted village	Female	44.8
	Male	49.8
Non-adopted village (near)	Female	43.4
	Male	46.7
Non-adopted village (remote)	Female	44.8
	Male	47.3

Table 3.3.4 shows the average number of household members in different age and gender groups. Some other conventions would use 64 years and older, below 15 years and 15-64 years in place of the ones used in Table 3.3.4. The average number of persons in the age and gender groups shown is fairly comparable across the village strata. The dependency ratios are particularly informative. Across the village strata, it has been shown that the dependency ratio (total) is quite high, and mainly accounted for by the children.

Table 3.3.4: Gender and age structure of households, computed at the mean values.

Gender and age structure of household (mean)	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Number of males aged 16-59 years	3.6	3.6	3.7
Number of females aged 16-59 years	3.3	3.2	3.3
Number of members aged below 16 years	4.5	4.7	5.0
Number of members aged 60 years and above	1.1	1.1	0.8
Household size	12.6	12.6	12.8
Aged dependency ratio (%)	15.9	16.2	11.4
Child dependency ratio (%)	65.2	69.1	71.4
Total dependency ratio (%)	81.1	85.3	82.8

Table 3.3.5 shows the gender disaggregated length of farming experience among the households. This variable has been widely related to technology adoption decision modeling in many studies. The length of farming experience has been shown in the table to be longer for male respondents. However, within a gender group, the length of farming experience is quiet comparable across village strata.

Table 3.3.5: Average farming experience of respondents (years)

Village type	Gender	Farming experience (years)
Adopted village	Female	16.4
	Male	24.6
Non-adopted village (near)	Female	16.5
	Male	23.2
Non-adopted village (remote)	Female	15.9
	Male	23.7

Living conditions of Households:

Table 3.3.6 to Table 3.3.8 describes the living conditions of households in terms of the roofing, wall and floor materials used. In Table 3.3.6, the dominant roofing material is iron sheets, while Table 3.3.7 shows that the most important wall materials are mud and cement, across all village strata. And, as shown in Table 3.3.8, the major flooring materials are tiles and bricks, followed in terms of preference by straws. In the context of endline project evaluations, it will be useful comparing these baseline living conditions with their endline results, in the hope to detecting at least qualitative changes. Table 3.3.9 shows that the average number of rooms is approximately the same (7) across the village strata.

Table 3.3.6: Percentage distribution of households by roofing material of main residence

Roofing material of main residence	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Straw/thatch	5.6	8.7	7.9
Mud	4.0	8.9	7.0
Wood/planks	3.5	2.2	0.2
Iron sheets	69.4	62.3	67.2

Roofing material of main residence	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Asbestos	2.7	4.7	5.1
Tin	14.5	12.6	12.6
Other	0.3	0.6	0.0
Sub-sample total	372	358	470

Table 3.3.7: Percentage distribution of households by wall material of main residence

wall material of main residence	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Straw/thatch	2.4	2.5	1.9
Mud	44.0	41.3	42.9
Wood/planks	1.6	2.8	0.4
Bricks / tiles	13.1	11.0	7.9
Cement	38.9	42.4	46.9
Sub-sample total	373	356	469

Table 3.3.8: Percentage distribution of households by floor material of main residence

Floor material of main residence	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Straw/thatch	16.6	20.7	19.3
Mud	3.8	3.4	1.7
Wood/planks	7.5	9.5	7.3
Bricks / tiles	71.7	66.4	71.7
Other	0.3	0.0	0.0
Sub-sample total	373	357	467

Table 3.3.9: average number of rooms (minus kitchen and bathrooms)

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Number of rooms (minus kitchen and bathrooms)	6.7	6.6	7.1
Sub-sample total	368	343	459

Agricultural and non-agricultural assets:

Table 3.3.10 shows the assets presented to the households during the baseline survey. The upper panel shows the agricultural assets while the lower panel shows the non-agricultural assets. The non-agricultural assets are presented in this report (though not in the terms of reference) because some of these assets are cross cutting, that is, they also serve some agricultural purposes (e.g. radio). The percentage of households owning indicated assets across the village strata are presented in Table 3.3.10. The agricultural assets which at least 20% of the households consistently own across the village strata include: Machetes/ Cutlasses/Hoes, Knapsack sprayers, Wheelbarrows, and Tube wells. The incidence of ownership of non-agricultural assets is higher among the households across all the village strata. Table 3.3.11 presents the average number of the listed assets owned by households, disaggregated by village and gender strata. As presented, there are no consistent differences in between the number of assets owned by men and women.

Table 3.3.10: Percentage of households owning indicated assets (% yes)

	Adopted village (383)	Non-adopted village (near) (359)	Non-adopted village (remote) (477)
Agricultural assets:			
1.Machetes/ Cutlasses/Hoes	96.9	97.5	97.7
2 Ox-Ploughs	5.2	17.3	13.2
3 Oxen/work bulls	6.0	16.2	12.8
4 Knapsack sprayers	36.0	33.7	34.0
5 Water pumps	18.8	20.6	16.4
6 Tractor & tractor's implements	0.5	1.1	0.2
7. Milling machine	7.0	3.6	5.9
8. Milk processing equipment	0.3	0.3	0.0
9. Fish smoking kiln	5.2	3.9	6.3
10. Pickup truck (≤5 tons)	3.4	2.2	3.1

	Adopted village (383)	Non-adopted village (near) (359)	Non-adopted village (remote) (477)
11. Heavy truck (>5 tons)	0.5	0.6	0.8
12. Wheelbarrows	40.2	36.8	36.3
13. Ox-carts	2.1	4.7	2.3
14. cattle drinking troughs	5.2	10.9	9.4
15. Boreholes	12.0	11.4	12.8
16. Tube wells	32.1	25.9	28.1
17. Fishing traps/nets	7.6	3.9	6.9
18. Fishing canoe	1.8	2.5	3.1
19. Fishing boat	0.8	0.3	0.4
20. Fish pond	8.9	8.4	7.3
21. Outboard engine	0.0	0.3	0.0
Non-Agricultural Assets :			
22.Sewing machine	23.5	19.2	23.7
23.Car	16.4	17.0	15.5
24.Bicycle	38.9	37.0	43.0
25.Motorcycle	49.6	49.9	60.4
26.Radio	86.4	86.9	91.4
27.Television	70.5	66.6	61.2
28.Mobile Phone	82.2	84.1	83.4
29.Paraffin Stove	72.3	57.7	62.9
30. Sofa chairs	70.8	59.3	70.4

Table 3.3.11: Average total number of assets owned per household, disaggregated by gender

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Agricultural assets:						
1.Machetes/ Cutlasses/Hoes	10	10	7	10	7	8
2 Ox-Ploughs	2	2	3	2	2	2
3 Oxen/work bulls	1	4	3	4	3	3
4 Knapsack sprayers	1	1	2	1	1	1
5 Water pumps	2	1	2	2	2	2
6 Tractor & tractor's implements	1	1		1		1
7. Milling machine	2	2	1	2	1	2
8. Milk processing equipment				2		

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
9. Fish smoking kiln	4	2	1	2	2	2
10. Pickup truck (≤5 tons)	1	1	1	2	1	1
11. Heavy truck (>5 tons)		1		2		2
12. Wheelbarrows	2	2	2	2	2	2
13. Ox-carts	2	1	1	1	1	3
14. cattle drinking troughs	2	3	3	3	2	2
15. Boreholes	1	1	1	1	2	2
16. Tube wells	1	1	2	1	1	1
17. Fishing traps/nets	3	4	11	6	5	6
18. Fishing canoe	1	1	2	2	2	2
19. Fishing boat		5	1		1	4
20. Fish pond	9		6	8	4	4
21. Outboard engine				2	1	
Non-Agricultural Assets :						
22.Sewing machine	2	2	2	1	1	2
23.Car	2	1	1	1	1	1
24.Bicycle	2	2	2	2	2	2
25.Motorcycle	2	2	2	2	2	2
26.Radio	2	2	2	2	2	2
27.Television	2	1	1	1	2	2
28.Mobile Phone	3	3	3	2	3	3
29.Paraffin Stove	2	2	2	2	2	2
30. Sofa chairs	5	5	4	4	4	5

Note: Averaging done over only those households owning an asset type. Averaging over the whole sample in each stratum would have depicted fractional numbers of most of the assets in the table.

Table 3.3.12 shows the percentage of households in which the use of asset(s) is/are controlled by the wife. Across all village strata, there is no asset except mobile phone which more than 5% of the respondents attribute control of usage to the wife. This means that even assets that are strongly owned by wives in Table 3.3.10 are apparently under the control of the husbands.

Table 3.3.12: Percentage of households in which the use of asset(s) is/are controlled by the wife (% yes)

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Agricultural assets:			
1.Machetes/ Cutlasses/Hoes	1.2(329)	1.9(313)	1.0(415)
2 Ox-Ploughs	0.0(19)	0.0(59)	0.0(59)
3 Oxen/work bulls	0.0(22)	0.0(56)	0.0(59)
4 Knapsack sprayers	1.6(125)	0.0(115)	0.0(149)
5 Water pumps	1.5(67)	1.5(67)	0.0(75)
6 Tractor & tractor's implements	0.0(2)	0.0(1)	0.0(3)
7. Milling machine	7.1(14)	0.0(9)	0.0(24)
8. Milk processing equipment			
9. Fish smoking kiln	0.0(12)	0.0(12)	0.0(24)
10. Pickup truck (≤5 tons)	0.0(7)	0.0(6)	0.0(15)
11. Heavy truck (>5 tons)	0.0(2)	0.0(2)	0.0(2)
12. Wheelbarrows	1.5(135)	0.9(116)	0.6(158)
13. Ox-carts	0.0(10)	0.0(16)	0.0(11)
14. cattle drinking troughs	0.0(18)	0.0(31)	0.0(42)
15. Boreholes	0.0(26)	0.0(25)	0.0(42)
16. Tube wells	1.1(95)	0.0(74)	1.0(100)
17. Fishing traps/nets	0.0(20)	0.0(14)	0.0(30)
18. Fishing canoe	0.0(6)	0.0(9)	0.0(15)
19. Fishing boat	0.0(2)	0.0(1)	0.0(2)
20. Fish pond	0.0(22)	0.0(28)	3.1(32)
21. Outboard engine		50.0(2)	
Non-Agricultural Assets :			
22.Sewing machine	7.1(28)	5.9(17)	2.5(40)
23.Car	0.0(54)	0.0(51)	1.4(73)
24.Bicycle	0.0(135)	0.0(125)	0.0(191)
25.Motorcycle	1.1(181)	0.0(168)	0.7(267)
26.Radio	4.6(303)	3.8(290)	4.0(397)
27.Television	2.4(249)	1.3(226)	1.8(257)
28.Mobile Phone	8.4(275)	6.6(272)	5.5(348)
29.Paraffin Stove	1.5(136)	0.9(113)	1.4(143)
30. Sofa chairs	0.9(221)	3.0(169)	2.3(262)

Note: Analysis done over only those households owning asset(s) . Also, for each x(y), x = percentage and y=number responding.

Livestock Assets:

Table 3.3.13 shows the percentage of households owning livestock, disaggregated by gender. As shown, ownership of improved goats and sheep were virtually non-existent, but ownership of improved chicken is mostly in the order of 10-13% of responding households across the village and gender strata. Local goats, sheep and chicken were owned by at least 20% of all respondents across gender and village strata. We also note that, consistently, more women than men indicated ownership of local goats, sheep and chicken across the village strata.

Table 3.3.14 shows the actual average number of livestock owned, disaggregated by gender. This table shows that, on the average, men own more of the livestock types shown than women. That is, the higher percentages of livestock ownership by women in Table 3.3.13 do not translate into higher number of livestock for women in Table 3.3.14. This may probably be related to control, as previously seen in earlier tables in this section.

Table 3.3.13: Percentage of households owning livestock, disaggregated by gender (% yes)

	Adopted village (383)		Non-adopted village (near) (359)		Non-adopted village (remote) (476)	
	Female	Male	Female	Male	Female	Male
Improved goats	1.7	3.7	1.0	1.6	3.1	1.3
Local goats	43.5	41.0	52.9	42.0	43.8	38.9
Improved sheep	0.0	1.5	2.9	0.4	1.0	0.5
Local sheep	33.0	26.1	32.7	28.6	24.0	23.9
Improved chicken (broilers or layers)	10.4	11.2	13.5	9.4	2.1	10.8
Local chicken	40.9	37.7	43.3	40.0	43.8	37.4

Note: computed based on only those who responded.

Table 3.3.14: Average number of livestock owned, disaggregated by gender

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Improved goats	7.7	7.2	6.0**	3.8	5.0	6.2
Local goats	6.9	9.0	5.9	11.0	7.9	11.3
Improved sheep		7.5**	9.5	4.0	1.0	5.5
Local sheep	10.7	8.9	5.2	23.5	7.7	10.4

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Improved chicken (broilers or layers)	638.0**	464.1	202**	239.2	8.7**	297.4
Local chicken	14.5	18.4	13.5	22.8	10.6	17.4

**this average may be unstable due to low number of respondents (n<10)

Access to financial services:

Table 3.3.15 shows the percentage of households who borrowed in the last 12 months preceding the survey. Across both gender and all village strata, less than 40% of the respondents showed tendency to borrow money. A further look at the table shows that, male respondents consistently showed higher incidence of borrowing than their female counterparts.

Table 3.3.15: Percentage of households who borrowed in the last 12 months (% yes)

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Female	29.3(99)	22.0(82)	28.4(74)
Male	32.1(215)	27.3(216)	33.7(285)

Note: for each x(y), x=percentage, y= number responding

Table 3.3.16 shows that relatives and friends present the most popular sources of borrowing to households who borrowed. Closely following relatives and friends as sources of credit is Informal savings and credit group. In a less consistent manner, Commercial banks / Micro-finance banks is presented as the third most patronized source of credit by the households.

Table 3.3.17 provides numerical information on the average amount borrowed from each source, disaggregated by gender and village strata. The amount borrowed does not consistently favour any of the gender groups when examined for each credit source and across the village strata.

Table 3.3.16: Percentage distribution of households by source of borrowing (% yes)

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Relatives and friends	54.2	65.8	64.7	73.7	75.0	60.6
Informal savings and credit group	38.1	28.8	35.7	29.5	33.3	35.4
Money lenders	11.1	0.0	8.3	2.6	7.7	3.6
Government credit schemes	11.8	2.3	0.0	2.6	25.0	7.0
NGO/Religious groups	11.8	2.3	16.7	0.0	0.0	3.7
Commercial banks / Micro-finance banks	17.6	15.9	0.0	17.1	0.0	11.9
Input and output dealers	5.9	0.0	0.0	0.0	0.0	3.6

Note: the results in this table are relative to the % saying yes to borrowing in Table 3.3.15.

Table 3.3.17: Average amount borrowed from various sources (Naira)

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Relatives and friends	32,307.69	54,846.15	77,750.00	73,280.49	42,710.53	66,457.14
Informal savings and credit group	114,875.00	59,000.00	253,333.33	284,285.71	72,000.00	139,807.69
Money lenders	44,000.00**		30,000.00**	200,000.00**	5,000.00**	24,000.00**
Government credit schemes	22,500.00**	26,666.67**		100,000.00**	30,000.00**	1,037,142.90
NGO/Religious groups	15,000.00**	20,000.00	15,000.00**			125,000.00**
Commercial banks / Micro-finance banks	20,000.00**	151,428.57	1,400,000.00**	114,285.71		86,444.44
Input and output	13,000.00**					255,000.00**

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
dealers						
Total borrowing, all sources	13,347.83 **	18,641.79	37,913.46	31,703.92	13,244.79	47,276.32

Note: the results in this table are relative to the percentages saying yes to borrowing in Table 3.3.15. **figures averaged over n≤5; highly unstable for robust discussion.

Table 3.3.18 (presented in three panels to minimize table overflow) shows the distribution of households by primary source and primary purpose of borrowing. The results presented were limited in robustness by data problems, namely because computations were based on the very few households who borrowed from the indicated sources. Thus, while most of the results are largely indicative, they consistently show that the primary purpose of borrowing is agricultural production. This response recurs under each source of borrowing across both gender and all village strata.

Table 3.3.19 shows the distribution of households by who borrowed from indicated credit sources. If we again play down the data problems underlying this table, the broad indication is that borrowing from the various credit sources was done mostly by husbands than wives. As shown, there were few cases in which borrowing by women showed more occurrence.

Table 3.3.18: Percentage distribution of households by primary source and primary purpose of borrowing (Panel 1)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Source of borrowing	Borrowing purpose	Female	Male	Female	Male	Female	Male
Relatives and friends	Purchase of food		10.2	11.1	2.6	21.4	4.8
	Purchase of household assets	10.0	4.1		2.6	7.1	3.2
	Payment of fees	10.0	6.1	11.1	2.6	7.1	
	Medical costs		4.1	22.2		14.3	
	Agricultural production	80.0**	73.5**	44.4**	92.3**	42.9**	90.5**
	Educational costs		2.0	11.1		7.1	1.6
Informal	Purchase of food						4.8

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Source of borrowing	Borrowing purpose	Female	Male	Female	Male	Female	Male
savings and credit group							
	Purchase of household assets						
	Payment of fees						
	Medical costs					25.0	
	Agricultural production	100.0**	100.0**	100.0**	100.0**	75.0**	95.2**
	Educational costs						
Money lenders	Purchase of food						
	Purchase of household assets						
	Payment of fees						
	Medical costs						
	Agricultural production	100.0**			100.0**	100.0**	100.0**
	Educational costs						

Note: the results in this table are relative to the % saying yes to borrowing in Table 3.3.15.
**figures averaged over n≤5; highly unstable for robust discussion.

Table 3.3.18: Percentage distribution of households by primary source and primary purpose of borrowing (Panel 2)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Source of borrowing	Borrowing purpose	Female	Male	Female	Male	Female	Male
Government credit schemes	Purchase of food						20.0
	Purchase of household assets						
	Payment of fees						
	Medical costs					50.0	
	Agricultural	100.0**	100.0**		100.0**	50.0**	80.0**

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Source of borrowing	Borrowing purpose	Female	Male	Female	Male	Female	Male
	production						
	Educational costs						
NGO/Religious groups	Purchase of food						
	Purchase of household assets	33.3					
	Payment of fees						
	Medical costs						
	Agricultural production	66.7**	100.0**	100.0**			100.0**
	Educational costs						

Note: the results in this table are relative to the % saying yes to borrowing in Table 3.3.15.
**figures averaged over n≤5; highly unstable for robust discussion.

Table 3.3.18: Percentage distribution of households by primary source and primary purpose of borrowing (Panel 3)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Source of borrowing	Borrowing purpose	Female	Male	Female	Male	Female	Male
Commercial banks / Micro-finance banks	Purchase of food						
	Purchase of household assets		16.7		14.3		14.3
	Payment of fees						14.3
	Medical costs						
	Agricultural production	100.0**	83.3**	100.0**	85.7**		71.4**
	Educational costs						
Input and	Purchase of food						

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Source of borrowing	Borrowing purpose	Female	Male	Female	Male	Female	Male
output dealers							
	Purchase of household assets						
	Payment of fees						
	Medical costs						
	Agricultural production	100.0**					100.0**
	Educational costs						

Note: the results in this table are relative to the % saying yes to borrowing in Table 3.3.15.
**figures averaged over n≤5; highly unstable for robust discussion.

Table 3.3.19: Percentage distribution of households by who borrowed from indicated credit sources

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Relatives and friends	Husband	73.7	73.9	79.2
	Husband and wife	8.8	4.3	3.9
	Wife	17.5	2.7	16.9
Informal savings and credit group	Husband	60.9	78.9	73.9
	Husband and wife	26.1	15.8	8.7
	Wife	13.0	5.3	17.4
Money lenders	Husband		50.0**	100.0**
	Husband and wife	50.0**		
	Wife	50.0**	50.0**	
Government credit schemes	Husband	33.3**	100.0**	33.3**
	Husband and wife			33.3**
	Wife	66.7**		33.3**

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
NGO/Religious groups	Husband	33.3**		100.0**
	Husband and wife			
	Wife	66.7**	100.0**	
Commercial banks / Micro-finance banks	Husband	42.9	87.5	100.0**
	Husband and wife			
	Wife	57.1	12.5	
Input and output dealers	Husband			100.0**
	Husband and wife			
	Wife	100.0**		

Note: the results in this table are relative to the % saying yes to borrowing in Table 3.3.15.
**figures averaged over n≤5; highly unstable for robust discussion.

3.4 PRODUCTIVITY LEVELS FOR PRIORITY COMMODITIES AND HOUSEHOLD WELFARE INDICATORS

Results in this section crucially represent the heart of the baseline study since the project is essentially about seeking productivity improvement through optimal harnessing of sub-regional agricultural technologies. Thus, effort was made to disaggregate our measures/indicators of productivity to the extent allowed by data. In the case of the priority crops, productivity was expressed in Kg/ha and Naira/ha for crop varieties that could be given some broad identification. Then, crop revenue was also computed in monetary values on per capita basis across both village and gender strata. Finally, livestock income (consisting of livestock and aquaculture) was computed also on per capita basis across gender and village strata, as allowed by data.

Plot-level productivities of priority crops/varieties:

Table 3.4.1(presented in three panels to minimize table overflow) shows estimates of plot-level average productivities of priority crops/varieties. The last two columns to the right are what is needed as results, while previous columns merely provide supporting information. In Panel 1, which relates to the adopted village, the lowest physical and monetary productivities are associated with the maize varieties while the highest productivities are associated with cassava varieties.

In Panel 2 (non-adopted village, near), the physical and monetary productivities are somewhat mixed, but the values for maize are still inferior to those of sorghum and TMS varieties of cassava. And, in Panel 3 (with the exception of Oba Super variety of maize), the observed superior productivities of sorghum and TMS varieties of cassava are retained relative to those of maize varieties.

Table 3.4.1: Estimates of plot-level average productivities of priority crops/varieties (Kg/ha) (Panel 1)

Village type	Crop	crop variety	Average area under variety (ha)	Average total output (kg)	Crop/varietal productivity (kg/ha)	Crop/varietal productivity (Naira/ha)
Adopted	Sorghum	farafara	3.5	4800	1371.429	150,857.30
	Rice	Faro**	6.6	14500	2196.97	165,080.33
	Maize	Popcorn**	1.5	1350	900	99,000.00
		Hybrid**	2.8	2244	801.4286	88,157.30
	Cassava	TMS**	2.2	43000	19,545.45	657,771.69

Note: computations strictly based on available valid plot-level data. **specific varieties could not be ascertained from households within the broad varietal classes presented in the table.

Table 3.4.1: Estimates of plot-level average productivities of priority crops/varieties (Kg/ha) (Panel 2)

Village type	Crop	crop variety	Average area under variety (ha)	Average total output (kg)	Crop/varietal productivity	Crop/varietal productivity (Naira/ha)
Non-adopted, near	Sorghum	kaura	1.76	3175	1803.977	198,437.80
		farafara	2.7	5775	2138.889	235,277.90
	Maize	Hybrid**	3.67	4925	1341.962	147,615.60
		oba super**	3.2	2214	691.875	76,106.80

Village type	Crop	crop variety	Average area under variety (ha)	Average total output (kg)	Crop/varietal productivity	Crop/varietal productivity (Naira/ha)
		Premier**	3	4000	1333.333	146,666.30
	Cassava	TMS**	1.61	24750	15372.67	517,290.34
		Nwabibi**	1.5	3200	2133.333	71,786.55

Note: computations strictly based on available valid plot-level data. **specific varieties could not be ascertained from households within the broad varietal classes presented in the table.

Table 3.4.1: Estimates of plot-level average productivities of priority crops/varieties (Kg/ha) (Panel 3)

Village type	Crop	crop variety	Average area under variety (ha)	Average total output (kg)	Crop/varietal productivity	Crop/varietal productivity (Naira/ha)
Non-adopted, remote	Sorghum	kaura	0.95	3104	3267.368	359,410.70
		farafara	1.5	3200	2133.333	234,666.30
	Maize	hybrid	5.15	5506	1069.126	117,604.30
		premier	2.5	2000	800	88,000.00
		oba super	2.5	5250	2100	231,000.00
	Cassava	TMS	8.84	46515	5261.878	177,062.26

Note: computations strictly based on available valid plot-level data. **specific varieties could not be ascertained from households within the broad varietal classes presented in the table.

In Table 3.4.2, additional but limited indications of crop productivity is provided. The last row is especially relevant. It is worthy of note that across the village strata, male respondents maintained consistently higher crop productivity than that of female respondents, per capita.

Tables 3.4.2: Average income from priority crops, disaggregated by gender (Naira)

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Sorghum	45,602.70	301,788.30	55,605.00	178,218.70	53,263.10	259,261.20
Rice	45,641.54	374,798.30	48,321.03	230,210.90	43,590.97	267,596.10
Maize	131,336.70	302,804.70	348,439.30	538,345.50	98,143.10	378,829.00
Cassava	264,845.00	517,421.90	219,351.20	411,516.60	332,764.90	527,535.40
Yam	418,593.60	442,371.50	130,356.00	142,274.80	397,001.10	252,453.40
Total revenue	906,019.6	1,939,185	802,072.6	1,500,567	924,763.1	1,685,675
Total revenue per capita**	75,501.63	161,598.7	66,839.38	125,047.2	77,063.59	140,472.9

**based on the average household size

Table 3.4.3 provides some indications of livestock productivity among the households. Two points are emphasized in this table. First, with the exception of the non-adopted village (near), male respondents maintained higher livestock productivity than that of female respondents, per capita. Secondly, comparing Table 3.4.2 and Table 3.4.3, it broadly seems that livestock income per capita was higher than crop income per capital among the households.

Tables 3.4.3: Income from priority livestock and fish, disaggregated by gender (Naira)

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Local goats	34,000	43,000	27,000	51,000	34,000	42,000
Local sheep	54,000	73,500	42,000	85,500	34,500	67,500
Improved chicken (broilers and layers)	267,800	1,009,000	427,600	536,000	300,000	1,165,800
Local chicken	55,650	16,950	12,000	18,900	12,750	39,900

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Fish	133,633.33	1,959,337.10	902,855.56	668,449.18	1,276,833.30	1,472,217.50
Livestock income	545,083.33	3,101,787.1	1,411,455.6	1,359,849.8	1,658,083.3	2,787,417.5
Livestock income per capita**	45,423.61	258,482.26	117,621.29	113,320.77	138,173.61	232,284.79

**based on the average household size

Household Income:

In this section we present another welfare indicator, namely household income. The data is more comprehensive about income since the survey probed beyond crop, livestock and aquaculture incomes. Furthermore, for computing the indicators of productivities, averaging was based strictly on those households raising the identified commodities and /or varieties. In computing the household income, averaging was done over the entire households in each village and gender strata.

Table 3.4.4 shows the percentage of households who gets income from indicated sources. In descending order of importance, the topmost indicated sources of household income are the crops, livestock and running of own businesses, respectively. The sale of other products such as firewood, honey, etc. constitutes the 4th most important source of income to the households.

Table 3.4.4: Percentage of household who gets income from indicated source (% yes)

Income source	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Sale of crops	80.0	76.5	76.0	84.3	85.4	84.7
Sale of livestock	48.7	40.7	49.0	39.6	43.8	37.9
Sale of fish	7.8	10.1	8.7	10.2	6.3	12.4
Sale of other products e.g. firewood	16.5	16.4	18.3	14.9	27.1	24.2
Regular employment	7.8	10.1	4.8	10.2	4.2	8.7
Casual employment (agriculture)	5.2	8.2	2.9	8.6	1.0	9.5
Casual employment (non-	6.1	8.6	2.9	5.5	2.1	10.3

Income source	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
agriculture)						
Running own business	28.7	30.2	21.2	25.1	36.5	26.6
Remittances	9.6	8.6	6.7	9.0	8.3	9.5

Note: each percentage is determined relative to the respective gender sub-samples and village strata.

As expected, there is a close link between household income and productivity. So, we present some results on households' income in this section also. In Table 3.4.5, we see a complete different picture about the order of importance of households' sources of income. To help in making sense out Table 3.4.5, we constructed Table 3.4.6 which ranks the incomes from different sources in descending order across village and gender strata. The results are remarkably different from the impression given by Table 3.4.4. Specifically, the amount of income from crop sale ranked 1st only among the female respondents in the adopted village. However, and remarkably, livestock income value ranked 2nd consistently across the rest of the gender and village strata. Other sources of income appear to push back crop farming in terms of value and this have significant policy implications for project design and implementation. Strictly focusing on crop agriculture as a basis for welfare improvement among target and spillover beneficiaries may lead to under-achievement of project objectives unless a holistic approach is adopted.

Table 3.4.5: average household income from indicated sources per annum (Naira)

Income source	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Sale of crops	92,457.55	166,824.23	122,208.33	305,280.25	98,744.68	217,475.14
Sale of livestock	29,780.37	54,450.00	32,873.74	54,882.30	20,478.89	71,594.43
Sale of fish	12,432.38	215,174.15	61,745.46	93,412.42	71,804.35	172,718.24
Sale of other products e.g. firewood	4,500.00	12,377.05	16,659.79	12,663.72	9,732.97	19,527.63
Regular employment	13,137.26	33,874.48	79,632.29	43,890.91	10,444.44	33,716.42
Casual employment (agriculture)	3,911.76	10,244.81	1,073.68	11,093.75	1,555.56	26,097.06
Casual employment	1,511.76	13,050.00	1,053.68	11,247.71	2,222.22	13,288.69

Income source	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
(non-agriculture)						
Running own business	51,911.43	131,405.99	16,006.32	105,443.95	32,562.22	85,198.81
Remittances	8,766.99	8,000.00	2,216.49	9,119.27	8,088.89	4,936.36
Total income, all sources	200,141.74	593,343.54	311,227.88	597,050.52	247,452.08	590,497.85

Table 3.4.6: Ranking of household income by importance of source, disaggregated by village and gender strata

Income source:	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Sale of crops	1st	2nd	4th	6th	9th	9th
Sale of livestock	3rd	1st	1st	1st	1st	1st
Sale of fish	5th	5th	2nd	4th	6th	6th
Sale of other products e.g. firewood	7th	6th	8th	2nd	4th	7th
Regular employment	4th	7th	9th	9th	7th	8th
Casual employment (agriculture)	8th	3rd	3rd	3rd	2nd	4th
Casual employment (non-agriculture)	9th	9th	7th	7th	8th	3rd
Running own business	2nd	4th	5th	5th	5th	5th
Remittances	6th	8th	6th	8th	3rd	2nd

Household expenditure:

In Table 3.4.7 we present the average household expenditure under major categories across different village and gender strata. Two points are noteworthy from this table. First, with the exception of the non-adopted village (near), male respondents on the average outspent the female respondents using the average total expenditure as basis for comparison. Second, food was the largest expenditure item among the various categories surveyed, followed fairly consistently by education. Some studies have ranked expenditure data higher than income data as a measure of household welfare, because of the tendency of households to report on the former more accurately.

Table 3.4.7: Average household expenditure per annum (Naira)

Expenditure category	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Purchase of non-productive durable goods	11,171.05	19,742.72	23,300.00	30,233.71	9,646.67	26,633.70
Repair of houses and other durable assets	22,290.12	26,967.11	38,562.50	27,964.84	11,637.50	37,268.13
Education	60,747.31	54,449.15	76,879.07	52,159.78	36,317.28	64,546.46
Health	20,139.54	25,116.88	19,519.05	24,756.62	18,301.21	28,511.73
Clothing and footware	36,611.77	36,740.81	43,101.27	39,305.56	30,301.21	42,160.12
Other assets	29,260.87	45,141.15	54,720.59	68,843.28	12,507.58	35,086.62
Food	259,137.39	209,529.85	323,134.62	264,291.76	265,875.00	258,468.95
Expenditure, all items	391,372.17	397,749.63	518,578.85	460,025.72	364,371.88	461,265.39

Households' poverty incidence:

In Table 3.4.8, we see that poverty incidence tops 80% across all village and gender strata at the $1.00 poverty line, and clearly worsens at $1.25 per day. Also of significance is that, at each poverty line, the poverty incidence is higher among female respondents across all village strata.

Table 3.4.8: Poverty incidence among the baseline households

village	gender	subsample	Poverty line	P_0(%)	Poverty line	P_0(%)
1	0	115	$1.00	94.8	$1.25	97.4
1	1	268	$1.00	84.7	$1.25	88.8
2	0	104	$1.00	88.5	$1.25	90.4
2	1	255	$1.00	80.0	$1.25	87.5
3	0	96	$1.00	94.8	$1.25	96.7
3	1	381	$1.00	80.3	$1.25	85.0

Village : 1=adopted village;2=non-adopted village, near; 3=non-adopted village, remote
Gender: 0=female, 1=male
Poverty line: computed based on exchange rate of $1.00=N160.00, and scaled up for 365 days and for average household size of 13.

3.5 ADOPTION LEVELS OF KEY TECHNOLOGIES OF PRIORITY COMMODITIES

This section treats yet another core issue in the baseline study support to WAAPP, technology adoption. Technology adoption is at the heart of every intervention project because project benefits can only be derived when adoption of recommended technologies takes place. Some authors have even argued that adoption is linearly related to project benefits, therefore, zero adoption amounts to zero project benefits. The results relating to the adoption of the technologies found with the household survey are presented using two main conventions. First, we computed adoption rates using the traditional approach that takes adoption rate as the percentage of respondents/households 'using' a technology. Secondly, we computed adoption rate of a technology in the case of crop as the area under the technology of interest as a fraction of the total area accruing to all the technologies arrogated to the crop. In the case of livestock, we computed the adoption rate as the number of animals benefiting from the technology of interest as a fraction of the total number of the livestock type per household. Normally, the traditional and the latter approach will not yield the same results. The rare condition that may equate the two types of adoption rates is if (in the case of crop) the area under the technology and the total area under the crop are the same across all households or (in the case of livestock), the number of benefiting animals and the total number of the animal type owned are the same across all households. Clearly, these are hard conditions to fulfill.

Traditional computation of adoption rates:

Our discussion begins with the presentation of the percentage of respondents who planted improved varieties of priority crops. Table 3.5.1 shows that, with the exception of rice in the non-adopted village (near) and sorghum in the non-adopted village (remote), at least 30% of the respondents grow improved varieties of the priority crops.

Table 3.5.1: Percentage of respondents who planted improved varieties of priority crops (% yes)

Priority crop	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Sorghum	48.2(56)	32.3(65)	17.5(80)
Rice	35.1(37)	21.6(51)	36.0(50)
Maize	57.0(151)	59.5(111)	42.2(180)
Cassava	69.7(66)	78.0(50)	55.7(88)
Yam		33.3(3)**	66.7(6)

**result may be unstable due to low sample response (n<10). Also, for each x(y), x=percentage yes, y=number responding.

In Table 3.5.2, we present the adoption rates, based on the percentage of users, for a wide array of crop-related technologies. A close study of the results shows that some technologies are adopted by less than 20% of the respondents. These include mulching, water harvesting, trenches/terraces, irrigation, conservation tillage, fungicide, botanical pesticides, composting and organic residue management, cover crops, improved storage facilities, and commodity grading. Technologies for which at least 30% of the respondents consistently indicate usage are herbicide, herbicides, insecticide use on field, insecticide use for storage, row planting, planting density, thinning, inorganic fertilizer (NPK, Urea, DAP, SSP, others), animal manure, and farm equipments. For the remaining technologies in the table, the results are a mixture of weak and fairly strong adoption rates. These include legume-cereal rotation, improved method of fertilizer application, crop drying methods, threshing/shelling equipment, water pumps, pest control, improved crop variety, and seed dressing across the village and gender strata.

Table 3.5.2: Percentage of respondents who presently use technologies (% yes)**

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Presently use/apply:	Female (81)	Male (183)	Female (75)	Male (191)	Female (65)	Male (276)
Mulching	7.4	16.4	5.3	15.7	9.2	21.0
Water harvesting	1.3	8.0	5.5	6.9	0.0	7.1

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Presently use/apply:	Female (81)	Male (183)	Female (75)	Male (191)	Female (65)	Male (276)
Trenches/terraces	11.8	18.8	6.8	16.3	14.8	16.5
Irrigation	1.3	16.8	5.5	16.7	0.0	17.0
Conservation tillage	7.9	11.7	5.5	9.2	11.1	11.2
Fungicide	5.3	16.2	10.8	14.9	1.6	16.3
Herbicide	33.7	46.6	46.7	50.0	35.1	45.6
Herbicides	44.9	76.5	70.0	72.9	52.0	69.0
Insecticide use on field	35.1	44.9	44.1	48.3	33.3	36.6
Insecticide use for storage	36.0	33.5	30.5	29.5	37.0	30.1
Botanical pesticides	11.5	5.6	12.2	5.2	18.2	6.7
Row planting	49.0	62.7	42.7	58.5	61.3	55.9
Planting Density	46.7	60.8	44.1	60.0	58.3	52.1
Thinning	50.5	56.8	31.0	57.2	66.3	56.7
Inorganic Fertilizer (NPK, Urea, DAP, SSP, Others)	79.8	88.6	86.9	88.5	92.1	86.9
Animal manure	40.8	48.3	32.4	50.6	54.1	52.8
Composting and organic residue management	3.9	15.6	2.7	15.6	6.5	11.7
Legume-cereal rotation	28.9	19.0	26.0	19.8	34.4	19.5
improved method of fertilizer application	32.0	49.0	22.3	51.1	46.6	44.4
Cover crops	1.3	1.2	0.0	0.6	0.0	2.3
crop drying methods	12.7	21.3	17.7	16.4	15.4	21.3
Threshing/shelling equipment	5.3	24.7	5.5	20.5	4.9	25.6
Farm equipments	31.3	68.3	89.4	68.6	92.5	74.1
Water pumps	18.6	30.3	25.6	31.3	4.9	28.9
Improved storage facilities	10.5	7.5	1.4	7.6	1.6	12.1
Pest control	9.1	27.1	12.0	26.8	9.7	26.0
commodity Grading	6.6	7.5	2.7	8.7	6.6	10.9
improved crop variety	10.4	33.3	9.5	22.0	3.2	21.3
Seed dressing	18.3	30.3	7.7	21.6	19.1	24.9

**time of baseline survey

Table 3.5.3 shows the percentage of respondents who use livestock and aquaculture technologies. We again try to classify the results according to the strength of adoption observed. The technologies that are adopted by less than 20% of the respondents include improved goats, improved sheep, aquaculture feeds, and aquaculture drugs. Technologies for which at least 30%

of the respondents consistently indicate usage are goat drugs, goat supplementary feed, sheep drugs, sheep supplementary feed, improved chicken (broilers or layers), chicken drugs, and chicken supplementary feed.

An interesting scenario is observed in respect of the use/ownership of improved sheep and goats. While very low percentages of the respondents own these improved livestock, very high percentages claim to use drugs and supplementary feeds for sheep and goats. This anomaly is probably resolved by associating the use of drugs and supplementary feeds with their local goats and sheep, which were earlier captured.

Table 3.5.3: Percentage of respondents who presently use livestock and aquaculture technologies (% yes)**

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Presently use:	Female (36)	Male (74)	Female (22)	Male (73)	Female (29)	Male (102)
Improved goats	0.0	6.9	25.0	15.4	5.9	3.7
goat drugs	72.2	83.8	95.5	90.4	93.1	94.1
goat supplementary feed	43.5	64.6	90.9	95.0	82.6	70.4
Improved sheep	0.0	0.0	0.0	0.0	13.3	10.6
sheep drugs	95.8	86.8	100.0	89.8	91.7	85.9
sheep supplementary feed	47.1	63.9	100.0	96.3	84.6	77.8
Improved chicken (broilers or layers)	61.5	63.3	66.7	75.0	42.9	60.6
chicken drugs	72.2	77.5	71.4	80.0	57.1	86.8
chicken supplementary feed	53.8	61.9	55.6	71.4	50.0	63.2
Aquaculture feeds	10.9	17.5	15.9	16.1	10.9	17.6
Aquaculture drugs	9.4	16.3	13.6	14.4	8.9	13.7

**time of baseline survey

Technical computation of adoption Rates:

The adoption rates presented in Table 3.5.4 to Table 3.5.6 are based on the technical units of production (hectarage or number of livestock). The results are limited in scope by the available data, but are nonetheless indicative of prevailing adoption rates for the range of technologies studied.

Table 3.5.4 shows that in the adopted village stratum, varieties with at least 30% adoption rates include farafara/sorghum, kaura/sorghum, faro/rice, hybrid/maize, and Nwabibi/cassava. In the non-adopted village (near), varieties with at least 30% adoption rates include farafara/sorghum,

kaura/sorghum, hybrid/maize, Oba super/maize, premier/maize, TMS/cassava and Nwabibi/cassava. And, in the non-adopted village (remote), varieties with at least 30% adoption rates include farafara/sorghum, kaura/sorghum, hybrid/maize, and TMS/cassava. As was pointed out in a previous section, the results are mainly indicative, since the respondents were unable to identify the specific varieties referred to under each broad varietal group (e.g. Faro 40 or Faro 44, instead of just Faro).

Table 3.5.4: Estimated area-based adoption rates for selected varieties of priority crops

village	Crop	crop variety	Area under variety	Adoption rate
Adopted	Sorghum	Farafara	3.5	0. 642
		Kaura	1.95	0.358
	Rice	Faro	6.6	0.898
		Nerica	0.75	0.102
	Maize	premier	0.75	0.106
		Hybrid	2.8	0.397
		oba super	2	0.284
		popcorn	1.5	0.213
	Cassava	TMS	2.2	0.184
		Nwabibi	9.75	0.815
Non-adopted, near	Sorghum	Kaura	1.76	0.395
		Farafara	2.7	0.605
	Maize	Hybrid	3.67	0.372
		oba super	3.2	0.324
		Premier	3	0.304
	Cassava	TMS	1.61	0.518
		Nwabibi	1.5	0.482
Non-adopted, remote	Sorghum	Kaura	0.95	0.388
		Farafara	1.5	0.612
	Maize	Hybrid	5.15	0.424
		Premier	2.5	0.206
		Popcorn	2	0.165

village	Crop	crop variety	Area under variety	Adoption rate
		oba super	2.5	0.206
	Cassava	TMS	6.88	0.796
		Nwabibi	1.76	0.204

Note: each entry of adoption proportion may be converted into adoption rate by multiplying with 100

Table 3.5.5 shows the estimated area-based adoption rates for a composite of crop technologies. Components of the technologies for which about 30% or more adoption rates are associated in at least one village stratum are herbicide, row planting, planting density, thinning, inorganic fertilizer application and method of fertilizer application. Most of the other technologies in the table have adoption rates that are much lower than 20% across the village strata.

Table 3.5.6 shows the estimated adoption rates for a composite of livestock technologies (based on livestock numbers). The technologies for which about 30% or more adoption rates are associated in at least one village stratum are goat drugs, goat supplementary feed, sheep drugs, sheep supplementary feed, improved chicken (broilers or layers). All other livestock technologies in the table have adoption rates that are much lower than 20% across the village strata.

Table 3.5.5: Estimated area-based adoption rates for a composite of crop technologies

Technology	Estimated area under technology, adopted village	Adoption rate	Estimated area under technology, non-adopted village, near	Adoption rate	Estimated area under technology, non-adopted village, remote	Adoption rate
Mulching	0.37	0.088	0.18	0.027	0.41	0.069
Trenches/terraces	0.55	0.131	1.38	0.206	1.16	0.195
Irrigation	0.34	0.081	0.24	0.036	0.72	0.121
Conservation tillage	0.41	0.097	0.43	0.064	0.64	0.108
Fungicide	0.31	0.074	0.34	0.051	0.36	0.061
Herbicide	1.11	0.264	2.35	0.35	1.96	0.33
Insecticide	1.09	0.259	1.56	0.232	1.2	0.202
Row planting	1.48	0.352	2.41	0.359	1.76	0.296
Planting Density	1.48	0.352	2.43	0.362	1.81	0.305
Thinning	1.25	0.297	2.3	0.343	1.77	0.298
Inorganic fertilizer application	1.49	0.354	3.03	0.452	2.26	0.38
Animal manure	0.94	0.223	1.73	0.258	1.8	0.303
Composting and organic residue management	0.44	0.105	1.32	0.197	0.52	0.088
Legume-cereal rotation	0.64	0.152	1.56	0.232	0.8	0.135
Method of fertilizer application	1.37	0.325	2.14	0.319	1.74	0.293
Cover crops	0.07	0.017	0.01	0.001	0.05	0.008
improved variety	0.64	0.152	0.76	0.113	0.47	0.079

Note: each entry of adoption proportion may be converted into adoption rate by multiplying with 100

Table 3.5.6: Estimated adoption rates for a composite of livestock technologies (based on livestock numbers)

Technology	Average number of livestock benefiting from technology, Adopted village	Adoption proportions	Average number of livestock benefiting from technology, Non-adopted village , near	Adoption proportions	Average number of livestock benefiting from technology, Non-adopted village , remote	Adoption proportions
Improved goats	7	0.077864	14.5	0.148718	4	0.045924
goat drugs	14.1	0.156841	16.6	0.170256	20.4	0.234214
goat supplementary feed	17.6	0.195773	23.2	0.237949	21.6	0.247991
Improved sheep	0	0	3	0.04644	0	0
sheep drugs	25.3	0.417492	17.8	0.275542	19	0.384615
sheep supplementary feed	39.5	0.651815	20.1	0.311146	21	0.425101
Improved chicken (broilers or layers)	21.6	0.215569	22.9	0.215631	12.9	0.137088
chicken drugs						
chicken supplementary feed						

Note: each entry of adoption proportion may be converted into adoption rate by multiplying with 100. The shaded area could not be reported due to data problems.

3.6 DESCRIPTION OF FACTORS AFFECTING TECHNOLOGY ADOPTION

Background literature

Several studies have focused on whether or not farmers adopt a technology item and/or the level of use of the technology, given that it was adopted. Then attempts are made to determine those factors that might have contributed to the observed adoption behaviour. Explanatory variables have tended to vary between studies, while some variables have featured more frequently, irrespective of the technology under study. Some authors have found it convenient and expedient to group adoption determinants. Among the socio-economic group of factors affecting technology adoption are age (Doss and Morris ,2001; Baidu-Forson, 1999), gender (Doss and Morris, 2001), education (Doss and Morris, 2001; Herath and Takeya, 2003; Ransom *et al*, 2003), household size (Herath and Takeya, 2003), gender of household head (Kumar , 1994), crop-specific farming experience (Herath and Takeya, 2003), and farm size (Doss and Morris, 2001; Ransom *et a*l, 2003). The group of institutional factors affecting adoption of agricultural technologies includes extension contact (Doss and Morris,2001; Herath and Takeya, 2003; Ransom *et al*, 2003; Baidu-Forson, 1999), village location/market access (Ransom *et al*, 2003), membership of social organizations (Herath and Takeya, 2003) and Land tenure security (Gebremedlin and Swinton, 2003; Herath and Takeya, 2003). We also have households' perception of technology characteristics such as grain yield, grain colour, grain size, time to maturity, resistance to pests, resistance to insects, tastes, etc. When perceived along increasing scale of satisfaction, these characteristics are expected to enhance adoption.

In sections 3.1 and 3.3, some of the factors affecting adoption of agricultural technologies have been presented in fulfillment of earlier specific objectives. These include group membership, age, headship of household, household size and education level. In the section that follows, we present brief descriptions of other factors in households' technology adoption decisions.

Knowledge/awareness of technologies:

Table 3.6.1 shows the percentage of respondents with knowledge/awareness of crop-related technologies. Knowledge or awareness of a technology is expected to positively influence adoption decision. Technologies for which at least 30% of the respondents are aware across all village and gender strata are herbicide use, insecticide use on field, insecticide use for storage, irrigation, row planting, mulching, planting density, thinning, inorganic fertilizer application, animal manure, legume-cereal rotation, method of fertilizer application, and improved crop variety. And, technologies for which less than 30% of the respondents are aware across all village and gender strata are water harvesting, conservation tillage, composting and organic residue management, cover crops, and commodity grading.

Table 3.6.2 shows the percentage of respondents with knowledge/awareness of livestock-related technologies. It is of great interest that all the livestock technologies indicated in the table are known by at least 30% of the respondents across all village and gender strata.

Table 3.6.1: Percentage of respondents with knowledge/awareness of technologies (% yes)

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Know /aware of:	Female (101)	Male (254)	Female (95)	Male (236)	Female (88)	Male (356)
Mulching	30.9	50.3	33.3	49.5	36.9	51.1
Water harvesting	10.5	25.6	9.6	19.3	9.8	18.4
Trenches/terraces	28.9	38.6	24.3	39.4	36.1	35.0
Irrigation	53.8	60.4	50.7	68.8	67.7	65.0
Conservation tillage	11.7	17.1	8.2	19.7	19.4	21.7
Fungicide use	17.1	41.2	17.8	39.4	12.9	36.3
Herbicide use	63.3	76.6	70.7	83.1	70.0	75.2
Insecticide use on field	68.7	73.9	71.0	80.9	79.3	71.1
Insecticide use for storage	61.6	66.8	48.8	71.8	77.5	65.2
Botanical pesticides	16.5	10.6	13.5	10.2	18.2	15.3
Row planting	58.8	71.7	50.0	63.8	67.0	65.3
Planting Density	51.0	69.1	45.7	65.3	61.6	61.2
Thinning	52.7	67.1	47.0	65.2	73.6	67.8
Inorganic fertilizer application	64.4	79.8	79.8	80.4	82.6	78.0
Animal manure	55.3	71.0	54.1	74.3	73.4	73.6
Composting and organic residue management	9.2	26.7	11.0	28.5	14.1	31.4
Legume-cereal rotation	39.0	41.2	31.5	43.5	45.2	42.7
Method of fertilizer application	48.5	70.1	41.1	69.5	62.5	71.6
Cover crops	0.0	11.5	2.7	9.9	4.9	18.5
crop Drying methods	22.0	42.7	27.2	35.8	26.5	41.8
Threshing/shelling equipment	27.3	47.2	32.9	45.8	40.3	48.0
Improved storage facilities	27.6	36.6	12.2	30.5	14.8	31.2
Pest control	20.5	53.6	21.5	49.7	28.6	51.1
commodity Grading	9.2	13.9	4.1	12.1	9.8	19.7
improved crop variety	43.0	51.6	45.1	41.2	50.0	35.7

Table 3.6.2: Percentage of respondents with knowledge/awareness of livestock technologies (% yes)

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Know/aware of:	Female (52)	Male (116)	Female (40)	Male (109)	Female (38)	Male (154)
Improved goats	37.1	61.0	36.4	48.2	44.7	53.7
goat drugs	82.8	90.8	88.6	92.7	92.5	96.3
goat supplementary feed	60.0	84.8	65.6	89.1	84.6	85.5
Improved sheep	49.0	65.0	51.5	64.4	44.4	63.6
sheep drugs	72.5	87.2	83.3	89.0	86.8	94.7
sheep supplementary feed	57.1	78.8	54.8	86.1	31.6	83.2
Improved chicken (broilers or layers)	82.8	93.8	88.9	96.6	84.4	94.2
chicken drugs	83.3	92.2	90.5	90.9	89.5	92.2
chicken supplementary feed	80.8	89.7	85.0	88.1	84.2	90.3

Request for agricultural technology:

Table 3.6.3 shows the percentage of respondents who asked/requested for crop technologies. This variable represents one way to determine if availability of a technology is demand-driven or not. As shown, very low percentages of respondents requested for the technologies listed. Indeed, the technologies which 30-45% of the households asked for in at least one village stratum are herbicide use, insecticide use on field, insecticide use for storage, row planting, planting density, thinning, inorganic fertilizer application and method of fertilizer application.

Table 3.6.4 shows the percentage of respondents who asked/requested for livestock technologies. With the exception improved goats and sheep, all other livestock technologies in the table are asked for by at least 30% of the households in at least one village stratum.

Table 3.6.3: Percentage of respondents who asked/requested for crop technologies (% yes)

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Asked for:	Female (78)	Male (180)	Female (75)	Male (178)	Female (62)	Male (262)
Mulching	6.2	12.0	2.7	17.2	4.6	18.4
Water harvesting	0.0	1.1	1.4	3.5	0.0	4.9

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Asked for:	Female (78)	Male (180)	Female (75)	Male (178)	Female (62)	Male (262)
Trenches/terraces	1.3	6.8	2.7	9.0	3.3	8.5
Irrigation	1.3	8.7	1.4	12.7	1.6	14.8
Conservation tillage	7.9	9.5	5.5	8.6	9.5	8.2
Fungicide use	1.3	15.0	6.8	12.6	0.0	13.4
Herbicide use	23.2	34.6	33.7	40.3	14.9	31.6
Insecticide use on field	28.9	38.1	30.1	38.1	23.5	31.5
Insecticide use for storage	23.3	30.7	13.4	31.3	28.8	31.9
Botanical pesticides	5.1	1.7	5.4	1.7	10.6	4.9
Row planting	24.0	36.1	20.0	34.3	36.2	35.6
Planting Density	24.5	38.4	22.8	38.1	42.4	38.0
Thinning	18.7	29.7	10.7	31.1	32.1	30.4
Inorganic fertilizer application	24.5	39.7	38.3	41.9	37.9	38.1
Animal manure	11.7	22.2	13.5	22.1	16.4	28.0
Composting and organic residue management	0.0	11.5	1.4	9.4	1.6	10.2
Legume-cereal rotation	10.5	6.9	9.6	8.7	6.6	12.0
Method of fertilizer application	22.7	29.3	18.1	36.3	34.1	32.0
Cover crops	0.0	1.7	0.0	1.7	0.0	4.6
crop drying methods	8.9	20.2	15.2	17.9	12.3	20.2
Threshing/shelling equipment	2.6	10.3	2.7	9.7	3.3	15.6
Improved storage facilities	6.6	5.2	2.7	7.0	1.6	9.4
Pest control	6.5	17.5	6.7	15.6	11.3	19.8
commodity Grading	6.6	6.4	2.7	8.1	6.6	6.6
improved crop variety	9.0	15.6	8.0	13.5	1.6	13.7

Table 3.6.4: Percentage of respondents who asked/requested for livestock technologies

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Asked /requested for:	Female (18)	Male (36)	Female (13)	Male (24)	Female (6)	Male (47)
Improved goats	0.0	3.8	0.0	14.3	0.0	4.3
goat drugs	67.6	77.5	77.3	76.4	75.9	76.8
goat supplementary feed	33.3	25.5	45.5	38.5	30.0	25.8

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Asked /requested for:	Female (18)	Male (36)	Female (13)	Male (24)	Female (6)	Male (47)
Improved sheep	0.0	0.0	0.0	0.0	0.0	2.8
sheep drugs	87.0	80.4	83.3	90.0	85.0	84.6
sheep supplementary feed	47.1	41.2	55.6	37.9	18.2	36.4
Improved chicken (broilers or layers)	61.5	53.8	50.0	82.6	100.0	61.0
chicken drugs	66.7	61.1	53.8	83.3	100.0	78.7
chicken supplementary feed	61.5	42.1	44.4	84.6	100.0	59.4

Agricultural extension contacts:

Table 3.6.5 shows the average number of extension contacts per respondent in the 12 preceding months in respect of the indicated technologies. A few points of policy interest are in the table. First, the listed technologies are differentially emphasized for extension contacts with the households. For example, while improved varieties/ planting materials was high in the extension agenda and every village and gender strata benefited from it during the preceding 12 months, households did not seem to benefit from extension contact for such technologies as organic fertilizer, soil water management practices (e.g. mulching), post-harvest technologies and all the livestock services listed during the same period. Secondly, the last row in the table shows that male respondents received higher number of extension contacts than their female counterparts across all village strata.

Table 3.6.5: Average number of extension contacts in the 12 preceding months in respect of the indicated technologies

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology:	Female (115)	Male (268)	Female (104)	Male (255)	Female (96)	Male (380)
Improved varieties/ Planting material	1	1	1	1	1	1
Chemical Fertilizer		1				1

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology:	Female (115)	Male (268)	Female (104)	Male (255)	Female (96)	Male (380)
Organic fertilizer						
Spacing		1				1
Soil Water management practices (e.g. mulching)						
Plant protection		1				
Weed control	1	1				1
Post-harvest technologies						
Livestock breeds						
Livestock pasture/feeds						
Veterinary services						
Aquaculture		1				
Average total number of extension contacts, all technologies**	5	8	2	4	3	7

Note: all results were rounded off to the nearest whole number if the first decimal value was at least 0.6; for example, 4.6 became 5, 0.6 to 0.9 became 1, etc. So, the empty cells are those not fulfilling this condition. **this is derived from the entire household data for each village and gender type, and not a simple summation of the entries in this table.

Gender aspect of extension contacts

Table 3.6.6 shows the percentage of respondents who were visited by male extension agents in respect of the indicated technologies. The essence of this inquiry is to assess within-gender versus cross-gender contacts between extension agents and respondents. Although the results in Table 3.6.6 suffered some data problems, the overall picture is highly indicative. It is largely expected that male extension agents will visit male farmers. So, our primary interest is in the percentage of females indicating the receipt of male extension agents for the listed technologies. The dominant response across the village strata is that male extension agents visit the female respondents more than female agents. This is of crucial policy relevance because in situations where male extension agents have limited or no access to female farmers, delivery of extension messages will have to rely on male members of the households. This may create inherent message delivery problems.

Table 3.6.7 is the percentage distribution of the gender of respondents which were contacted by extension agents in respect of the indicated technologies. So, this table in a way provides additional details concerning the analysis presented in Table 3.6.6.

Table 3.6.6: Percentage of respondents who were visited by male extension agents in respect of the indicated technologies (% yes)

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Improved varieties/ Planting material	86.7	100.0	91.7	91.1	100.0	98.5
Chemical Fertilizer	100.0	91.3	50.0	92.9	100.0	90.2
Organic fertilizer	75.0	80.8	0.0	70.8	100.0	63.3
Spacing	90.0	92.2	83.3	96.4	85.7	93.8
Soil Water management practices (e.g. mulching)	75.0	66.7	0.0	73.3	0.0	75.0
Plant protection	88.9	89.8	50.0	100.0	66.7	91.2
Weed control	90.0	91.8	75.0	93.1	87.5	96.3
Post-harvest technologies	80.0	82.6	0.0	87.5	0.0	91.7
Livestock breeds	87.5	69.2		50.0	0.0	66.7
Livestock	85.7	50.0		60.0	100.0	0.0

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
pasture/feeds						
Veterinary services	77.8	85.0		100.0	100.0	100.0
Aquaculture	85.7	53.8	100.0	82.4	66.7	90.9

Note: for the 0%, 50% and 100% "yes" percentages in the table, the underlying number of cases were typically small (n<10). Such results are only indicative and may be unstable for robust discussions. The shaded portion had no data to support computations.

Table 3.6.7: Percentage distribution of households in respect of the received extension services, disaggregated by gender.

	Gender	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Improved varieties/ Planting material	Female	18.9	12.7	11.0
	Male	81.1	87.3	89.0
Chemical Fertilizer	Female	19.6	13.8	19.3
	Male	80.4	86.2	80.7
Organic fertilizer	Female	38.7	20.8	37.5
	Male	61.6	79.2	62.5
Spacing	Female	27.1	14.7	16.7
	Male	72.9	85.3	83.3
Soil Water management practices (e.g. mulching)	Female	52.0	20.0	27.6
	Male	48.0	80.0	72.4
Plant protection	Female	24.6	12.5	15.8
	Male	75.4	87.5	84.2
Weed control	Female	22.4	9.1	9.7
	Male	77.6	90.0	90.3
Post-harvest technologies	Female	37.0	18.8	12.0
	Male	63.0	81.2	88.0

	Gender	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Livestock breeds	Female	76.5	50.0	50.0
	Male	23.5	50.0	50.0
Livestock pasture/feeds	Female	82.4	0.0	50.0
	Male	17.6	100.0	50.0
Veterinary services	Female	48.1	25.0	0.0
	Male	51.9	75.0	100.0
Aquaculture	Female	46.2	30.0	13.0
	Male	53.8	70.0	87.0

3.7. AGRICULTURAL RESEARCH, AGRICULTURAL EXTENSION AND AGRICULTURAL PRODUCTION.

In this section we attempt to review the state of agricultural research, extension and their implications for agricultural production and productivity. Our review is largely empirical, since evidence is drawn to the extent possible from the household survey.

Providers of agricultural research services:

Households were asked to indicate the major providers of agricultural research services in respect of twelve (12) technology items, namely, improved varieties/ planting material, chemical fertilizer, organic fertilizer, spacing, soil water management practices (e.g. mulching), plant protection, weed control, post-harvest technologies, livestock breeds, livestock pasture/feeds, veterinary services, and aquaculture. Table 3.7.1 (presented in 4 panels to minimize table overflow) shows the results. Taking all panels of Table 3.7.1 together, we observe that at least 70% of the respondents across the village and gender strata credit the national research organizations with research support for the listed technologies. The balance of the research support has been credited to private/local and international research organizations.

Table 3.7.1: Percentage distribution of respondents by their providers of research services Panel 1)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology	provider of research:	Female	Male	Female	Male	Female	Male
Improved varieties/ Planting material	Private research organizations		5.5		12.5		11.8
	Local/Nigerian Research organizations	100.0	93.4	100.0	84.4	100.0	88.2
	International research organizations		1.1		3.1		
Chemical Fertilizer	Private research organizations		1.7	33.3	16.7		20.6
	Local/Nigerian Research organizations	100.0	96.6	66.7	77.8	100.0	79.4
	International research organizations		1.7		5.6		
Organic fertilizer	Private research organizations		3.6		21.4		39.1
	Local/Nigerian Research organizations	100.0	92.9	100.0	71.4		60.9
	International research organizations		3.6		7.1		

Note: for the 100% or 50-50% "yes" responses in the table, the underlying number of cases were typically <10. So, the percentages may be unstable for robust inferences. The empty cells in the table had no valid data to support computation.

Table 3.7.1: Percentage distribution of respondents by their providers of research services (Panel 2)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology	provider of research:	Female	Male	Female	Male	Female	Male
Spacing	Private research organizations		5.8		14.3		16.2
	Local/Nigerian Research organizations	100.0	94.2	100.0	85.7	100.0	81.1
	International research organizations						2.7
Soil Water management practices (e.g. mulching)	Private research organizations				27.3		20.0
	Local/Nigerian Research organizations	100.0	93.6	100.0	63.6		80.0
	International research organizations		6.3		9.1		

Note: for the 100% or 50-50% "yes" responses in the table, the underlying number of cases were typically <10. So, the percentages may be unstable for robust inferences. The empty cells in the table had no valid data to support computation.

Table 3.7.1: Percentage distribution of respondents by their providers of research services (Panel 3)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology	provider of research:	Female	Male	Female	Male	Female	Male
Plant protection	Private research organizations		6.5		16.7		26.1
	Local/Nigerian Research organizations	100.0	91.3	100.0	83.3	10.0	73.9

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology	provider of research:	Female	Male	Female	Male	Female	Male
	International research organizations		2.2				
Weed control	Private research organizations		6.5		21.7		12.2
	Local/Nigerian Research organizations	100.0	93.5	100.0	78.3	100.0	87.8
	International research organizations						
Post-harvest technologies	Private research organizations		3.4		18.8		20.0
	Local/Nigerian Research organizations	100.0	96.6	100.0	81.3		80.0
	International research organizations						
Livestock breeds	Private research organizations	33.3			50.0		
	Local/Nigerian Research organizations	66.7	100.0		50.0		100.0
	International research organizations						

Note: for the 100% or 50-50% "yes" responses in the table, the underlying number of cases were typically <10. So, the percentages may be unstable for robust inferences. The empty cells in the table had no valid data to support computation.

Table 3.7.1: Percentage distribution of respondents by their providers of research services (Panel 4)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology	provider of research:	Female	Male	Female	Male	Female	Male
Livestock pasture/feeds	Private research organizations	27.3			50.0		
	Local/Nigerian Research organizations	72.7	100.0		50.0		
	International research organizations						
Veterinary services	Private research organizations	27.3			50.0		
	Local/Nigerian Research organizations	63.6	100.0		50.0		100.0
	International research organizations	9.1					
Aquaculture	Private research organizations		13.8		28.6	50.0	16.7
	Local/Nigerian Research organizations	100.0	86.2	100.0	71.4	50.0	70.8
	International research organizations						12.5

Note: for the 100% or 50-50% "yes" responses in the table, the underlying number of cases were typically <10. So, the percentages may be unstable for robust inferences. The empty cells in the table had no valid data to support computation.

Providers of agricultural extension services:

Households were further asked to indicate the major providers of agricultural research services in respect of improved varieties/ planting material, chemical fertilizer, organic fertilizer, spacing, soil water management practices (e.g. mulching), plant protection, weed control, post-harvest technologies, livestock breeds, livestock pasture/feeds, veterinary services, and aquaculture. We again present the results as panels of Table 3.7.2. This table shows that the Agricultural

Development Programmes (ADPs) remains the dominant source of extension services among the agencies listed, namely Agricultural Development Programmes (ADPs), Non-governmental Organizations (NGOs), Private extension organizations, Farmer to farmer contacts and National agricultural research institutes. Across the panels of Table 3.7.2, at least 70% of the respondents credit the Agricultural Development Programmes (ADPs) with extension support for the listed technologies. It is important to stress that, farmer-to-farmer interactions provided the next most extension support among the other options surveyed.

Table 3.7.2: Percentage distribution of respondents by their providers of extension services (Panel 1)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology :	Extension agency:	Female	Male	Female	Male	Female	Male
Improved varieties/ Planting material	ADP	80.0	84.1	84.6	78.6	100.0	89.4
	NGO		9.5	15.4	11.9		9.1
	Private extension organizations				9.5		1.5
	Farmer to farmer	20.0	3.2				
	National agric research institutes		3.2				
Chemical Fertilizer	ADP	50.0	89.1	100.0	85.7	100.0	91.7
	NGO		4.3		7.1		8.3
	Private extension organizations				7.1		
	Farmer to farmer	5.0	4.3				
	National agric research institutes		2.2				
Organic fertilizer	ADP		73.9	100.0	61.1	100.0	57.9
	NGO		8.7		11.1		10.5
	Private extension organizations				5.6		5.3
	Farmer to farmer	100.0			22.2		21.1
	National agric research institutes						5.3
Spacing	ADP	70.0	88.0	100.0	85.7	100.0	95.2
	NGO		6.0		10.7		4.8
	Private extension		2.0		3.6		

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology :	Extension agency:	Female	Male	Female	Male	Female	Male
	organizations						
	Farmer to farmer	30.0	4.0				
	National agric research institutes						

Note: the number of households responding to the issues in the table were extremely low (n<10 per gender group in each village stratum). So, the percentages may not be stable for robust discussions. Possible reasons include the irrelevance of some survey issues to a large number of households across different agro-ecologies.

Table 3.7.2: Percentage distribution of respondents by their providers of extension services (Panel 2)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology :	Extension agency:	Female	Male	Female	Male	Female	Male
Soil Water management practices (e.g. mulching)	ADP		86.7	100.0	75.0		85.7
					25.0		14.3
	NGO						
	Private extension organizations						
	Farmer to farmer	100.0					
	National agric research institutes						
Plant protection	ADP	50.0	89.8	100.0	90.9	100.0	96.8
	NGO		6.1				3.2
	Private extension organizations	20.0			9.1		
	Farmer to farmer	30.0	4.1				
	National agric research institutes						

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology :	Extension agency:	Female	Male	Female	Male	Female	Male
Weed control	ADP	50.0	89.8	100.0	86.2	87.5	88.7
	NGO		6.1		6.9	12.5	9.4
	Private extension organizations	20.0			6.9		1.9
	Farmer to farmer	30.0	4.1				
	National agric research institutes						

Note: the number of households responding to the issues in the table were extremely low (n<10 per gender group in each village stratum). So, the percentages may not be stable for robust discussions. Possible reasons include the irrelevance of some survey issues to a large number of households across different agro-ecologies.

Table 3.7.2: Percentage distribution of respondents by their providers of extension services (Panel 3)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology :	Extension agency:	Female	Male	Female	Male	Female	Male
Post-harvest technologies	ADP	25.0	84.2	100.0	85.7		81.8
	NGO		5.3		7.1		18.2
	Private extension organizations				7.1		
	Farmer to farmer	75.0	10.6				
	National agric research institutes						
Livestock breeds	ADP	37.5	50.0		100.0		100.0
	NGO		12.5				
	Private extension organizations	12.5					
	Farmer to farmer	50.0	37.5				
	National agric research institutes						

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology :	Extension agency:	Female	Male	Female	Male	Female	Male
Livestock pasture/feeds	ADP	37.5	33.3		100.0	100.0	
	NGO		16.7				
	Private extension organizations	12.5					
	Farmer to farmer	50.0	50.0				
	National agric research institutes						

Note: the number of households responding to the issues in the table were extremely low (n<10 per gender group in each village stratum). So, the percentages may not be stable for robust discussions. Possible reasons include the irrelevance of some survey issues to a large number of households across different agro-ecologies.

Table 3.7.2: Percentage distribution of respondents by their providers of extension services (Panel 4)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology :	Extension agency:	Female	Male	Female	Male	Female	Male
Veterinary services	ADP	50.0	72.2		100.0	100.0	100.0
	NGO		5.6				
	Private extension organizations	10.0	5.6				
	Farmer to farmer	40.0	16.7				
	National agric research institutes						
Aquaculture	ADP	20.0	42.9	40.0	42.9	100.0	63.6
	NGO		4.8				4.5
	Private extension organizations		9.5		7.1		27.3
	Farmer to farmer	80.0	14.3	60.0	42.9		4.5
	National agric		28.6		7.1		

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology :	Extension agency:	Female	Male	Female	Male	Female	Male
	research institutes						

Note: the number of households responding to the issues in the table were extremely low (n<10 per gender group in each village stratum). So, the percentages may not be stable for robust discussions. Possible reasons include the irrelevance of some survey issues to a large number of households across different agro-ecologies.

Types of agricultural research collaborations:

The survey attempted to understand the prevailing methods of agricultural research. The options presented in the survey format were Farmer-managed on-farm trial (farmer guided by researchers), On-farm trial (researcher-managed), and Research demonstration plots (data collection by researcher). Table 3.7.3 (presented in 4 panels to minimize table overflow) shows the results on the various technologies under survey. Taking all the panels of Table 3.7.3 together, we see that the three types of research designs complement one another . However, the dominant research design is the Farmer-managed on-farm trial (farmer guided by researchers) across all 12 technologies, village and gender strata. In the case of aquaculture, both Farmer-managed on-farm trial (farmer guided by researchers) and On-farm trial (researcher-managed) were approximately evenly important to the households across the village and gender strata.

Table 3.7.3: Percentage distribution of respondents by types of research collaborations (Panel 1)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology:	Type of research:	Female	Male	Female	Male	Female	Male
Improved varieties/ Planting material	Farmer-managed on-farm trial (farmer guided by researchers)	80.0	49.5	77.8	45.2	50.0	45.3
	On-farm trial (researcher-managed)	5.0	26.9		25.8		26.4
	Research demonstration plots	15.0	23.7	22.2	29.0	50.0	28.3

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology:	Type of research:	Female	Male	Female	Male	Female	Male
	(data collection by researcher)						
Chemical Fertilizer	Farmer-managed on-farm trial (farmer guided by researchers)	100.0	39.7	100.0	29.4	100.0	44.4
	On-farm trial (researcher-managed)		36.2		29.4		30.6
	Research demonstration plots (data collection by researcher)		24.1		41.2		25.0
Organic fertilizer	Farmer-managed on-farm trial (farmer guided by researchers)	100.0	50.0	50.0	46.2		56.5
	On-farm trial (researcher-managed)		23.3		23.1		21.7
	Research demonstration plots (data collection by researcher)		26.7	50.0	30.8		21.7

Note: for the 100% or 50-50% "yes" responses in the table, the underlying number of cases were typically <10. So, the percentages may be unstable for robust inferences. The empty cells in the table had no valid data to support computation.

Table 3.7.3: Percentage distribution of respondents by types of research collaborations (Panel 2)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology:	Type of research:	Female	Male	Female	Male	Female	Male
Spacing	Farmer-managed on-farm trial (farmer guided by researchers)	100.0	49.3	100.0	57.1		63.4
	On-farm trial (researcher-managed)		29.6		28.6		19.5
	Research demonstration plots (data collection by researcher)		21.1		14.3	100.0	17.1
Soil Water management practices (e.g. mulching)	Farmer-managed on-farm trial (farmer guided by researchers)	100.0	50.0	100.0	60.0	60.9	
	On-farm trial (researcher-managed)				20.0	21.7	
	Research demonstration plots (data collection by researcher)		50.0		20.0	17.4	

Note: for the 100% or 50-50% "yes" responses in the table, the underlying number of cases were typically <10. So, the percentages may be unstable for robust inferences. The empty cells in the table had no valid data to support computation.

Table 3.7.3: Percentage distribution of respondents by types of research collaborations (Panel 3)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology:	Type of research:	Female	Male	Female	Male	Female	Male
Plant protection	Farmer-managed on-farm trial (farmer guided by researchers)	100.0	45.5	100.0	72.2	100.0	73.9
	On-farm trial (researcher-managed)		36.4		27.8		21.7
	Research demonstration plots (data collection by researcher)		18.2				4.3
Weed control	Farmer-managed on-farm trial (farmer guided by researchers)	100.0	55.4	100.0	56.5	50.0	66.7
	On-farm trial (researcher-managed)		26.2		26.1		12.3
	Research demonstration plots (data collection by researcher)		18.5		17.4	50.0	20.0
Post-harvest technologies	Farmer-managed on-farm trial (farmer guided by researchers)	100.0	60.0	100.0	53.3		54.5
	On-farm trial (researcher-managed)		16.7		26.7		22.7
	Research demonstration plots (data collection by researcher)		23.3		20.0		22.7

Note: for the 100% or 50-50% "yes" responses in the table, the underlying number of cases were typically <10. So, the percentages may be unstable for robust inferences. The empty cells in the table had no valid data to support computation.

Table 3.7.3: Percentage distribution of respondents by types of research collaborations (Panel 4)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology:	Type of research:	Female	Male	Female	Male	Female	Male
Livestock breeds	Farmer-managed on-farm trial (farmer guided by researchers)	66.7	41.7	50.0	50.0		
	On-farm trial (researcher-managed)	25.0	33.3	50.0	50.0		
	Research demonstration plots (data collection by researcher)	8.3	25.0				100.0
Livestock pasture/feeds	Farmer-managed on-farm trial (farmer guided by researchers)	63.6	42.1		50.0		
	On-farm trial (researcher-managed)	27.3	36.8		50.0		
	Research demonstration plots (data collection by researcher)	9.1	21.1				
Veterinary services	Farmer-managed on-farm trial (farmer guided by researchers)	58.3	42.1		50.0		50.0
	On-farm trial (researcher-managed)	41.7	36.8		50.0		
	Research demonstration plots		21.1				50.0

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology:	Type of research:	Female	Male	Female	Male	Female	Male
	(data collection by researcher)						
Aquaculture	Farmer-managed on-farm trial (farmer guided by researchers)	37.5	42.9	40.0	21.4	50.0	37.5
	On-farm trial (researcher-managed)	37.5	32.1	40.0	50.0	50.0	27.2
	Research demonstration plots (data collection by researcher)	25.0	25.0	20.0	28.6		33.3

Note: for the 100% or 50-50% "yes" responses in the table, the underlying number of cases were typically <10. So, the percentages may be unstable for robust inferences. The empty cells in the table had no valid data to support computation.

Methods of agricultural extension services:

The survey attempted to understand the prevailing methods of agricultural extension services in relation to the listed technologies. The options presented in the survey format were: extension agent visits farmer, farmer visits extension agent, demonstration plots, radio programs, other mass media (newspapers, magazines, tv, etc), field days and farmer field schools or short-term training. Table 3.7.4 (presented in 6 panels to minimize table overflow) shows that the most important extension method is the visit of the extension agents to farmers. This method is followed, but not closely by the use of demonstration plots, among the options surveyed.

Table 3.7.4: Percentage distribution of respondents by methods of received extension services (Panel 1)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology:	method of extension:	Female	Male	Female	Male	Female	Male
Improved varieties/ Planting material	Extension agent visits farmer	75.0	71.4	91.7	70.7	87.5	77.6
	Farmer visits extension agent		11.1		7.3		3.0
	Demonstration plots	6.3	12.7	8.3	22.0	12.5	14.9
	Radio programs						
	other mass media (newspapers, magazines, TV, etc)						
	Field days	18.8	3.2				
	Farmer field schools or short-term training		1.6				4.5
Chemical Fertilizer	Extension agent visits farmer	50.0	69.6	66.7	67.9	83.3	68.8
	Farmer visits extension agent		10.9		17.9		8.3
	Demonstration plots		13.0	33.3	14.3	16.7	16.7
	Radio programs						2.1
	other mass media (newspapers, magazines, TV, etc)						
	Field days	50.0	4.3				
	Farmer field schools or short-term training		2.2				4.2

Table 3.7.4: Percentage distribution of respondents by methods of received extension services (Panel 2)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology:	method of extension:	Female	Male	Female	Male	Female	Male
Organic fertilizer	Extension agent visits farmer		56.5	100.0	88.9	50.0	78.9
	Farmer visits extension agent		8.7				10.5
	Demonstration plots		21.7		11.1	50.0	5.3
	Radio programs		4.3				5.3
	other mass media (newspapers, magazines, TV, etc)						
	Field days	100.0	8.7				
	Farmer field schools or short-term training						
Spacing	Extension agent visits farmer	70.0	74.5	83.3	72.4	100.0	77.8
	Farmer visits extension agent				3.4		
	Demonstration plots		19.6	16.7	24.1		19.0
	Radio programs						
	other mass media (newspapers, magazines, TV, etc)						
	Field days	30.0	3.9				
	Farmer field schools or short-term training		2.0				3.2

Table 3.7.4: Percentage distribution of respondents by methods of received extension services (Panel 3)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology:	method of extension:	Female	Male	Female	Male	Female	Male
Soil Water management practices (e.g. mulching)	Extension agent visits farmer		64.3	100.0	58.3		61.9
	Farmer visits extension agent				25.0		9.5
	Demonstration plots		21.4		16.7		19.0
	Radio programs						9.6
	other mass media (newspapers, magazines, TV, etc)						
	Field days	100.0	14.3				
	Farmer field schools or short-term training						
Plant protection	Extension agent visits farmer	70.0	78.7	66.7	90.5	100.0	75.0
	Farmer visits extension agent		6.4		4.8		9.4
	Demonstration plots		8.5	33.3	4.8		12.5
	Radio programs						3.1
	other mass media (newspapers, magazines, TV, etc)						
	Field days	30.0	4.3				
	Farmer field schools or short-term training		2.1				

Table 3.7.4: Percentage distribution of respondents by methods of received extension services (Panel 4)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology:	method of extension:	Female	Male	Female	Male	Female	Male
Weed control	Extension agent visits farmer	70.0	67.3	75.0	77.8	75.0	77.8
	Farmer visits extension agent		10.2				1.9
	Demonstration plots		16.3	25.0	22.2	25.0	14.8
	Radio programs						
	other mass media (newspapers, magazines, TV, etc)						
	Field days	30.0	4.1				
	Farmer field schools or short-term training		2.0				5.6
Post-harvest technologies	Extension agent visits farmer	25.0	75.0	100.0	85.7		70.8
	Farmer visits extension agent						4.2
	Demonstration plots		15.0		14.3		25.0
	Radio programs						
	other mass media (newspapers, magazines, TV, etc)						
	Field days	75.0	10.0				
	Farmer field schools or short-term training						

Table 3.7.4: Percentage distribution of respondents by methods of received extension services (Panel 5)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology:	method of extension:	Female	Male	Female	Male	Female	Male
Livestock breeds	Extension agent visits farmer	25.0	33.3		100.0		50.0
	Farmer visits extension agent						
	Demonstration plots	12.5	11.1				50.0
	Radio programs						
	other mass media (newspapers, magazines, TV, etc)						
	Field days	50.0	33.3				
	Farmer field schools or short-term training	12.5	22.2				
Livestock pasture/feeds	Extension agent visits farmer	25.0	16.7		100.0	100.0	
	Farmer visits extension agent		16.7				
	Demonstration plots	12.5					
	Radio programs						
	other mass media (newspapers, magazines, TV, etc)						
	Field days	50.0	50.0				
	Farmer field schools or short-term training	12.5	16.7				

Table 3.7.4: Percentage distribution of respondents by methods of received extension services (Panel 6)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Technology:	method of extension:	Female	Male	Female	Male	Female	Male
Veterinary services	Extension agent visits farmer	40.0	61.1		100.0	100.0	100.0
	Farmer visits extension agent		16.7				
	Demonstration plots	10.0					
	Radio programs						
	other mass media (newspapers, magazines, TV, etc)						
	Field days	40.0	16.7				
	Farmer field schools or short-term training	10.0	5.6				
Aquaculture	Extension agent visits farmer	16.7	34.6	20.0	26.7	50.0	36.4
	Farmer visits extension agent				13.3		13.6
	Demonstration plots	16.7	50.0	40.0	26.7	50.0	45.5
	Radio programs				6.7		
	other mass media (newspapers, magazines, TV, etc)			40.0	26.7		4.5
	Field days	66.7	11.5				
	Farmer field schools or short-term training		3.8				

Sources of knowledge/awareness of agricultural technologies:

In Table 3.7.5 (presented in 12 panels) we sought to know the most important extension agencies with respect to the technologies presented to the households. Panels 1 to 9 are crop related while Panels 10 to 12 are livestock related. Most households across the village and gender strata selected the ADPs. But, we also asked households to indicate their principal source of

knowledge/awareness about crop and livestock technologies. The options presented to households were Government extension workers, Farmer group members, NGOs, Other farmers, Radio and Demonstration / research sites. The surprising result in Table 3.7.5 across all panels is that 'other farmers' now dominate all other sources of awareness (even government extension workers) about the crop and livestock technologies presented. This is of great policy significance because the rating of government agencies as the most important extension bodies has not translated into households relying on them as their most important source of knowledge about technologies.

Table 3.7.5: Percentage distribution of respondents by principal source of knowledge/awareness crop technologies (Panel 1)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
source of learning about Mulching	Government extension workers	25.0	24.0	7.7	32.1	15.0	18.1
	Farmer group members		1.3	3.8	1.2		0.9
	NGOs	8.3	1.3	3.8	2.4		6.9
	Other farmers	66.7	68.0	84.6	64.2	85.0	71.6
	Radio		1.3				2.6
	Demonstration / research sites		4.0				
source of learning about Water harvesting	Government extension workers		19.4	12.5	9.7		22.7
	Farmer group members						
	NGOs		2.8	12.5			
	Other farmers	100.0	72.2	75.0	90.3	100.0	75.0
	Radio		5.6				2.3
	Demonstration / research sites						
source of learning about Trenches/terraces	Government extension workers		14.0	5.0	8.2	10.6	7.4
	Farmer group members						1.2

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
	NGOs	9.5	3.5	5.0	1.6	5.3	
	Other farmers	90.5	82.5	90.0	88.5	84.2	90.1
	Radio				1.6		1.2
	Demonstration / research sites						

Table 3.7.5: Percentage distribution of respondents by principal source of knowledge/awareness crop technologies (Panel 2)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
source of learning about Irrigation	Government extension workers	18.2	17.5	4.5	18.4		18.9
	Farmer group members						0.8
	NGOs		6.3	9.1	8.0	4.3	5.7
	Other farmers	81.8	75.0	81.8	73.6	95.7	72.1
	Radio						2.5
	Demonstration / research sites		1.3	4.5			
source of learning about Conservation tillage	Government extension workers	25.0	34.6	16.7	55.2	38.5	41.2
	Farmer group members		3.8				
	NGOs			16.7	3.4		3.9
	Other farmers	75.0	61.5	66.7	41.4	61.5	52.9
	Radio						2.0
	Demonstration / research sites						
source of learning about	Government extension workers	7.7	37.0	18.8	24.1	22.2	22.0

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
Fungicide use							
	Farmer group members				1.7		1.2
	NGOs		9.3	12.5	5.1	11.1	2.4
	Other farmers	92.3	51.9	68.8	58.6	66.7	68.3
	Radio				10.3		6.1
	Demonstration / research sites		1.9				

Table 3.7.5: Percentage distribution of respondents by principal source of knowledge/awareness crop technologies (Panel 3)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
source of learning about Herbicide use	Government extension workers	46.6	58.7	41.9	46.1	50.0	45.7
	Farmer group members				.6		0.5
	NGOs	6.9	7.6	6.5	7.2	3.6	5.0
	Other farmers	46.6	30.8	50.0	40.6	44.6	43.8
	Radio		0.6		3.6		4.1
	Demonstration / research sites		2.3	1.6	1.8	1.8	0.9
source of learning about Insecticide use on field	Government extension workers	45.2	57.6	42.1	51.0	47.6	44.7
	Farmer group members		0.6		1.3		
	NGOs	3.2	3.6	3.5	3.3	3.2	1.6
	Other farmers	51.6	35.8	54.4	41.1	47.6	48.4
	Radio		0.6		3.3		3.2
	Demonstration / research sites		1.8			1.6	2.1

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
source of learning about Insecticide use for storage	Government extension workers	28.9	47.2	31.4	45.1	40.0	35.5
	Farmer group members				0.9		1.9
	NGOs	8.9	4.8	2.9	3.5	2.0	3.2
	Other farmers	62.2	45.6	65.7	45.1	58.0	52.9
	Radio		0.8		5.3		4.5
	Demonstration / research sites		1.6				1.9

Table 3.7.5: Percentage distribution of respondents by principal source of knowledge/awareness crop technologies (Panel 4)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
source of learning about Botanical pesticides	Government extension workers	30.0	35.3	11.1	41.2	41.7	47.1
	Farmer group members						
	NGOs	10.0		11.1			2.9
	Other farmers	60.0	64.7	77.8	52.9	58.3	50.0
	Radio				5.9		
	Demonstration / research sites						
source of learning about Row planting	Government extension workers	46.9	54.0	46.9	55.9	52.5	50.2
	Farmer group members		0.6		0.7		0.9
	NGOs	3.2	8.6	2.0	2.1		3.2
	Other farmers	50.0	33.9	51.0	36.6	45.9	40.6
	Radio				2.8		2.8
	Demonstration / research sites		2.9		2.1	1.6	2.3

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
source of learning about Planting Density	Government extension workers	44.2	53.2	47.8	52.8	49.0	45.1
	Farmer group members				1.4		1.5
	NGOs	3.8	9.5	4.3	2.1	2.0	4.6
	Other farmers	51.9	34.2	47.8	38.9	46.9	43.1
	Radio				2.8		2.6
	Demonstration / research sites		3.2		2.1	2.0	3.1

Table 3.7.5: Percentage distribution of respondents by principal source of knowledge/awareness crop technologies (Panel 5)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
source of learning about Thinning	Government extension workers	35.3	45.0	31.6	42.4	43.3	40.6
	Farmer group members				0.7		0.5
	NGOs	4.0	9.9	2.6	3.6	1.7	5.2
	Other farmers	58.8	42.4	65.8	49.6	53.3	49.1
	Radio	2.0	0.7		1.4		2.8
	Demonstration / research sites		2.0		2.2	1.7	1.9
source of learning about Inorganic fertilizer application	Government extension workers	45.8	47.8	39.4	39.9	38.4	39.5
	Farmer group members				1.1		2.0
	NGOs	5.1	7.6	9.9	6.7	2.7	4.0
	Other farmers	47.5	42.4	49.3	50.0	57.5	52.0
	Radio	1.7	0.5	1.4	1.7		2.0
	Demonstration /		1.6		0.6	1.4	0.4

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
	research sites						
source of learning about Animal manure	Government extension workers		9.9		11.4	12.5	16.2
	Farmer group members				0.9		1.2
	NGOs		10.8	11.8	11.4	2.5	9.0
	Other farmers	100.0	77.5	88.2	76.3	85.0	73.1
	Radio		0.9				0.6
	Demonstration / research sites		0.9				

Table 3.7.5: Percentage distribution of respondents by principal source of knowledge/awareness crop technologies (Panel 6)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
source of learning about Composting and organic residue management	Government extension workers		28.6		23.8	33.3	29.2
	Farmer group members				2.4		1.5
	NGOs		14.3	40.0	14.4		4.6
	Other farmers	100.0	54.3	60.0	59.5	55.6	63.1
	Radio						1.5
	Demonstration / research sites		2.9			11.1	
source of learning about Legume-cereal rotation	Government extension workers	7.7	11.5	4.0	9.2	6.7	20.4

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
	Farmer group members				1.5		
	NGOs		4.9	4.0	4.6	3.3	4.3
	Other farmers	88.5	83.6	88.0	81.5	90.0	74.2
	Radio			4.0	3.1		1.1
	Demonstration / research sites						
source of learning about Method of fertilizer application	Government extension workers	54.9	56.6	61.5	47.7	48.1	45.6
	Farmer group members				1.3	1.9	1.3
	NGOs	2.0	7.2	5.1	2.0	3.8	4.4
	Other farmers	41.2	32.5	33.3	45.0	42.3	46.0
	Radio	2.0	2.4		3.3	1.9	2.7
	Demonstration / research sites		1.2		0.7	1.9	

Table 3.7.5: Percentage distribution of respondents by principal source of knowledge/awareness crop technologies (Panel 7)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
source of learning about Cover crops	Government extension workers		21.4	33.3		33.3	9.4
	Farmer group members						
	NGOs		21.4		14.2		
	Other farmers	100.0	57.1	66.7	85.7	66.7	81.3
	Radio						9.4
	Demonstration / research sites						

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
source of learning about Drying	Government extension workers	31.3	39.1	43.5	38.6	53.3	36.5
	Farmer group members		1.4				
	NGOs	12.5	15.9	21.7	15.8		14.1
	Other farmers	56.3	42.0	34.8	45.6	46.7	45.9
	Radio						2.4
	Demonstration / research sites		1.4				1.2
source of learning about Threshing/shelling equipment	Government extension workers	4.4	15.4	9.5	9.9	9.5	23.1
	Farmer group members		1.5		1.4	4.8	
	NGOs	4.3	9.2	9.5	2.8		4.1
	Other farmers	82.6	70.8	76.2	84.5	85.7	69.4
	Radio	8.7	1.5	4.8	1.4		3.3
	Demonstration / research sites		1.5				

Table 3.7.5: Percentage distribution of respondents by principal source of knowledge/awareness crop technologies (Panel 8)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
source of learning about Improved storage facilities	Government extension workers	20.0	23.3	37.5	20.6	25.0	26.7
	Farmer group members		2.3		2.9		
	NGOs	10.0	20.9	12.5	5.8		8.3
	Other farmers	50.0	44.2	37.5	50.0	75.0	55.0
	Radio	20.0	4.7	12.5	20.6		10.0
	Demonstration / research sites		4.6				
source of learning about Pest control	Government extension workers	17.6	34.5	47.1	27.4	15.4	30.8
	Farmer group members		1.2		2.7		
	NGOs	17.6	15.5	5.9	2.8		11.7
	Other farmers	64.7	46.4	47.1	63.0	76.9	52.5
	Radio				4.1	7.7	4.2
	Demonstration / research sites		2.4				0.8
source of learning about Grading	Government extension workers		15.0		5.9		22.0
	Farmer group members						
	NGOs	22.2	10.0	25.0	17.7		9.8
	Other farmers	77.8	75.0	75.0	76.5	100.0	65.9
	Radio						2.4
	Demonstration / research sites						

Table 3.7.5: Percentage distribution of respondents by principal source of knowledge/awareness crop technologies (Panel 9)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
source of learning about improved variety	Government extension workers	55.8	59.8	48.7	49.4	31.3	41.1
	Farmer group members		0.9		1.2		0.9
	NGOs	4.7	8.4	7.7	6.2	6.3	4.6
	Other farmers	34.9	24.3	38.5	35.8	56.3	45.8
	Radio		0.9	5.1	1.2	3.1	5.6
	Demonstration / research sites	4.7	5.6			3.1	1.8

Table 3.7.5: Percentage distribution of respondents by principal source of knowledge/awareness of livestock technologies (Panel 10)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
source of learning about Improved goats	Government extension workers	15.0	28.1	20.0	13.5	13.3	13.6
	Farmer group members		4.7		3.8		7.4
	NGOs	10.0	12.5				7.4
	Other farmers	20.0	31.3	80.0	71.2	46.7	60.5
	Radio	5.0	9.4		1.9		8.6
	Demonstration / research sites	50.0	14.1		9.6		2.5
source of learning about	Government extension workers	19.5	33.0	20.6	21.6	16.1	14.4

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
goat drugs							
	Farmer group members		4.0		3.4		4.2
	NGOs	19.5	19.0	29.4	5.7		9.4
	Other farmers	41.5	33.0	50.0	61.4	74.2	63.6
	Radio	4.9	3.0		3.4	6.5	7.6
	Demonstration / research sites	14.6	8.0		4.5	3.2	0.8
source of learning about goat supplementary feed	Government extension workers	3.8	31.0	14.3	14.3	4.0	14.9
	Farmer group members		2.8		2.9		3.2
	NGOs	11.5	9.9				7.4
	Other farmers	38.5	40.8	85.7	74.3	84.0	67.0
	Radio	7.7	4.2		2.9	8.0	7.4
	Demonstration / research sites	38.5	11.3		5.7	4.0	

Table 3.7.5: Percentage distribution of respondents by principal source of knowledge/awareness of livestock technologies (Panel 11)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
source of learning about Improved sheep	Government extension workers	10.0	31.0	18.2	15.7	7.1	14.5
	Farmer group members		5.2		3.9		6.0
	NGOs	10.0	12.1	9.1			7.2
	Other farmers	20.0	32.8	72.7	70.6	57.1	62.7
	Radio	10.0	6.9		2.0	28.6	7.2

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
	Demonstration / research sites	50.0	12.1		7.8	7.1	2.4
source of learning about sheep drugs	Government extension workers	23.5	33.8	25.9	18.5	16.7	16.5
	Farmer group members		6.3		3.7		4.6
	NGOs	11.8	12.6	18.5	6.2		9.2
	Other farmers	41.2	36.3	55.6	64.2	73.3	60.6
	Radio		2.5		2.5	6.7	8.3
	Demonstration / research sites	17.6	8.8		4.9	3.3	0.9
source of learning about sheep supplementary feed	Government extension workers	8.3	30.3	15.4	15.2	10.0	13.8
	Farmer group members		3.0		3.0		2.1
	NGOs	8.3	9.1				7.4
	Other farmers	33.3	42.4	84.6	74.2	75.0	70.2
	Radio	8.3	4.5		1.5	10.0	6.4
	Demonstration / research sites	41.7	10.6		6.1	5.0	

Table 3.7.5: Percentage distribution of respondents by principal source of knowledge/awareness of livestock technologies (Panel 12)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
source of learning about Improved	Government extension workers	15.0	34.4	13.3	19.2	6.7	13.2

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
chicken (broilers or layers)							
	Farmer group members		4.4		3.8		4.4
	NGOs	5.0	7.8	6.7	2.6		9.6
	Other farmers	42.5	38.9	73.3	64.1	83.3	64.7
	Radio	5.0	3.3		1.3	6.7	7.4
	Demonstration / research sites	32.5	11.1	6.7	9.0	3.3	0.7
source of learning about chicken drugs	Government extension workers	22.5	32.9	21.2	19.2	13.3	14.0
	Farmer group members		5.9		4.1		2.5
	NGOs	7.5	8.2	9.1	1.4		9.9
	Other farmers	40.0	40.0	63.6	63.0	76.7	63.6
	Radio	5.0	2.4		2.7	3.3	9.1
	Demonstration / research sites	25.0	1.6	6.1	9.6		0.8
source of learning about chicken supplementary feed	Government extension workers	16.2	34.2	11.5	23.9	7.4	13.0
	Farmer group members		3.8		4.2		5.2
	NGOs	8.1	11.4	11.5			8.7
	Other farmers	40.5	35.4	76.9	63.4	81.5	66.1
	Radio	2.7	3.8		1.4	7.4	7.0
	Demonstration / research sites	32.4	11.4		7.0	3.7	

Participation in research or extension demonstrations:

Table 3.7.6 shows the percentage of respondents who participated in research or extension demonstrations. With the exception of the male respondents in the adopted village, less than 45% of the households participated in research or extension demonstrations across the village strata.

This is surprising, given the relatively strong weight attached to demonstration plots for both research and extension services in our earlier results.

Table 3.7.6: Percentage of respondents who participated in research or extension demonstrations (% yes).

Gender	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Female	37.4 (99)	28.9 (83)	32.3 (65)
Male	61.2 (227)	31.6 (225)	43.7 (286)

Note: for each x(y), x=percentage, y= number responding

Participation in specific types of technology research:

Table 3.7.7 shows the percentage of respondents who participated in the demonstration of the technologies listed. The results presented suffered a bit of data problem since computations were based on those who participated as shown previously in Table 3.7.6. The broad indication from Table 3.7.7, however, is that at least 30% of responding households participated in the listed research demonstrations, in at least one village and gender strata.

Table 3.7.7: Percentage of respondents who participated in the demonstration of the technologies listed (% yes)

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Research for:	Female (9)	Male (22)	Female (2)	Male (13)	Female (2)	Male (25)
Improved varieties/ Planting material	38.1	48.9	70.0	50.0	0.0	51.9
Chemical Fertilizer	66.7	44.3	50.0	42.1	0.0	46.2
Organic fertilizer	60.0	54.5	100.0	25.0		56.0
Spacing	45.5	48.6	100.0	36.4	50.0	57.1
Soil Water management practices (e.g. mulching)	75.0	65.0	100.0	23.1		53.8

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Research for:	Female (9)	Male (22)	Female (2)	Male (13)	Female (2)	Male (25)
Plant protection	57.1	56.5	100.0	31.6	100.0	46.2
Weed control	60.0	56.1	100.0	50.0	50.0	60.0
Post-harvest technologies	75.0	62.5	100.0	31.3		52.2
Livestock breeds	50.0	42.3		100.0		33.3
Livestock pasture/feeds						
Veterinary services	44.4	36.4		100.0		0.0
Aquaculture	33.3	67.7	60.0	61.5	100.0	72.0

Note: for many of the "yes" percentages in the table, the underlying number of cases were typically <10. So, the percentages may be unstable for robust inferences.

Decision on the type of agricultural technologies to be demonstrated:

Table 3.7.8 shows the inclusiveness in the decisions regarding the type of agricultural technologies to be demonstrated. This table shows that farmers play limited roles in deciding the type of agricultural technologies to be demonstrated to them across the village strata. Responsibilities for this decision largely reside within the research and extension establishments, thus reechoing the well known top-down intervention syndrome.

Table 3.7.8: Percentage distribution of households by who decided on type of agricultural technologies to be demonstrated

	Adopted village (146)	Non-adopted village (near) (60)	Non-adopted village (remote) (112)
Researchers and extension officers only	53.4	50.0	37.5
Researchers only	14.4	8.3	3.6
Extension officers only	6.8	16.7	38.4
Researchers, Extension officers and farmers	25.3	18.3	19.6
Farmers		6.7	0.9

Research effect on adoption decisions:

Tables 3.7.9 and 3.7.10 show the percentage of respondents who adopted technology based on the underlying research and extension activities. Aside from the data problem with a few result cells, the general indication is that at least 50% of the respondents in at least one village and gender strata adopted the listed technologies based on the various research and extension activities exposed to them.

Table 3.7.9: Percentage of respondents who adopted technology based on the underlying research activity (% yes)

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female (12)	Male (71)	Female (5)	Male (20)	Female (4)	Male (21)
Improved varieties/ Planting material	78.9	89.1	100.0	100.0	100.0	91.1
Chemical Fertilizer	83.3	86.4	50.0	95.0	100.0	83.8
Organic fertilizer	60.0	90.9	100.0	86.7		83.3
Spacing	81.8	90.1	100.0	95.5	100.0	87.8

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female (12)	Male (71)	Female (5)	Male (20)	Female (4)	Male (21)
Soil Water management practices (e.g. mulching)	80.0	76.2	100.0	100.0		76.0
Plant protection	85.7	89.1	100.0	90.0	100.0	84.6
Weed control	70.0	89.2	100.0	95.5	75.0	95.3
Post-harvest technologies	75.0	83.3	100.0	100.0		90.9
Livestock breeds	66.7	56.0		100.0		50.0
Livestock pasture/feeds	72.7	45.5		100.0		0.0
Veterinary services	75.0	50.0		100.0		100.0
Aquaculture	50.0	76.7	100.0	92.9	100.0	96.0

Note: for many of the "yes" percentages in the table, the underlying number of cases were typically <10. So, the percentages may be unstable for robust inferences.

Table 3.7.10: Percentage of respondents who adopted technology based on the received extension services (% yes).

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Improved varieties/ Planting material	93.3	93.5	100.0	85.7	100.0	91.2
Chemical Fertilizer	100.0	93.5	100.0	85.7	83.3	88.7

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Organic fertilizer	75.0	80.8	100.0	66.7	100.0	63.3
Spacing	90.0	90.6	100.0	89.7	85.7	93.9
Soil Water management practices (e.g. mulching)	75.0	61.9	100.0	66.7	100.0	77.8
Plant protection	70.0	86.0	100.0	95.5	66.7	94.3
Weed control	70.0	92.2	100.0	90.0	87.5	94.5
Post-harvest technologies	80.0	82.6	100.0	87.5	100.0	87.0
Livestock breeds	100.0	69.2		50.0	0.0	50.0
Livestock pasture/feeds	100.0	41.7		60.0	100.0	0.0
Veterinary services	80.0	76.2		100.0	100.0	50.0
Aquaculture	85.7	73.3	100.0	76.5	66.7	95.5

Note: for most of the 0%, 50% and 100% “yes” percentages in the table, the underlying number of cases were typically small (n<10). Such results are only indicative and may be unstable for robust inferences.

Request for extension services:

For each of the technologies in Table 3.7.11, the survey sought to know who asked or requested for extension services. The essence is to determine the extent to which extension services are demand-driven among the households. It is noteworthy that in the adopted village at least 30% of all respondents indicate extension services to be demand-driven. However, while similar results are found in the non-adopted village (near) and non-adopted village (remote), there is notably some strata in which no household requested/asked for the extension services provided.

Table 3.7.11: Percentage of respondents who asked for extension service in respect of selected technologies (% yes)

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Asked for :	Female	Male	Female	Male	Female	Male
Improved varieties/ Planting material	40.0	46.8	76.9	45.5	25.0	41.8
Chemical Fertilizer	42.9	35.4	50.0	37.9	33.3	38.5
Organic fertilizer	75.0	52.0	0.0	33.3	50.0	41.4
Spacing	27.3	48.1	33.3	44.4	14.3	42.9
Soil Water management practices (e.g. mulching)	75.0	35.0	0.0	46.2	0.0	62.5
Plant protection	30.0	40.0	66.7	50.0	0.0	50.0
Weed control	27.3	56.0	75.0	55.2	37.5	58.5
Post-harvest technologies	80.0	40.9	0.0	50.0	0.0	66.7
Livestock breeds	75.0	50.0		50.0	0.0	0.0
Livestock pasture/feeds	75.0	25.0		60.0	100.0	
Veterinary services	50.0	52.4		50.0	100.0	0.0
Aquaculture	57.1	43.3	80.0	70.6	33.3	59.1

Note: for most of the 0%, 50% and 100% “yes” percentages in the table, the underlying number of cases were typically small (n<10). Such results are only indicative and may be unstable for robust inferences.

Feedback on technology demonstrations:

Table 3.7.12 shows the households' assessment of the usefulness of the agricultural technologies demonstrated. Significantly, at least 80% of respondents across gender and village strata rate the research demonstrations as either useful very useful.

Table 3.7.12: Percentage distribution of households by assessment of the usefulness of agricultural technology demonstration.

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
	Not useful						1.1
	Somewhat useful	5.9			2.2	10.0	3.3
	Useful	47.1	49.1	37.5	60.0	65.0	64.8
	Very useful	47.1	50.9	62.5	37.8	25.0	30.8

Subject matter trainings:

Aside from research and extension demonstrations, farming households also and occasionally benefit from subject matter training aimed at building their capacities. Table 3.7.13 shows the percentage of respondents in each gender and village stratum that participated in subject matter training. Except for the non-adopted village (near), at least 30% of the respondents across village and gender strata participated in subject matter trainings. Also, in Table 3.7.14, the trainings were asked for by at least 30% of the respondents in at least one village and gender strata.

Table 3.7.15 shows the subject matters on which the trainings were based. These include crop management, pest and disease control, livestock management, and specific agricultural technologies (e.g. new crop varieties). As shown in the table, crop management attracted most of the households, followed but not closely by livestock management across the village strata.

Table 3.7.16 shows the households' assessment of the various methods used in delivering the subject matter trainings. Significantly, across all village and gender strata, at least 70% of all respondents rate the training methods as either good or very good.

Table 3.7.13: Percentage of households who participated in subject matter training (% yes)

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Female	45.1	22.9	31.3
Male	51.5	22.7	38.5

Table 3.7.14: Percentage of households who asked for subject matter training (% yes)

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Female	23.9	36.8	0.0
Male	40.3	51.0	38.3

Table 3.7.15: Percentage distribution of households by subject matter trainings received

	Adopted village (146)	Non-adopted village (near) (64)	Non-adopted village (remote) (115)
Crop management	61.6	73.4	82.6
Pest and disease control	6.2	1.6	1.7
Livestock management	24.0	15.6	7.0
Specific agricultural technologies (e.g. new crop varieties)	8.2	9.4	8.7

Table 3.7.16: Percentage distribution of households by assessment of the subject matter trainings received.

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Assessment of methods	Female	Male	Female	Male	Female	Male
Very poor	2.2	1.7		11.1		1.9
Poor	4.3	0.8				0.9

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Don't know				1.9		2.8
Good	65.2	62.2	47.4	63.0	75.0	70.4
Very good	28.3	35.3	52.6	24.1	25.0	24.1

3.8 CONSTRAINTS AND OPPORTUNITIES IN NIGERIA'S AGRICULTURAL SECTOR

The study team's approach to preparing this section of the report is to articulate, on the one hand, the constraints to increasing the productivity of the priority commodities, and on the other hand, the opportunities for making the priority commodities more competitive.

Selected constraints to increasing the productivity of the priority commodities:

Input accessibility:

Table 3.8.1 (presented in 4 panels to minimize table overflow) shows the percentage distribution of households by perception of input accessibility, with reference to Inorganic Fertilizer, Herbicides, Fungicides, Insecticides, Manure, Certified seed, Seed dressing, Post harvest insect control, Farm equipments, Water pumps, Livestock supplementary feed, Livestock drugs, Aquaculture feeds and Aquaculture drugs. Households were given four ordinal ratings of accessibility of inputs, namely, no access, low access, medium access, and easy/high access. While each of the ratings showed relevance, the inputs which at least 50% of the households rated as either medium access or easy/high access include Inorganic Fertilizer, Herbicides, Insecticides, Manure, Post harvest insect control, Farm equipments, Livestock supplementary feed, and Livestock drugs. Also, the inputs which at least 50% of the households rated as no access or low access include Fungicides, Certified seed, Seed dressing chemicals, Water pumps, Livestock drugs, Aquaculture feeds and Aquaculture drugs.

Table 3.8.1: Percentage distribution of households by perception of input accessibility (Panel 1)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Input:		Female	Male	Female	Male	Female	Male
Inorganic Fertilizer (NPK, Urea, DAP, SSP, Others)	No access	11.9	2.5	2.7	8.1	1.4	5.4
	Low access	19.0	26.7	17.8	21.8	20.0	26.5
	Medium access	34.5	41.1	49.3	32.5	27.1	30.8
	Easy/high access	34.5	29.7	30.1	37.6	51.4	37.3
Herbicides	No access	35.7	10.3	9.4	9.9	23.5	13.7
	Low access	14.3	14.2	13.2	14.6	2.9	20.6
	Medium access	28.6	45.8	45.3	41.7	20.6	31.4
	Easy/high access	21.4	29.7	32.1	33.8	52.9	34.3
Fungicides	No access	77.5	45.5	69.6	44.0	90.9	53.7
	Low access	12.5	8.8	8.7	13.3		5.0
	Medium access	5.0	11.3	21.7	9.3		15.7
	Easy/high access	5.0	32.5		33.3	9.1	25.6
Insecticides	No access	29.0	12.8	7.8	6.8	17.1	8.8
	Low access	14.5	9.1	7.8	16.4	5.7	16.0
	Medium access	19.4	43.3	47.1	39.7	8.6	35.1
	Easy/high access	37.1	34.8	37.3	37.0	68.6	40.2

Table 3.8.1: Percentage distribution of households by perception of input accessibility (Panel 2)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Input:		Female	Male	Female	Male	Female	Male
Manure	No access	33.3	12.1	2.9	12.2	13.3	5.9
	Low access	3.7	17.2	5.7	11.3		17.8
	Medium access	9.3	18.1	28.6	10.4	16.7	20.0
	Easy/high access	53.7	52.6	62.9	66.1	70.0	56.2

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Input:		Female	Male	Female	Male	Female	Male
Certified seed	No access	63.3	25.4	33.3	23.5	52.9	45.0
	Low access	10.2	18.6	4.2	12.7	14.7	10.7
	Medium access	18.4	30.5	41.7	31.4	23.5	27.5
	Easy/high access	8.2	25.4	20.8	32.4	8.8	16.8
Seed dressing chemicals	No access	70.5	44.3	80.0	47.5	69.2	54.3
	Low access	9.1	17.7	10.0	11.9	11.5	13.8
	Medium access	4.5	16.5	10.0	20.3	11.5	23.3
	Easy/high access	15.9	21.5		20.3	7.7	8.6
Post harvest insect control	No access	59.5	33.0	35.3	24.7	27.6	22.1
	Low access	9.5	14.7	5.9	10.6	3.4	13.1
	Medium access	11.9	14.7	17.6	16.5	3.4	29.7
	Easy/high access	19.0	37.6	41.2	48.2	65.5	35.2

Table 3.8.1: Percentage distribution of households by perception of input accessibility (Panel 3)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Input:		Female	Male	Female	Male	Female	Male
Farm equipments	No access	28.3	20.5	4.5	12.4	2.0	11.4
	Low access	6.7	20.5	6.8	13.3	3.9	12.4
	Medium access	11.7	15.4	20.5	19.0	11.8	26.9
	Easy/high access	53.3	43.6	68.2	55.2	82.4	49.2
Water pumps	No access	65.7	43.8	47.4	37.3	95.0	51.4
	Low access	17.1	24.7	5.3	17.9	5.0	10.3
	Medium access	5.7	15.1	15.8	10.4		19.6
	Easy/high access	11.4	16.4	31.6	34.3		18.7
Livestock supplementary feed	No access	44.0	31.0	23.1	18.8	14.8	24.8

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Input:		Female	Male	Female	Male	Female	Male
	Low access	4.0	12.6		13.8	7.4	9.9
	Medium access	4.0	17.2	26.9	16.3		11.6
	Easy/high access	48.0	39.1	50.0	51.3	77.8	53.7
Livestock drugs	No access	24.6	12.0	9.1	10.3	5.6	8.3
	Low access	3.3	17.1	9.1	18.8		14.5
	Medium access	24.6	35.9	34.1	25.6	16.7	24.8
	Easy/high access	47.5	35.0	47.7	45.3	77.8	52.4

Table 3.8.1: Percentage distribution of households by perception of input accessibility (Panel 4)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Input:		Female	Male	Female	Male	Female	Male
Aquaculture feeds	No access	80.6	62.3	50.0	51.0	79.2	67.0
	Low access	2.8	14.5	25.0	18.4	8.3	4.9
	Medium access	5.6	13.0	12.5	20.4	4.2	12.6
	Easy/high access	11.1	10.1	12.5	10.2	8.3	15.5
Aquaculture drugs	No access	83.3	65.7	60.0	53.2	79.2	71.3
	Low access	11.1	16.4	20.0	17.0	8.3	4.3
	Medium access	5.6	13.4	6.7	17.0	4.2	9.6
	Easy/high access		4.5	13.3	12.8	8.3	14.9

Average distance to inputs:

Ordinarily, access to an input is inversely related to distance to the input. Table 3.8.2 shows the average distance to indicated inputs. It is not clear how to judge which values of distance in Table 3.8.2 are near or far on behalf of the respondents. However, it is of great interest that the inputs which are 12 km or longer from the households in at least one village strata are those previously rated as no access or low access in Table 3.8.1, namely, Fungicides, Certified seed, Seed dressing chemicals, Water pumps, Livestock drugs, Aquaculture feeds and Aquaculture drugs. It is also to be noted that, with the exception of manure, none of the inputs listed is accessible within 3km of the households' villages.

Table 3.8.3, presented in two panels, shows that the ratings of a distance as near or far by the households is different from our cutoff value of 12km. Specifically, with the exception of manure, the distance to virtually all the listed inputs is rated as either far or very far by at least 50% of all households across the village and gender strata.

Table 3.8.2: Average distance to indicated inputs (km)

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Input:	Female	Male	Female	Male	Female	Male
Inorganic Fertilizer (NPK, Urea, DAP, SSP, Others)	9.1	10.9	9.9	10.1	7.9	10.5
Herbicides	9.6	10.4	10.0	9.8	6.2	10.3
Fungicides	17.2	11.3	13.6	10.3	6.0	9.9
Insecticides	8.7	11.7	8.3	9.5	5.2	9.2
Manure	1.3	3.9	2.1	3.0	1.6	3.6
Certified seed	13.0	9.7	7.3	7.8	10.0	11.1
Seed dressing chemicals	12.4	9.5	20.0	9.8	8.5	14.8
Post harvest insect control	9.6	10.7	3.5	8.9	4.4	9.9
Farm equipments	6.4	9.4	6.3	8.5	3.9	7.4
Water pumps	3.7	11.0	7.9	17.3		15.0
Livestock supplementary feed	8.2	8.1	9.8	8.3	3.5	8.7
Livestock drugs	8.9	8.5	7.0	7.8	2.5	8.1
Aquaculture feeds	23.1	24.8	20.8	24.3	13.2	12.9
Aquaculture drugs	25.3	25.8	26.1	22.6	6.5	10.2

Table 3.8.3: Percentage distribution of households by perception of input distance (Panel 1)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Input:		Female	Male	Female	Male	Female	Male
Inorganic Fertilizer (NPK, Urea, DAP, SSP, Others)	Near	22.7	30.9	15.5	30.4	34.8	30.1
	Far	55.4	54.6	70.4	49.2	40.6	53.2
	Very far	16.9	14.4	14.1	20.4	24.6	16.7
Herbicides	Near	37.5	27.1	23.4	35.2	46.2	38.7
	Far	42.5	57.1	68.1	38.7	42.3	50.3
	Very far	20.0	15.7	8.5	26.1	11.5	11.0
Fungicides	Near	14.3	30.4		24.5	50.0	47.4
	Far	35.7	52.2	50.0	37.7	50.0	47.4
	Very far	50.0	17.4	50.0	37.7		5.3
Insecticides	Near	36.2	27.3	25.0	33.3	50.0	39.2
	Far	48.9	55.9	70.8	48.6	39.3	52.0
	Very far	14.9	16.8	4.2	18.1	10.7	8.8
Manure	Near	78.1	80.0	78.3	73.8	90.5	89.5
	Far	18.8	16.0	17.4	16.8	4.8	7.4
	Very far	3.1	4.0	4.3	9.3	4.8	3.1
Certified seed	Near	25.9	24.4	42.1	38.6	31.3	34.1
	Far	51.9	61.1	42.1	38.6	37.5	55.3
	Very far	22.2	14.4	15.8	22.9	31.3	10.6
Seed dressing	Near	31.8	22.2		27.8	12.5	30.5
	Far	40.9	62.2	25.0	33.3	62.5	52.5
	Very far	27.3	15.6	75.0	38.9	25.0	16.9

Table 3.8.3: Percentage distribution of households by perception of input distance (Panel 2)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Input:		Female	Male	Female	Male	Female	Male
Post harvest insect control	Near	29.2	29.7	30.8	37.5	54.5	45.9
	Far	41.7	50.0	61.5	37.5	31.8	43.2
	Very far	29.2	20.3	7.7	25.0	13.6	10.8
Farm equipments	Near	42.0	31.6	27.9	37.7	56.0	50.0
	Far	42.0	51.6	53.5	37.7	38.0	40.2
	Very far	16.0	16.8	18.6	24.5	6.0	9.8
Water pumps	Near	50.0	33.3	36.4	18.0		40.0
	Far	37.5	38.5	45.5	48.0	100.0	32.0
	Very far	12.5	28.2	18.2	34.0		28.0
Livestock supplementary feed	Near	33.3	55.4	23.8	35.2	77.3	56.3
	Far	39.4	30.8	52.4	33.8	13.6	28.1
	Very far	27.3	13.8	23.8	31.0	9.1	15.6
Livestock drugs	Near	45.3	47.7	45.2	43.2	82.9	57.6
	Far	37.7	37.4	40.5	33.9	14.3	28.8
	Very far	17.0	15.0	14.3	22.9	2.9	13.6
Aquaculture feeds	Near		19.0	33.3	10.7		37.5
	Far	27.3	23.8	11.1	39.3	33.3	33.3
	Very far	72.7	57.1	55.6	50.0	66.7	29.2
Aquaculture drugs	Near	8.3	16.0	25.0	16.7	80.0	57.7
	Far	16.7	44.0		43.3	20.0	30.8
	Very far	75.0	40.0	75.0	40.0		11.5

Input costs:

Distance to inputs, whether actual or perceived, is closely and inversely related to input costs. Table 3.8.4 presents in three panels the households' perception about the listed inputs. With the exception of manure, the cost of all other inputs in the list are rated as either medium cost or high

cost by at least 50% of households across the village and gender strata, again in close relationship with the perception or data about distances to the inputs.

Table 3.8.4: Percentage distribution of households by perception of input costs (Panel 1)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Input:		Female	Male	Female	Male	Female	Male
Inorganic Fertilizer (NPK, Urea, DAP, SSP, Others)	Low cost	4.7	7.9	1.4	5.2	4.1	4.0
	Medium cost	35.3	28.6	47.2	26.8	20.5	21.7
	High cost	60.0	63.5	51.4	68.0	75.3	74.4
Herbicides	Low cost	8.3	5.0		5.1	7.7	3.5
	Medium cost	50.0	57.9	72.3	54.4	69.2	52.0
	High cost	41.7	37.1	27.7	40.4	23.1	44.4
Fungicides	Low cost	9.1	6.8		6.4		12.5
	Medium cost	36.4	40.9	37.5	51.1	50.0	48.2
	High cost	54.5	52.3	62.5	42.6	50.0	39.3
Insecticides	Low cost	11.4	5.0		6.1		5.3
	Medium cost	61.4	56.1	77.1	55.3	78.6	48.2
	High cost	27.3	38.8	22.9	38.6	21.4	46.5
Manure	Low cost	52.0	53.1	54.5	56.7		57.4
	Medium cost	28.0	30.6	22.7	25.8	68.2	30.0
	High cost	20.0	16.3	22.7	17.5	31.8	12.3

Table 3.8.4: Percentage distribution of households by perception of input costs (Panel 2)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Input:		Female	Male	Female	Male	Female	Male
Certified seed	Low cost	4.5	7.6	10.5	8.1	12.5	21.7
	Medium cost	45.5	42.4	57.9	40.5	18.8	33.7
	High cost	50.0	50.0	31.6	51.4	68.8	44.6
Seed dressing	Low cost	11.1	2.4		3.4		22.2
	Medium cost	22.2	40.5	25.0	31.0	12.5	29.6
	High cost	66.7	57.1	75.0	65.5	87.5	48.1
Post harvest insect control	Low cost	14.3	8.1	23.1	8.1	13.6	17.0
	Medium cost	23.8	41.9	38.1	54.8	50.0	41.5
	High cost	61.9	50.0	38.5	37.1	36.4	41.5
Farm equipments	Low cost	38.3	22.1	28.6	26.3	41.2	33.7
	Medium cost	21.3	25.3	31.0	23.2	33.3	31.9
	High cost	40.4	52.6	40.5	50.5	25.5	34.1

Table 3.8.4: Percentage distribution of households by perception of input costs (Panel 3)

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Input:		Female	Male	Female	Male	Female	Male
Water pumps	Low cost		2.5		5.1		27.1
	Medium cost		30.0	30.0	17.9	100.0	22.9
	High cost	100.0	67.5	70.0	76.9		50.0
Livestock supplementary feed	Low cost	9.7	3.1	4.8	15.6	8.7	9.5
	Medium cost	38.7	25.0	57.1	29.7	39.1	21.1

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
Input:		Female	Male	Female	Male	Female	Male
	High cost	51.6	71.9	38.1	54.7	52.2	69.5
Livestock drugs	Low cost	25.0	13.6	36.6	14.0	38.9	12.1
	Medium cost	35.4	40.8	39.0	36.4	52.8	42.4
	High cost	39.6	45.6	24.4	49.5	8.3	45.5
Aquaculture feeds	Low cost		4.0				11.8
	Medium cost			10.0	12.5		8.8
	High cost	100.0	96.0	90.0	87.5	100.0	79.4
Aquaculture drugs	Low cost		4.3		4.5		19.2
	Medium cost			25.0	13.6	20.0	3.8
	High cost	100.0	95.7	75.0	81.8	80.0	76.9

Access to commodity markets:

It is widely accepted in the transactions cost literature that the cost of selling any commodity is directly related to market distance. Thus, where a production system lacks easy and quick access to commodity markets, this could result in preponderant disposal of commodities in the village or nearby rural markets. Table 3.8.5 shows the percentage distribution of households by perception of priority crop market distance. There is no clear-cut distribution of respondents in their ratings of distance to priority crop markets. However, across the village and gender strata, the ratings of crop market distance appears to cluster around ‘near’ or ‘far’, and less so for ‘very far’ among the households. This is in broad agreement with Table 3.1.22 in which we saw that priority crops are mostly sold in the village market. A similar trend in the distribution of the households is shown in Table 3.8.6 for the perception about distance to priority livestock and fish markets. It is particularly noteworthy that in the case of chicken (local or improved) and fish, there is a strong cluster of responses around ‘near’ ratings of market distance, possibly underlining some perishability problem.

Table 3.8.5: Percentage distribution of households by perception of priority crop market distance

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
Sorghum	Near	40.9	53.6	46.2	36.1	42.1	58.3
	Far	54.5	39.1	30.8	43.1	42.1	37.4
	Very far	4.5	7.2	23.1	20.8	15.8	4.3
Rice	Near	42.9	60.4	30.8	49.3	60.0	63.3
	Far	57.1	30.2	61.5	36.0	40.0	33.3
	Very far		9.4	7.7	14.7		3.3
Maize	Near	45.2	44.0	42.1	31.3	63.0	47.4
	Far	47.6	49.6	42.1	45.5	34.8	45.4
	Very far	7.1	6.4	15.8	23.1	2.2	7.2
Cassava	Near	26.3	39.4	44.1	44.0	54.5	48.7
	Far	71.1	53.0	41.2	33.0	39.4	39.5
	Very far	2.6	7.6	14.7	23.1	6.1	11.8
Yam	Near	35.7	47.1	50.0	38.3	66.7	35.5
	Far	50.0	47.1	14.3	36.2	22.2	54.8
	Very far	14.3	5.9	35.7	25.5	11.1	9.7

Table 3.8.6: Percentage distribution of households by perception of priority livestock and fish market distance

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
Local goats	Near	52.9	58.7	54.5	60.6	78.1	75.7
	Far	38.2	32.0	36.4	28.2	21.9	21.4
	Very far	8.8	9.3	9.1	11.3		2.9
Local sheep	Near	44.4	55.8	63.6	60.0	80.0	71.4
	Far	37.0	30.2	31.8	25.7	20.0	23.2
	Very far	18.5	14.0	4.5	14.3		5.4

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
Improved chicken	Near	53.3	68.4	75.0	40.9	100.0	83.3
	Far	20.0	21.1	16.7	45.5		10.0
	Very far	26.7	10.5	8.3	13.6		6.7
Local chicken	Near	73.3	75.5	63.0	73.2	90.0	88.8
	Far	26.7	20.4	37.0	17.9	10.0	11.3
	Very far		4.1		8.9		
Fish	Near	50.0	80.8	69.2	90.0	85.7	80.0
	Far		7.7	23.1	10.0	14.3	20.0
	Very far	50.0	11.5	7.7			

Note: improved goats and sheep results are omitted in this table in view of their virtual non-existence in Table 3.3.13.

Post-harvest handling:

One of the key constraints to agricultural productivity increase and competitiveness in Nigeria is the prevalence of poor post-harvest handling of commodities. As shown in Table 3.8.7, virtually all the priority crops are sold as harvested (raw) or in shelled/peeled form. Little or no processing takes place, resulting in poor financial rewards to the primary producers. As a case in point, Nigeria leads the world in cassava tuber production, but controls less than 1% of the world's cassava products market because she lacks infrastructure for value addition.

Table 3.8.7: Percentage distribution of households by form of priority crops sold

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
Sorghum	as harvested/fresh	9.1	10.6	30.8	20.3	11.1	8.2
	Shelled/ peeled	90.9	87.9	61.5	79.7	88.9	90.9
	milled/as flour		1.5				0.9
	cooked/baked/conserved			7.7			

		Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
		Female	Male	Female	Male	Female	Male
Rice	as harvested/fresh	57.1	41.3	57.1	44.3	60.0	26.5
	Shelled/ peeled	42.9	56.5	42.9	55.7	40.0	63.9
	milled/as flour		2.2				
	cooked/baked/conserved						
Maize	as harvested/fresh	51.2	53.7	56.4	56.3	47.8	37.0
	Shelled/ peeled	48.8	45.5	41.0	43.0	52.2	61.4
	milled/as flour		0.8	2.6			1.1
	cooked/baked/conserved				0.7		0.5
Cassava	as harvested/fresh	85.7	77.6	82.4	89.0	81.8	84.7
	Shelled/peeled	2.9	1.5	2.9		3.0	
	milled/as flour	8.6	17.9	14.7	11.0	15.2	14.4
	cooked/baked/conserved	2.9	3.0				0.8
Yam	as harvested/fresh	87.5	100.0	92.9	95.7	88.9	98.4
	Shelled/peeled						
	milled/as flour	12.5		7.1	4.5	11.1	1.6
	cooked/baked/conserved						

Market organization:

Agricultural marketing efficiency and returns to marketing is determined by market organization. Under conditions of poor access to inputs, costly inputs and poor access to commodity markets, marketing efficiency may be reduced when producers are poorly organized. Table 3.8.8 and Table 3.8.9 show the organizations of households for the sale of the priority crops, livestock and fish, respectively. The prevalent method of commodity sale is individual rather than collective efforts. Collective efforts to marketing are expected to share and spread associated risks and costs of marketing, and possibly reward individual members beyond accruals to individual efforts.

Table 3.8.8.: Percentage distribution of households by methods of marketing priority crops

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Sorghum	Individually	86.2	92.2	99.2
	Collectively	13.8	7.1	0.8
Rice	Individually	85.2	93.0	98.1

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
	Collectively	14.8	7.0	1.9
Maize	Individually	82.0	87.1	93.3
	Collectively	18.0	12.9	6.7
Cassava	Individually	72.8	83.1	89.4
	Collectively	27.2	16.9	10.6
Yam	Individually	63.3	90.0	91.4
	Collectively	36.7	10.0	8.6

Table 3.8.9: Percentage distribution of households by methods of marketing priority livestock

		Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Local goats	Individually	100.0	97.2	96.2
	Collectively		2.8	3.8
Local sheep	Individually	91.4	94.8	94.1
	Collectively	8.6	5.2	5.9
Improved chicken	Individually	66.7	91.4	75.0
	Collectively	33.3	8.6	25.0
Local chicken	Individually	98.7	94.1	97.0
	Collectively	1.3	5.9	3.0
Fish	Individually	68.6	81.8	85.1
	Collectively	31.4	18.2	14.9

Note: improved goats and sheep results are omitted in this table in view of their virtual non-existence in Table 3.3.13

Constraints associated with aquaculture management:

The assessments of households' access to aquaculture feeds and drugs have already been presented (Table 3.8.1, panel 4). To put these problems in context, we present Table 3.8.10 to show the percentage of respondents by who own feed mill. Against the dismal percentage of households owning feed mills, it is expected that fish feeds, the core input in aquaculture management, is outside the control of the practicing households. Not surprising, Table 3.8.11 shows that virtually all the aquaculture managers in the survey depend on commercial fish feed for feeding their fish. Viewed against prevailing labour costs and wage rates (Table 3.8.12 and Table 3.8.13), fish feeding appears to account for the largest portion of the overall variable costs in aquaculture management among the households (see Table 3.8.14).

This trend has negative implications for the efficiency and competitiveness of the aquaculture management, having noted previously that feeds and drugs are poorly accessed and fish are disposed primarily at village /nearby markets.

The prevalent fish feeding regime is the intensive option (Table 3.1.34). This, together with poor access to feeds (in terms of costs and distance) is expected to affect the productivity and competitiveness of the aquaculture sector.

Table 3.8.10: Percentage of respondents by who own feed mill (% yes)

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Female	0.0(77)	2.6(76)	1.6(61)
Male	1.7(177)	0.6(181)	2.6(268)

Note: for each x(y), x=percentage, y= number responding

Table 3.8.11: Percentage distribution of respondents by type of fish feed fed

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
Commercial fish feed	100.0	96.7	100.0	92.0	100.0	97.6
Self composed fish feed		3.3		8.0		2.4
	100.0(8)	100.0(30)	100.0(5)	100.0(25)	100.0(5)	100.0(41)

Table 3.8.12: Average quantity of labour used by type, operations and gender in aquaculture (mandays) , disaggregated by gender

	Adopted village		Non-adopted village (near)		Non-adopted village (remote)	
	Female	Male	Female	Male	Female	Male
total labour, Sweeping & cleaning	9.7	7.2	4.9	3.6	6.3	4.9
total labour, Feeding fish	14.7	14.3	16.0	14.9	7.7	15.3
total labour, Mending nets	7.5	4.5	9.0	3.3	5.0	4.1
total labour, Selling fish	9.2	8.9	9.0	5.7	9.3	7.7
total labour, Keeping records	12.2	10.9	12.0	9.4	6.7	11.3
total labour, Smoke-drying fish	12.0	7.7	4.0	4.3	5.5	5.4
total labour, Other activity	12.2	16.5	17.5	15.3	15.0	16.9
total labour , all aquaculture activities	70.8	54.0	56.6	43.0	45.3	53.5
total labour cost, all aquaculture activities	79,500.00	33,638.46	43,533.33	28,092.86	19,550.00	36,550.00

Table 3.8.13: average wage rate in aquaculture (Naira/manday)

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Female	850.00	743.33	700.00
Male	584.61	709.38	591.38

Table 3.8.14: Sample averages of selected parameters in fish feeding

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Number of production cycles per year	2.5	2.1	2.1
Feeding cost per production cycle	477,282.05	359,683.33	589,133.33
Feeding cost per year	1,495,081.10	719,700.00	1,292,636.40

Mortality in aquaculture management:

Households were asked to estimate fish mortality, simply as the number of fish lost out of every 10 reared. Table 3.8.15 presents the results, which in percentage terms, varies from 13% to 21% across the village strata, if we set aside the underlying data problem inherent in some of the computations. In the aggregate, this level of fish loss at production level can constitute huge financial losses, which can exacerbate the poor productivity and competitive regimes already discussed. Table 3.8.16 shows the percentage distribution of respondents by the main reason given for fish mortality. Poor water quality is the main reason given by the aquaculture producers, followed by diseases, for the observed fish mortality in their production systems.

Table 3.8.15: Average fish mortality by gender (number per 10 fishes).

	Adopted village	Non-adopted village (near)	Non-adopted village (remote)
Female	2.1(8)	1.3 (8)	1.6 (5)
Male	2.1(30)	1.4 (25)	1.7 (41)

Note: for each x(y), x=percentage, y= number responding

Table 3.8.16: Percentage distribution of respondents by the main reason given for fish mortality

Reasons for fish mortality	Adopted village (37)	Non-adopted village (near) (31)	Non-adopted village (remote) (47)
External pollution	27.0	0.0	4.3
Poor water quality	40.5	54.8	40.4
Predators	5.4	12.9	8.5
Diseases	21.6	32.3	29.8
Poor feeding	5.4	0.0	10.6
Poaching / theft	0.0	0.0	2.1
Other	0.0	0.0	4.3

Recommendations

1. The qualitative establishment of the ecological relevance/suitability or otherwise of the priority agricultural commodities in this study again points to the need to focus on particular ecological domains for the promotion of certain commodities, towards maximizing productivity potentials of such commodities;

2. The virtual non-existence of improved goats, sheep and poultry among livestock owning households poses challenge for the improvement in both research and extension investment;

3. The dominance of the local market for the sale of the priority crops and local livestock points to the need for improved access to other markets, enabled by better road and transport facilities;

4. The preference of fish producing households for on-farm sale to consumers attests to the concern for perishability of the product and the ensuring risk of distant transportation of the product on poor road conditions;

5. The existence of strong production, savings and credit associations among the households, if strengthened, provides good opportunity for efficient group-targeted distribution of productivity enhancing technologies where and when available;

6. As the study established that men own and operates larger amount of lands than women, there is the need for policies that grants improved or equitable access to agricultural lands, especially where agriculture engages more women;

7. Fertilizer usage is lower than generally recommended both on per capita or per Hectare basis, pointing in the direction of depressed crop productivity unless this scenario is reversed;

8. The study established that men uses larger amount of fertilizers, labour and improved seeds than women, suggesting the need for policies that grants improved or equitable access to agricultural inputs, especially where agriculture engages more women;

9. The study established that aquaculture is mainly private sector led, but men own larger number of ponds and larger pond sizes than women, suggesting the need for policies that aids women to scale over the limiting factors within the aquaculture sector;

10. With less than 5% of the respondents owning fish hatchery (thus sourcing fingerlings mainly from private farms and government fish farms), there is the need to reduce the overarching cost and vulnerability implications implied by this dependency scenario;

11. Machetes/ Cutlasses/Hoes continue to dominate the agricultural assets found among the households, which needs to be reversed if the productivities of improved technologies are to be achieved;

12. Assets owned by wives are predominantly under the control of husbands, which without some gender enlightenment, could continue to hurt aggregate farm productivity, especially where agriculture engages more women;

13. The study established the dominance of relatives/friends as the source of agricultural credit above commercial banks and micro-finance institutions, which needs critical re-examination under the urgent desire for greater access to productivity enhancing inputs and practices;

14. The study established that men had access to more credit than women, suggesting the need for policies that aids women to scale over the credit limiting factors in the interest of the overall national production;

15. The amount of income from crop sale ranked 1st only once across 6 village/gender strata, while livestock income value ranked 2nd consistently across the rest of the gender and village strata. Other sources of income appear to push back crop farming in terms of value. Thus, strictly focusing on crop agriculture as a basis for welfare improvement among target and spillover beneficiaries may lead to under-achievement of project objectives unless a holistic approach is adopted.

16. Poverty incidence tops 80% across all village and gender strata at the $1.00 poverty line, and clearly worsens at $1.25 per day. Also of significance is that, at each poverty line, the

poverty incidence is higher among female respondents across all village strata. Both results points to the urgency of productivity improvement among the target and spillover beneficiaries of WAAPP;

17. Using either the traditional or technical computation, adoption rates of most of the technologies in this study are in the double digits, with substantial room for improvements;

18. The dominant response across the village strata is that male extension agents visit the female respondents more than female agents. This is of crucial policy relevance because in situations where male extension agents have limited or no access to female farmers, delivery of extension messages will have to rely on male members of the households. This may create inherent message delivery problems unless corrected;

19. The most important extension method is the visit of the government extension agents to farmers. The surprising anomaly is that 'other farmers' dominate all other sources of awareness (even government extension workers) about the crop and livestock technologies presented. This is of great policy significance and needs further examination, because the rating of government agencies as the most important extension bodies has not translated into households relying on them as the most important source of knowledge about technologies.

20. With the exception of manure, the distance to virtually all the listed inputs is rated as either far or very far by at least 50% of all households across the village and gender strata. Again, with the exception of manure, the cost of all other inputs in the list are rated as either medium cost or high cost by at least 50% of households across the village and gender strata This situation needs urgent policy intervention if the desired productivity enhancement is to be achieved;

21. With virtually all the priority crops are sold as harvested (raw) or in shelled/peeled form, and little or no processing taking place, farmers and the nation will be ultimately poorly rewarded from enhanced physical on-farm production, unless post harvest facilities are promoted concurrently;

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