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LOCAL GOVERNMENT FINANCING AND PROVISION IN AN INSTITUTIONALLY CONSTRAINED DECENTRALIZED SYSTEM: THE CASE OF AGRICULTURAL EXTENSION IN UGANDA

BY

Abdu Muwonge

A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree
of
Doctor of Philosophy
in the
Andrew Young School of Policy Studies
of
Georgia State University

GEORGIA STATE UNIVERSITY
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ACCEPTANCE

This dissertation was prepared under the direction of the candidate's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics in the Andrew Young School of Policy Studies of Georgia State University.

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The views expressed in this dissertation are those of the author and not any other institution to which the author has been affiliated. I assume responsibility of any mistakes in this dissertation.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS IV

TABLE OF CONTENTS VII

LIST OF TABLES IX

ABSTRACT XIII

CHAPTER ONE. BACKGROUND TO THE STUDY 1

Introduction 1

Organization of the study 18

CHAPTER TWO. DECENTRALIZED APPROACHES TO AGRICULTURAL EXTENSION 19

Introduction 19

Prior to decentralized extension approaches 24

A review of decentralized extension programs 27

How the NAADS program works 35

The placement decision 36

Financing of the NAADS program 38

The role of sub-counties in NAADS activities 39

The role of s (PSPs) in NAADS activities 45

Conclusion 46

CHAPTER THREE. METHODOLOGY 48

Introduction 48

The survey design and instrument 48

The site selection and sample size 52

Selection of the farmers 55

The units of analysis and measurement 58

Qualitative and quantitative methods 59

Survey and estimation challenges 60

CHAPTER FOUR. EMPIRICAL FINDINGS 63

Introduction 63

The analytical framework 68

The empirical specification 72

Descriptive statistics 77

Testing for endogeneity 84

Identification, tests for overidentifying restrictions and testing for Weak instruments 87

Qualitative analysis 93

CHAPTER FIVE. CONCLUSIONS AND POLICY IMPLICATIONS 106

REFERENCES 115

APPENDICES 130

Table A1. Survey Questionnaire [attached in separate file] 130

Table A2. Unit conversions for computing crop yield 130

Table A3. Procedure and data used to compute sampling weights 131

Table A4. Average price data of selected crops grown in the study sites. ... 133

Table A5. Summary data on (PSP) contracts in NAADS study sites (Kasawo subcounty) 134

Table A6. Summary data on (PSP) contracts in the NAADS study sites (Kisoko subcounty) 135

Table A7. Summary data on (PSP) contracts in the NAADS study sites (Kyanamira subcounty) 136

Table A8. First stage regression results from 2SLS. 137

Table A9. Sub-county fixed effects 138

VITA 140

List of Tables

Table

1..... 32

2..... 53

3. 57

4. 80

5: 83

6. 86

7..... 90

LIST OF FIGURES

Figure

1:..... 37

2. 40

List of Maps

Map

1..... 129

LIST OF ABBREVIATIONS

AAMP	Area Based Agricultural Modernization Program
AERC	Africa Economic Research Consortium
AKIS	Agricultural Knowledge and Information Systems
ATE	Average Treatment Effects
AYSPS	Andrew Young School of Policy Studies
CARE	CARE International
CBOs	Community Based Organizations
CBFs	Community Based Facilitators
DFID	Department for International Development
EU	European Union
EPRC	Economic Policy Research Centre
FPPL	Fondo Para Productores de Ladera
FFS	Farmer Field Schools
FGDs	Focus Group Discussions
GDP	Gross Domestic Product
GSU	Georgia State University
ICT	Information Communication Technologies
ICRAF	International Center for Research in Agroforestry
IDA	International Development Association
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IPM	Integrated Pest Management
ISFG	Integrated Support to Farmers Groups
IV	Instrumental Variables
JARD	Joint Annual Review of Decentralization
LC	Local Councils
LGDP	Local Government Development Program
LSMS	Living Standards Measurement Survey
LPE	Livestock Production Extension
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
MFPED	Ministry of Finance, Planning and Economic Development
MoLG	Ministry of Local Government
MoUs	Memorandum of Understanding
MOFA	Ministry of Food and Agriculture
MTEF	Medium Term Expenditure Framework
NAADS	National Agricultural Advisory Services
NAAD MIS	National Agricultural Advisory Services Management Information System
NSDS	National Service Delivery Survey
NGOs	Non-Governmental Organizations
OLS	Ordinary Least Squares
2SLS	Two Stage Least Squares
OPM	Oxford Policy Management
PAF	Poverty Action Fund
PC	Parish Coordinator

PCCs	Parish Coordinating Committee
PEAP	Poverty Eradication Action Plan
PMA	Plan for the Modernization of Agriculture
PSPs	Private Service Providers
POs	Producer Organizations
PSM	Propensity Score Methods
RDS	Rural Development Strategy
SAGA	Strategies for Analysis of Growth and Access
SCs	Sub-County
SFF	Sub-County Farmers Forum
SNCs	Sub-County NAADS Coordinator
STRATEX	Strategic Export Initiative
TDS	Technology Demonstration Sites
T and V	Training and Visit
UBOS	Uganda Bureau of Statistics
UCLA	University of California, Los Angeles
UNHS	Uganda National Household Survey
USAID	United States Agency for International Development

ABSTRACT

LOCAL GOVERNMENT FINANCING AND PROVISION IN AN INSTITUTIONALLY CONSTRAINED DECENTRALIZED SYSTEM: THE CASE OF AGRICULTURAL EXTENSION IN UGANDA

By

ABDU MUWONGE

May, 2007

Committee Chair: Dr. Sally Wallace
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Decentralization is a key governance reform which many developing countries have embarked on. Local governments are expected to use their informational advantage to improve the delivery of public goods. This result implied by Tiebout's (1956) model requires fully informed citizens who "vote with their feet." The model's application to developing countries has been limited, since local decisions may not be responsive to local demands.

Practitioners are shifting to innovations that minimize institutional constraints so that decentralized programs can lead to improved outcomes. Examples of such innovative ways include decentralized agricultural extension programs, which embrace farmers' empowerment, local government, and private sector participation.

Few impact evaluation studies on agricultural extension have combined qualitative and quantitative methods. This dissertation contributes to the literature by applying these methods and survey data to study the impact of a decentralized extension program in Uganda, known as the National Agricultural Advisory Services (NAADS) on

the value of farm production per acre. The program is non-randomly assigned to local governments and farmers self-select in or out within participating sub-counties.

Using a sample of 305 participating and non-participating farmers and local government assessment indicators as instruments, we cannot reject the null that the NAADS program has had an impact. The 2SLS results show no program impact; however, the OLS results show that the program had a positive impact on the value of farm production per acre of about 20 percent. Qualitative results show that NAADS farmers: participate in local decision making processes through farmers' institutions; have increased knowledge on farming; and practice enterprise diversification. The quantitative finding must be treated with caution; for example, the study did not account for spillover effects.

The NAADS program faces challenges inherent in Uganda's decentralized structure; particularly the low financial and human capacity, and the weak monitoring at the local level.

The policy implications include: the need to strengthen farmers' institutions; development of a marketing strategy; clear policy guidelines for local government support to NAADS; improved coordination of NAADS activities among line ministries; need for additional resources for NAADS activities; and improved capacity of service providers.

CHAPTER ONE. BACKGROUND TO THE STUDY

Introduction

Decentralization is among the key governance reforms which many developing countries have embarked on (Bardhan, 2002). Decentralization has many different aspects including allowing local government representatives to be selected through local elections (political decentralization), transferring authority and responsibility for service delivery to local governments (administrative decentralization) and shifting authority to raise adequate revenues and to make expenditure decisions to the local level (fiscal decentralization) (Litvack, Ahmad, & Bird, 1998).[1] Decentralization is viewed by its proponents as a way to make government more responsive and efficient (Oates, 1999). Lower levels of government are increasingly involved in the implementation of decentralized programs with the hope that, by being closer to the beneficiaries, the local governments can use their informational advantage to improve the provision of public goods.

The Tiebout (1956) model sets the stage for studying the economics of local public goods provision. The model assumes mobility of the population, implying that fully informed citizens "vote with their feet" in response to differential public performance. Despite its implications for local public good provision in the context of developed countries, the model's applicability to developing countries has been criticized (Bahl & Linn, 1992).

---

[1] There are three main forms of decentralization, namely: deconcentration, delegation and devolution. *Deconcentration* occurs when lower levels of government (e.g., regional or municipal) execute functions on behalf of the central government without having decision making authority. *Delegation* is the process in which the central government transfers decision making over certain functions to relatively autonomous local governments, which have limited autonomy and are ultimately responsible to the central government.

Thus, adapting the theory of fiscal federalism in developing countries has meant that practitioners have had to rethink the notion that under decentralization allocated funds reach their intended beneficiaries (Bardhan, 2002) and that the demand for local public goods is actually met. Decentralized programs are confronted with institutional constraints such as corruption, weak public management systems, information asymmetries, inadequate manpower, high administrative costs, local capture by the elite/politicians, and soft budget constraints.[2] These constraints work to impede the realization of central government objectives such as poverty reduction through targeted decentralized programs for a variety of services ranging from social service provision (e.g., education, health) to physical infrastructure and agricultural extension.

More recently, the theory of fiscal federalism has been extended to incorporate institutional constraints in the context of political agency models (Qian & Weingast, 1997; Lin & Nugent, 1995).These models explain, for example, how the electorate (as principals) may be less informed than the elected representatives (agents) or the center (as a principal) may be less informed than the sub-national governments (agents) about the local needs, delivery costs and the amount of the public good actually delivered (Bardhan, 2002; Betancourt & Gleason, 2000). The informed sub-national government officials may malevolently use their informational advantage to capture the program (e.g., as shown by Reinikka & Svensson, 2004) or may collude with other special interest groups such as s (PSPs) sub-contracted to provide services to the poor (e.g., delegation of local public works problem analyzed by Besfamille, 2004a, (2004b). In these cases

---

Devolution involves the complete transfer of decision making over finance and management of public services to quasi-autonomous local government units.

[2] The World Development Report (2004) discusses the consequences of such constraints on service delivery as well as the mechanisms to mitigate them (World Bank, 2004).

imperfect information and the lack of accountability undermine the potential benefits of a decentralized approach to service provision. In Besfamille's (2004a; 2004b) analysis, local public works construction is delegated to local authorities, which in turn sub-contract the construction of local roads to private firms. The local authorities may exaggerate the jurisdictional preferences for the project during administrative procedures that allocate the federal grant. In that framework, incentive problems arise because the local authority may have some interests in the project's effective undertaking and so may inflate its cost, the efficiency of the contractor or even the expected benefit of the project to society.

To mitigate the consequences of such institutional constraints, innovative programs of improving decentralized service delivery in rural areas in developing areas are emerging. These include decentralized agricultural extension programs, whose aims include increasing agricultural productivity and household incomes of farmers and thus assist in reducing poverty by empowering beneficiaries to demand the "right" advisory services and to hold accountable the service providers (Chapman & Tripp, 2003; World Bank., 2005a). As noted by Birkhaeuser & Evenson (1991) and Evenson (2001) effective agricultural extension can bridge the gap between discoveries in the science laboratory and changes in the individual farmer's fields. In addition to information about cropping techniques, optimal input use, high yield varieties, and prices, extensionists can inform farmers about improved record keeping and assist in the development of their management skills, thus facilitating a shift to more efficient methods of production.

Unlike the 1970s and 1980s, agricultural extension systems worldwide are increasingly decentralized with the private sector increasingly involved in the provision

of extension services (World Bank, 2005a). However, the public sector maintains the funding function *at least* during the early stages of implementation of extension programs.[3] The programs incorporate bottom-up approaches grounded on the principals of farmer empowerment to own local decision making processes including nurturing their ability to demand extension services and to hold accountable the administrators and providers of extension (Rivera & Zijp, 2002). This shift is in sharp contrast to the traditional agricultural extension programs including the Training and Visit (T and V) system that involved public funding and provision and lacked bottom-up participatory approaches (Antholt, 1998).

By targeted programs we mean programs that are designed to address the concerns (e.g., welfare) of specific groups of people, notably the poor or the marginalized (Ravallion, 2006). Targeted programs implicitly recognize the fact that decentralization alone may not lead to improved service delivery if, for example, program beneficiaries are not empowered to counter the institutional constraints. By empowerment, the local beneficiaries of decentralized programs actively participate in the decision making processes that lead to the provision and/or the financing of the services such as agricultural extension. This arrangement makes the local authorities accountable to the local people and thus, may minimize program capture and collusive behavior that may lead to inefficient outcomes in service delivery. In addition, by tailoring services to local needs, outcomes from government programs may improve-thus contributing to poverty reduction. Examples of such decentralized and privatized agricultural extension programs are currently running in Latin America (e.g., in Chile, Venezuela, Honduras) and in Asia

[3] As a pure public good, there is always a justification for the public sector to intervene, since the private sector may not efficiently provide the extension public good.

(India and Pakistan) (World Bank, 2005a). However, little is known about the impact of such decentralized agricultural extension programs. This thesis contributes to the literature by addressing this gap.

We evaluate the impact of a targeted decentralized agricultural advisory services program in Uganda known as the NAADS, which was created as an independent institution by Act of Parliament in November, 2001 and charged with the objective of revamping Uganda's agricultural productivity through the provision of decentralized, demand-driven and privately-provided advisory services to the farmers (Republic of Uganda, 2000a). At its inception, six districts namely, Arua, Kabale, Kibaale, Mukono, Soroti and Tororo were selected to pilot the NAADS.[4] By 2005, the NAADS program had covered 37 districts in 344 sub-counties out of about 857 sub-counties in 76 districts in Uganda (Republic of Uganda, 2005c). [5] The program rolls out to new districts and sub-counties on a fiscal year basis in line with Uganda's budget cycle and accounting framework, the Medium Term Expenditure Framework (MTEF). It is expected that NAADS will cover the entire country by 2008 (Republic of Uganda, 2005c). Among the key design features of NAADS are emphasizing participatory processes by empowering farmer groups to demand advisory services, targeting the "poor", shifting the focal point of service delivery to local governments in line with the broader reform of decentralization, and the contractual arrangements for advisory services between farmers' groups and the PSPs (Republic of Uganda, 2000a).

[4] These districts were chosen based on specific criteria that included the local government assessment indicators measuring how well a district manages previous or other ongoing government programs. The criteria included the availability and quality of development plan, the degree of communication and accountability mechanisms, local revenue performance, and availability of monitoring and evaluation mechanisms. Other factors considered include the agricultural potential of the district.

[5] Number includes only rural sub-counties.

There are important reasons why we choose to study agricultural extension in Uganda and moreover, within a decentralization framework. Uganda is predominantly an agro-based economy with agriculture contributing about 40 percent of Gross Domestic Product (GDP), of which over 60 percent is composed of food crops. The sector is a source of livelihood to more than 80 percent of the population in Uganda (World Bank., 2005b). The bulk of agriculture is smallholder agriculture with the majority poor farmers who grow mainly for subsistence. In addition, the 1999 Uganda National Household Survey (UNHS) evidence indicated that agriculture accounted for more than two-thirds of households' earned income. Since poverty in Uganda is mainly a rural phenomenon, with the rural areas predominantly agro-based, policy interventions that mitigate the constraints to agricultural productivity are crucial to poverty reduction.[6] Moreover, Uganda's high potential to provide food security to its population and to the East African region is expected to boost its quest for sustained economic growth and structural transformation (Republic of Uganda, 2001a, 2001b).

The transformation of the agricultural sector is faced with problems such as the lack of skilled labor, limited research and extension services, poor technology, lack of purchased inputs, and low capital (Republic of Uganda, 2000a, 2000d). With reference to agricultural extension services, Reinikka & Collier (2001) noted that extension services remained limited and only one-third of the communities studied in the 1999 UNHS had reported having been served by an extension worker. Although additional survey

[6] Based on UNHS data, the proportion of people below the poverty line in urban areas has declined from 27.8 percent in 1992 to 9.6 percent in 1999/2000. However, this proportion increased to 12. 2 percent in 2002/2003. On the other hand, the proportion of the people below the poverty line in rural areas was 59.7 percent in 1992, declined to 37.4 percent in 1999/2000, before increasing to 41.1 percent in 2002/2003. The proportion of crop farmers below the poverty line was 50 percent in 2002/2003 (Republic of Uganda, 2005).

evidence revealed that the coverage of extension services increased from 11 percent of farmers in 1992 to 17 percent in 1999, it was noted that only 5 percent of producers at the national level had reported contact with an extension worker more than twice a year (Deininger & Okidi, 2001). The authors further found that at the village level, about 64 percent of the respondents reported that the community was not at all reached by extension services. In addition, in all regions of Uganda households relied more on radio than on extension workers for information on technology. Owing in part to dismal performance of extension services during the 1990s, agricultural productivity has been limited. Deininger & Okidi (2001) suggested that in addition to the investment in human capital and infrastructure including improved access to markets, there was a great need for improved availability and awareness about agricultural technologies through research and extension.

Despite the challenges facing the agricultural sector, the Ugandan economy registered real GDP growth rates averaging 5.98 percent over the period 1996-2004. The agriculture sector accounted for 38.7 percent of GDP in 2002/03, as compared to 51.1 percent in 1991/92 and poverty was reduced from 56 percent in 1992 to 34 percent in 1999/2000 (Republic of Uganda, 2001b). However, recent analysis based on the 2003 UNHS suggests that poverty increased from 34 percent to 38 percent between 1999/2000 and 2002/03 (Republic of Uganda, 2003). The increase in poverty is particularly marked for households in crop agriculture (Republic of Uganda, 2005b). It is argued that among the factors explaining the rise in poverty is less investment to the productive sectors, particularly agriculture (Nabbumba & Kuteesa, 2004). Agriculture had the slowest growth rate amongst the major sectors, averaging 3.8 percent per annum between

1990/91 and 2002/03, although growth was slightly higher in the last five years, at 4.4 percent per annum.

Against this background, the Uganda Poverty Eradication Action Plan (PEAP) (Republic of Uganda, 2000e, 2001b, 2005c) lays out the different sectoral interventions aimed at poverty eradication (Republic of Uganda, 2005c). With respect to the agricultural sector, the Plan for the Modernization of Agriculture (PMA) lays out seven key components to address problems such as inadequate markets and credit access as well as inadequate agricultural extension services and poor agricultural practices among Uganda's farmers. The aim of the PMA is the transformation of subsistence agriculture into commercial agriculture through agricultural advisory services, agricultural research and extension, agricultural marketing and processing, rural finance, agricultural education, natural resource management, and physical supportive infrastructure (Republic of Uganda, 2000a). This study focuses on agricultural advisory services with reference to the NAADS program since of all the seven components, the NAADS is arguably the most important innovation under the PMA (Omamo, 2005) and one that has actually taken off much more in terms of implementation (Republic of Uganda, 2005c).

Another reason for studying NAADS is that estimating the impact of the NAADS program is relevant for analyzing the modernization of Uganda's decentralized agricultural extension. Prior to the decentralization program which commenced in 1993, the central government was in charge of service delivery arrangements including agricultural extension. With decentralized governance over the 1990s, agricultural extension was decentralized to the local government level; however, just like the centralized extension programs, farmers could not access the extension services due to

absenteeism from extensionists, selectivity to reach out to rich farmers, and the fact that the program was generally not cost-effective for farmers (Republic of Uganda, 2000a, 2000c, 2001a).

The innovative decentralized approach to agricultural extension via NAADS is expected to result in better agricultural outcomes for farmers versus the traditional centralized approaches because it is based on a bottom-top approach that incorporates farmers' empowerment. Therefore, the NAADS program was introduced to redress past misfortunes of agricultural extension and to deliver on the expectations of transforming agriculture from being subsistence to being commercial in line with the PMA.

The NAADS program has a mission to increase farmer access to information, knowledge and technology for profitable agricultural production over 25 years (Republic of Uganda, 2000a). The first phase begun in the fiscal year 2001/2002 and will end in 2007/2008. The cost of the first phase is estimated at about 108 million U.S. dollars.[7] The main sources of the funds are donors (these include the International Development Association (IDA), the International Fund for Agricultural Development (IFAD), Department for International Development (DFID), European Union (EU), the Netherland International Assistance and the Irish Aid), the Government of Uganda, participating local governments (districts and sub-counties) and participating farmers. The program is funded from a common basket to which participating stakeholders channel their contributions. The donors provide about 80 percent of the NAADS budget followed by the Government of Uganda with a contribution of 8 percent. The local

[7] As a percentage of the 2002/2003 total public expenditure in the amount of 2352 U.S. million dollars, the entire first phase cost of NAADS would constitute approximately 5 percent.

governments and farmers associations contribute 10 percent and 2 percent respectively (Republic of Uganda, 2000c, 2001a).

Over the 25 year horizon, the farmers and local government shares in the NAADS budget are expected to increase. However, this rests on the assumption that the current efforts under NAADS will result in a sustained boost in agricultural productivity to raise farmers' income and thus, command purchases of advisory services with little or no financial dependence from the other stakeholders.

As noted above, several unique design features about NAADS make it relevant to study its impact as a decentralized program. First, the selection of participating districts and sub-counties is in part based on local government assessment indicators for decentralized governance. Districts and sub-counties performing "relatively" well in terms of accountability, local revenue generation and allocation, monitoring and evaluation and quality of local development plan are more likely to be chosen into the NAADS program. Second, successfully chosen districts and sub-counties receive central conditional transfers earmarked for agricultural and advisory services. The chosen districts and sub-counties prepare annual budgets for NAADS activities and submit them to the NAADS secretariat, which then triggers the release of the transfers from the Ministry of Finance, Planning and Economic Development (MFPED) (Republic of Uganda, 2000c, 2001a).

Third and very critical to the success of the NAADS program is that the sub-counties, the lowest administrative units in Uganda's decentralization, are the main units of program implementation (Republic of Uganda, 2000a, 2000b, 2000c, 2000d, 2001a). The Local Government Resistance Council Statute (1993), the Constitution of the

Republic of Uganda (1995), the Local Governments Act (1997), the Local Government Financial and Accounting Regulations (1998), and the Local Government Finance Commission Act (2003) mandate the local governments as the main units of decentralized service delivery.

As recognized by the FAO and World Bank.(2000), local governments may be an appropriate unit for service delivery implementation if they have adequate capacity and are accountable to the local population. In line with increased administrative and fiscal decentralization, sub-counties receive over 75 percent of the financial allocation of the total NAADS budget. The sub-county funds are earmarked to NAADS activities including contracting of PSPs, technology development, and capacity building in participatory planning, monitoring and evaluation.

Fourth, the formation of farmers' groups, the establishment of democratic voting processes to elect farmers' representatives at the sub-county farmers' forum (SFF), and the participatory approaches to selection of viable and profitable enterprises to invest in, increases the empowerment of farmers. In 2005, a total of 13,202 farmer groups were registered in the NAADS program and engaged in enterprise development and promotion (Republic of Uganda, 2004a). The enterprises selected are usually farmer-group specific and thus one would expect variation in enterprises selected within a participating sub-county. Enterprise choice ranges from improved crop varieties to high breed animal rearing to aquaculture to bee keeping, among others.

The farmers' representatives and farmers' groups are expected to ensure that the PSPs are accountable and deliver according to the contractual obligations. The premise is that if farmers adopt the better methods of farming, better agricultural outcomes such as

high crop yields, quality animal products, technology access and adoption, use of fertilizers, manure and pesticides, better marketing and farmer organizational skills-will result.

From both a theoretical and practical perspective, several issues emerge with respect to the implementation and impact of the decentralized NAADS program. These include: first, do the subnational government authorities have an incentive to misreport the progress on implementation of NAADS activities within their sub-counties or misreport annual budgets or even misreport the efficiency of the PSPs in case they collude in the anticipation of some gains-rent seeking? Second, do the sub-counties' authorities monitor the NAADS activities to ensure the PSPs deliver according to the contractual obligations? Third, are the farmers informed enough to identify the farming enterprises that will eventually improve their agricultural outcomes? Fourth, are the farmers' representatives benevolent, and, if so, how do they possibly check on the "potential collusion" between the sub-counties and the PSPs? Further, do the sub-county authorities and PSPs have the required capacity to manage and implement the NAADS program? What measures are in place to protect the contractual obligations of the NAADS services? Given that sub-counties coordinate the processes of NAADS including the mobilization of farmers groups at inception, do farmers' perceptions about the sub-county management affect their decision of whether to participate in NAADS or not? If the records at the participating sub-counties indicate that PSPs have delivered the advisory services, are the farmers satisfied with the quality of the services provided? And overall, what is the impact of access to advisory services among participating farmers? Unfortunately, our study does not explicitly address all these questions, except the impact

question. Yet the absence of program impact may partly be explained by the institutional constraints mentioned above.

Answering the impact question is an important but intricate issue. Quantifying the impact requires that one accounts for the non-random program placement and self-selection in and out of the program and at the same time recognize the possibility of spillover effects to non-participants (Ravallion, 2006) and the intra-group correlations common in cross sectional data collected in clustered localities (Deaton, 1997; Wooldridge, 2002). In addition, detailed data not only on agricultural outcomes and their determinants is required but also one must understand the broader program institutional framework (Ravallion, 2003). Although, some of the theoretical questions above such as informational asymmetries are non-trivial to test empirically, the use of qualitative techniques can give clues about the processes, although they cannot provide causation (Rao & Woolcook, 2003). An attempt to answer such questions is made in Chapter 4.

It is important to place this research in the context of previous work on decentralized service delivery in Uganda. Previous empirical work has mainly focused on the impact of decentralization on education and health service delivery (see for example, Hutchinson, 1999; Reinikka & Collier, 2001). Hutchinson (1999) notes that despite the decentralization of health service provision, the impact of decentralization on health service delivery and health outcomes is not clear. While decentralization has reportedly increased public participation in the health sector, new problems such as the decline in childhood immunization coverage demonstrated the difficulties of incorporating formerly vertical programs into a decentralized system, particularly if local priorities differed from the national ones. Reinikka & Collier (2001) studied the impact of decentralization on the

flow of public funds to primary schools in Uganda and found that decentralization adversely affected the flow of funds. The schools affected by decentralization received, on average, 9 percentage points less of the intended capitation grant per student. Although survey results indicated some improvement in input flow such as in teacher salaries, they also confirm that serious accountability problems remained in 1995. District authorities captured most of the nonwage public funds intended for schools.

The study by Deininger & Mpuga (2005) provides a general analysis of the extent of accountability in decentralized public service delivery in Uganda; However, no analysis with respect to decentralized extension is available, most likely due to the unavailability of data.

Altogether these studies contribute to our understanding of the impact of decentralized service delivery in the presence of institutional constraints such as local capture, limited manpower and corruption. In fact, policy dialogue in Uganda has embraced some of these studies' findings and as a result, some changes have been in acted to improve service delivery; although the quality of services (in health and education) remains a challenge (Republic of Uganda, 2004b, 2004c, 2004d).

The present study does not study whether local capture or corruption or inadequate manpower affect the NAADS program if at all they do exist; but instead, we ask the broader question of what is the impact of access to advisory services under the NAADS program. If we find no impact, assuming we have accounted for the potential econometric problems, then we may ask whether the absence of impact might be attributable to the presence of institutional constraints. The qualitative approaches offer some insights on the challenges of the NAADS program. For example, the Joint

Assessment Review of Decentralization (JARD) recognized the sluggish integration of NAADS activities into local government structures. Some of the local government officials do not accord the same weight to NAADS activities as they do to other activities (Republic of Uganda, 2005c). This not only affects the overall implementation of NAADS, but also its impact.

This dissertation is based on fieldwork that was carried out in Uganda between September 2005 and April 2006. To answer the research question, a household questionnaire (see Table A1) integrating household, community and NAADS program characteristics as well as a modified agriculture module based on the Living Standards Measurement Survey (LSMS) adopted from Reardon & Glewwe (2000a, 2000b) that was implemented in selected NAADS and non-NAADS sub-counties in Uganda. Data were collected on agricultural outcomes and the factors affecting these outcomes, political level indicators of local government performance, farmers' participation in the local electoral process, health and family background characteristics data (including education and family size), basic housing and asset data. We study the impact of access to advisory services on the value of farm production per acre as the agricultural outcome of interest. The value of household production is defined as the value of crop production and the value of animals reared per farm land cultivated by the farmer. We expect that controlling for other factors, participation into the NAADS program increases the value of household production, as a measure of agricultural productivity.

The survey concentrated on 3 NAADS districts (Treatments) namely Kabale, Mukono, and Tororo and 1 non-NAADS district (Control) namely Kayunga (Map 1). The NAADS districts were drawn out of the initial six NAADS districts that piloted the

NAADS in 2001/2002. Within each NAADS district, one NAADS sub-county was drawn out of the initial NAADS sub-counties that begun with the NAADS in 2001/2002. For control purposes, the survey was also executed in one non-NAADS sub-county within each NAADS district. A total of 305 farmers, 127 of whom are NAADS farmers, were interviewed. In addition, to the quantitative survey, qualitative methods were applied before and after the survey to address NAADS specific issues.

The estimation methods are based on instrumental variable (IV) methods to estimate the impact of the NAADS on participating farmers. The local government assessment indicators are potential candidates for IVs considered in the placement decisions. The presumption is that these variables do not affect the agricultural outcome of interest. However, we face the problem that some factors that affect the placement decision are correlated with the outcome of interest. For example, the agro-potential of the sub-county is a candidate in choosing whether a particular sub-county joins NAADS or not.

This study has limitations. In attempting to study the impacts of contract extension on improving the livelihoods of the participating farmers, there is a need to go beyond the impact on agricultural outcomes. A complete framework would require collecting not only agricultural related data, but also consumption and expenditure and non-farm enterprise data. This exercise if accomplished can enable the calculation of extension impacts on poverty for those participating in the NAADS program. Unfortunately, due to time and budget constraints, it was not possible to extend the present study to collect consumption and expenditure data. Doing so would imply extending the scope of the present study to a large-scale survey.

This study found a positive and statistically significant impact of the NAADS program on the value of the farm production per acre. Estimation results indicate that NAADS has had a 20 percent increase in the value of farm production per acre among NAADS farmers. The factors that might help explain this result include: (i) the fact that NAADS farmers participate in the local decision making processes governing the NAADS program, (ii) the development of farmer institutions aligned to the farmers' investment interests at the village level; (iii) increased knowledge through participatory processes; (iv) the ability for farmers to diversify their enterprise choice and the use of hybrid crop varieties and animals; and (iv) increased access to practical knowledge and skills through localized technology development sites. This finding must be treated with caution. Our study did not account for spillover effects, other general equilibrium effects, and we might have applied weak instruments. Further research will be required to validate our results.

Despite the positive impact of NAADS on the value of farm production per acre, we find that there are factors outside of the NAADS program and those inherent in the current system of NAADS that might impede further gains from NAADS program. The NAADS program faces challenges inherent in Uganda's decentralized structure; particularly the lack of adequate financial resources, low human capacity and inadequate monitoring of government programmes. In addition, the program suffers from the lack of competent individual PSPs, and a need to strengthen farmers' institutions. There are also problems of inadequate funding from the central government as well as delays in disbursement of financial resources, particularly at the local level.

The key policy messages for the government of Uganda are the need to strengthen farmer institutions through provision of relevant training to strengthen farmer empowerment. There is need for a comprehensive marketing strategy that works alongside NAADS to improve the marketing chain so that farmers understand farming as a business. There is urgent need for a clear policy guideline for local government support to NAADS activities and increased coordination of NAADS activities among the relevant line ministries. The policy guideline should clearly consider the mechanisms to improve local fiscal capacity and thus, the co-financing obligations of local governments. There is need to strengthen the skills of existing service providers through training problems; however, there is need to be aware of the PSP turnover problem and how to minimize it.

Organization of the study

The rest of the study is organized as follows: Chapter 2 reviews the literature on decentralization of agricultural extension and also describes the implementation of the NAADS program. Emphasis is laid on the role of the farmers, sub-county authorities and PSPs in the implementation of the NAADS programs at the sub-county level. Chapter 3 presents the methodology applied to generate the data used for analysis. Chapter 4 presents both the quantitative and qualitative empirical findings. We begin by presenting the quantitative results, and then present the qualitative results. Chapter 5 summarizes the empirical findings and discusses their policy implications in the implementation of the NAADS program.

CHAPTER TWO. DECENTRALIZED APPROACHES TO AGRICULTURAL EXTENSION

Introduction

The goal of this chapter is to review the relationships between decentralization and agricultural extension and to discuss how the NAADS program works. We draw upon the central government (principal)-local government and farmer's organizations (supervisors)-PSP (agent) conceptual framework to describe the design and operation of the NAADS as a decentralized agricultural advisory services provision program.

Agro-based developing countries are increasingly implementing decentralized, demand-driven participatory approaches to agricultural extension service delivery that put the farmers (clients) at the forefront (Chapman & Tripp, 2003; World Bank., 2005a). This gradual shift away from publicly funded/publicly provided extension toward publicly funded/privately provided extension, also known as contract extension, is a response in the search for service delivery mechanisms that are not only cost-effective, but also more responsive to the beneficiaries of the programs (Rivera & Zijp, 2002; Rivera, Zijp, & Alex, 2002).[8] This is similar to the argument for decentralization in the public finance literature.

During the 1970s and 1980s, there was little potential for producer organizations (POs) and non-governmental organizations (NGOs) to be involved in the development process (World Bank., 2000a). In addition, local governments could not provide public services such as agricultural services because the authority and financing needed to do so

[8] In this study we use extension to mean agricultural extension.

were with centralized government agencies. More generally, the traditional central extension systems were not responsive to the needs of different types of farmers, not accountable to farmers and included little or no farmer participation and were unsustainable (Anderson & Hoff, 1993; Antholt, 1998; Feder & Slade, 1993).

More recently, the roles of the state are changing with sub-national governments, private sector, POs, NGOs, and Community-Based Organizations (CBOs) involved in the execution of decentralized contract extension programs. The shift is in sharp contrast to the traditional view that equated public goods to government provision (Besley & Ghatak, 2006).

In countries with decentralized extension systems (e.g., Chile, Estonia, Uganda, and Venezuela) the central government continues to fund extension programs at least during the early years of implementation and usually delegates the operations of extension through semi-autonomous agencies charged with extension services (World Bank., 2005a). In addition, the central government puts in place an enabling environment in terms of macroeconomic stability, provision of technical and regulatory structures and coordinating strategies for poverty reduction (Farrington, 1995; Farrington, Christoplos, Kidd, & Beckman, 2002; Hubbard, 1995).

However, the private sector (both for profit and not-for profit) NGOs and CBOs are increasingly involved in the provision of extension services through contracting. It is recognized that NGOs/CBOs can be effective in reaching poor communities and remote areas at low cost, as they may be more inclined to identify local needs and promote participation, and that engaging these grassroots based organizations in projects and policy dialogue can improve project design, implementation and sustainability (World

Bank., 2005a). The reasons explaining why the NGOs/CBOs may have the incentive to be more responsive include their long experience working with rural communities or the desire to accomplish their parent organizations mandates, including fighting rural poverty.

Because local governments are closer to the communities, they have better knowledge about local conditions. This feature is central to local government functions under contract extension arrangements. Local governments play several roles ranging from administration to monitoring and supervision to co-financing extension to mobilization and sensitization of the farmers. The POs (for example, farmers groups) are the clients whose roles have become even more complex than before ranging from demand for specific advisory and information services tailored to local conditions to producers of information to co-financiers of extension to monitors to planners, to mention a few of the roles of the POs. The major benefit from decentralizing agricultural extension is the empowerment of producers to express their demands for technological innovation (World Bank., 2000b). However, as emphasized by the World Bank (2001) Agricultural Knowledge and Information Systems (AKIS) review, mere decentralization of extension to local governments does not guarantee that beneficiaries will have more control over the decision making process.

Contracting out of extension services is expected to increase institutional efficiency in providing agricultural advisory services. The expected economic gains such as raising the proportion of the poor out of poverty through increased incomes rests on adapting extension to specific regional or local conditions and on the political appeal of

increased participation in local governance (de Janvry, Sadoulet, & Murgai, 2002; Oates, 1999; Shah, 2004).

Amidst this shift, however, decentralized and contract extension systems face challenges that *may* impede the expected gains (Ahmad, Devarajan, Khemani, & Shah, 2005; Bahiigwa, Rigby, & Woodhouse, 2005; Chapman & Tripp, 2003; Ellis & Bahiigwa, 2003; Farrington et al., 2002; Ramirez & Quarry, 2004). Financial resources, governance and capacity constraints at the sub-national levels of government can affect the sub-national governments' roles including mobilization, co-financing, supervision, and monitoring of extension service delivery. Faced with such challenges, local governments struggle to define how they will prioritize the use of their resources in relation to their expanded responsibilities (Farrington et al., 2002). An adequate transfer of resources must accompany administrative decentralization, so that local governments have the fiscal resources needed to carry out decentralized functions effectively. Political decentralization is also necessary, as it leads to better accountability and governance reforms at the local level. In addition, Farrington et al. (2002) point out that a privatized extension system will only function if farmers are capable of articulating their needs, enforcing contracts with PSPs and evaluating PSPs services.

There is growing literature on decentralized and contract extension based on reviews of case-studies (Rivera et al., 2002; World Bank., 2005a). But there is little survey-based analysis on the impacts of the decentralized approach to service provision. Recent evidence on evaluating decentralized extension programs include Feder, Murgai, & Quizon, (2004a, 2004b); Godtland, Sadoulet, de Janvry, Murgai, and Ortiz (2004);and Labarta-Chávarri, (2005). All three studies analyze the impact of the Farmer Field School

(FFS) approach to agricultural extension; an approach whose implementation is at the lower levels of government. Farmers are trained in specialized skills such as Integrated Pest Management (IPM) methods and improved farming methods to raise agricultural productivity. There are few evaluations available with respect to the "new contract extension" approaches. The author is aware of the recent evaluation of the NAADS program (Benin et al., 2005) whose methodology is similar to the one used in this study. However, our analysis differs in sense that our study accounts for self-selection into the NAADS program as well as the non-random placement. In addition, we ask what explains participation into the NAADS program as well as the question of whether farmers are satisfied with the quality of extension services provided by PSPs.

The next sub-sections are structured as follows. The next section reviews the evidence on agricultural extension, particularly those approaches that did not embrace decentralization. We then review country case study evidence on decentralized agricultural extension. The goal of the review is twofold: first, to underscore the role of sub-counties in decentralized extension programs and second, to understand the challenges that previous evaluations of extension impacts have faced. Sub-section 2.4 presents the discussion of how the NAADS program works. The chapter concludes with the lessons about what needs to be done to implement and/or analyze the impact of a decentralized extension program.

Prior to decentralized extension approaches

Antholt's (1998) review on public extension systems around the developing world reveals that owing to the backlog of technology yet to reach farmers in the 1970s, the need for better management of extension programs emerged. By the mid-1970s many agricultural extension systems had been built with inadequate attention paid to the skill and support problems faced by the extensionists (Birkhaeuser & Evenson, 1991). Consequently, the effectiveness of the extension agents in assisting the farmers was limited. In addition, very few studies of agricultural extension impacts on farm productivity, technology adoption, and farmer knowledge had been done prior to 1970 (Evenson, 2001; Evenson & Mwabu, 2001).

The concept of management of extension was the pillar of the Training and Visit (T and V) system that was first introduced in 1967 in Turkey (Benor, 1987). Under the T and V system, extension agents met with selected “contact” farmers or farmer groups and followed a regular schedule for visits. The extension agents also met with their colleagues and supervisors at the regional level to discuss problems and their solutions (Antholt, 1998). The system required extension agents to have two primary duties: first, to transfer agricultural information to farmers and second, to report farmers’ problems to the central government -based extension offices. Management education was a secondary objective. Unlike the earlier extension systems of the 1970s, the T and V approach allowed for better communication between researchers and extensionists.

Using the T and V model, the World Bank increased its support of agricultural extension systems to about 3 billion U.S. dollars by 1989 (Anderson, Feder, & Ganguly,

2006; Antholt, 1998). A comprehensive assessment of the T and V system in 107 World Bank-funded projects over the period 1977 and 1992 showed that farmer participation in the different stages of the program design was limited; there were deficiencies in relevant technologies, and inadequate funding (World Bank, 1994). In addition, there were concerns of over-staffed programs, lack of sustainability, lack of clientele ownership, and generally lack of a bottom-up approach to extension. As a result, the T and V program was not results oriented. The evidence of the T and V system impacts in Asia (e.g., from Punjab in Pakistan to Nepal to Thailand to Indonesia to India,) mostly revealed no impact on agricultural outcomes (Antholt, 1998).

The evidence from sub-Saharan Africa is almost similar to that in Asia. However, the results must be interpreted with caution due to the methodological differences and challenges that the impact evaluators faced. Differences in data, initial conditions and survey methodologies as well as susceptibility to microeconometric problems (namely, measurement errors, self-selection, and omitted variable bias) confront the existing empirical studies so much that one can claim the results to be mixed. An example illustrating these challenges is that of the studies on the impact of the T and V system in Kenya. On the one hand, Bindlish & Evenson (1993) and Evenson & Mwabu (2001) found the returns to extension to be high. On the other hand, Gautam & Anderson (1999) found no impact of the T and V extension services. Perhaps the discussion by Birkhaeuser & Evenson (1991) and Evenson (2001) can settle the debate. These authors discuss the econometric and evaluation challenges and note that despite their prevalence and the availability of econometric procedures to address them, rarely have they been addressed in empirical studies. Studies on extension impact at the individual farm level

using a farm-level measure of extension may suffer from the problem of endogeneity in extension farmer interactions and the problem of indirect or secondary information flows. Endogeneity arises in any of the three forms namely, omitted variables, measurement errors, and self-selection (Wooldridge, 2002).

Treating the extension variable as exogenous may not be correct. It is possible that some unobserved characteristics of certain farmers drive them into seeking out information about changing farm conditions or new technologies (Birkhaeuser & Evenson, 1991). Such farmers may be inclined to attend more demonstration days, read more literature, and seek out extension contact. Analogously, extension agents may seek out contacts with better or rich farmers who would be good performers even in the absence of extension contacts. Failure to take this type of endogeneity into account leads to upward biases of the extension impact. Similarly, difficulties associated with measurement error of the extension variable (s) and the failure to control for certain variables such as farmer managerial or organizational abilities can result in inconsistent estimates.

The problem of indirect or secondary information flows arises where knowledge that originates from extension contacts is passed on to other farmers who do not directly interact with extension personnel (Birkhaeuser & Evenson, 1991). The presence of inter-farmer communications tend to cause an understatement of extension effects when the approach of defining extension impact by the number of direct contact is used. The problem highlighted above can be effectively solved, or at least reduced in severity, when the extension variable is specified at a village or area level. This variable is then exogenous to individual households and internalizes the inter-farmer communications.

An example of a recent study that tries to address some of the above problems is that by Owens, Hoddinott, & Kinsey (2003) in their study of extension impacts on farm productivity using a panel sample of households residing in three resettlement areas of rural Zimbabwe. They estimate the extension effects on the value of crop production per hectare, with and without controls for unobservable household level fixed effects. Differencing rids the specification of the correlation between extension and the disturbance term. Upon controlling for innate productivity characteristics and farmer's ability using household fixed effects estimation, the study finds that access to agricultural extension services, defined as receiving one or two visits per agricultural year, raises the value of crop production by about 15 percent.

Having reviewed the problems faced by past extension systems as well as the challenges that evaluators face, we now review selected evidence on the decentralized extension approaches.

A review of decentralized extension programs

Because of the complex policy environment within which agricultural extension operates, a review of country case studies along a single policy dimension is difficult.[9] For example, China's extension reform is not limited to decentralization and contracting, but also includes demand driven approaches and producer organizations, among others. In addition, several other reforms are undertaken; making the reform process complex to

[9] Policies for extension reform include decentralization, privatization, contracting, commercialized services, cost sharing/recovery, public-partnerships, role of NGOs, use of information, communication and technology (ICT), participatory approaches, demand-driven programs, producer organizations, national strategies, among others (Rivera & Zijp, eds., 2002).

analyze. A similar situation is depicted in other countries implementing agricultural extension reforms. Despite this complexity, a review of world-wide experiences with extension approaches can help researchers better understand the role of local governments and PSPs in decentralized extension provision.

The decentralization of extension to local governments where the center retains both the financing and delivery has been undertaken by several Latin American governments with a view of improving accountability and local political commitment since extension agents work closer to their clientele (Anderson & Feder, 2003). Rivera (1996) notes that decentralization of extension was driven by structural reform to improve institutional responsiveness and accountability, fiscal decentralization and the need for farmer participatory involvement in decision making and management of extension.

Early studies on decentralization of agricultural extension have, however questioned concerns over issues such as accountability, relevance and quality of extension provided by the service providers (Garfield, Guadagni, & Moreau, 1997; Malvicini, 1996). Other challenges include the financial sustainability and the linkage of extension with research (Anderson & Feder, 2003).

Fee-for-service and privatized extension are yet another set of approaches where small groups of farmers typically contract extension services to address their specific information needs. The provision of extension may be a public entity or private firm or consultant but the financing is largely public. Under such arrangements the challenges include the group knowledge of their information needs and their ability to assess the quality of the services received. A drawback of this approach is that less commercial

farmers (i.e., poorer farmers and those farming smaller and less favored areas) may purchase little or no information at all (Anderson & Feder, 2003).

The farmer field school (FFS) approach is yet another decentralized extension program. The FFS was originally introduced in Asia and involves educating farmer participants on a variety of practices such as agro-ecosystems and integrated pest management (Anderson & Feder, 2003; Farrington, 1995). It entails farmer experimentation and non-formal training to a group of 20-25 farmers during a single crop-growing season. Some farmers are equipped with additional skills to become farmer trainers. This approach is expected to improve accountability and the quality of services provided to the farmers. However, some evidence from Indonesia and the Philippines revealed that these approaches may not ensure financial sustainability and the outreach may be limited due to high costs of training the farmers (Quizon, Feder, & Murgai, 2001; Rola, Jamias, & Quizon, 2002). Recent evidence by Feder et al.(2004b) reveal similar challenges.

With reference to decentralized contract extension system, the only available evidence is based on reviews of case studies. In the mid-1990s in Estonia, a national agricultural advisory service program and a new advisory subsidy scheme were established as a response to the problems (e.g., insufficient management) of the old extension system (Loolaid, 2000). Different contract arrangements serving different needs were designed.[10] The evidence from Estonia's advisory program include better

[10] For example, the subsidized individual agricultural services contracts involve legally registered farmers and certified advisers as direct partners and the county administration as an indirect partner charged with the responsibility of management, financing, and accounting of contracts for farmers in their county jurisdictions. Other contracting arrangements include contracts for providing extension services for farmers in a group approach; contracts for development projects to provide training, support services and extension to groups of farmers; and contracts for the design of legislative framework, administration and financing of delivery of advisory and extension services.

access to advisory services and information to farmers, practical approach by advisers to provide information and train farmers, and developed local capacity. However, despite the achievements, extension is yet to be demand-driven (farmers have lacked economic, marketing, and legal knowledge). Other challenges include insufficient management capability at the county level and complex contract procedures. Similar challenges are faced by Honduras's Fondo Para Productores de Ladera (FPPL), a publicly funded/private extension system where a significant administrative effort is required to protect the contractual integrity (including enforcing contracts and preventing abuses) with the PSPs.

Prior to 1991, the Livestock Production Extension (LPE) in Mali was unresponsive to the producer's demands until contracting out began in three livestock regions of Sikasso, Kayes and Mopti (Quinet-Fermet & Gauthier, 2000). The government decentralized, privatized and restructured its agricultural services. Mali's networks of private veterinarians and paraveterinarians transformed information on livestock, and producer participation through producer organizations and regional agricultural chambers have contributed to improvements in livestock advice, vaccination, and environment management. A notable scheme is the village extension voucher system where less than 20 U.S. dollars is allocated per village through the farmers. This money is used to contract private agents. The village extension vouchers have improved the empowerment of the producers, transferred part of the control to the beneficiaries and allowed for competition among private agents. In addition, the cost of the program is said to be low to the government.

Table 1 summarizes additional evidence on decentralization or privatization of extension drawn from Rivera & Zijp (2002). The review illustrates that decentralized/privatized extensions face challenges that may impede the expected gains such as poverty reduction through increase in house incomes and food security resulting from increased agricultural productivity. At the same time, compared with the traditional extension systems, there is hope that improved extension service delivery through decentralized approaches will result into better agricultural outcomes and thus raise the incomes of the poor. That said, drawing upon empirical evidence from Uganda's NAADS may contribute to our understanding of how to improve the efficiency in financing and provision of agricultural extension services.

Table 1. A summary on extent of decentralization/privatization and quality of extension in selected case studies

Author	Country	Extent of extension decentralization	Local governance and quality of extension	Possible reasons for state of quality of extension
(Amezah & Hesse, 2002)	Ghana	• In 1997, the Ministry of Food and Agriculture (MOFA) decided to decentralize operations to achieve more responsiveness and effectiveness in service delivery. • However, the process was more of deconcentration	• There were claims that the quality of specialized services such as veterinary, plant regulatory, and agricultural statistics services was compromised. • Mainstreaming cocoa extension within MOFA extension system is claimed to have contributed to decline in quality of cocoa extension.	• Incomplete decentralization. This meant that agricultural extension activities have not yet been incorporated into the plans and budget of the district assemblies and remain within MOFA's authority and responsibility
(Seepersad & Vernon, 2004)	Trinidad and Tobago	• Extension was decentralized, but not enough authority was delegated to the regional and county offices.	• Farmers seem not to have been served in a participatory manner and the quality of extension was inadequate.	• As noted by Carpenter (2000) there has been a history of controversy regarding the administration of decentralized extension services.
(Saviroff & Lindarte, 2002)	Venezuela	• In 1995, a new agricultural extension program was established that placed key responsibility for implementing extension programs at the local municipality and established producer associations to assist local authorities manage extension. • The establishment of municipal agricultural extension offices	• With decentralized extension, the quality of extension services is much better than when extension was centralized. • The capacity of service providers has improved and there is greater community /farmer participation is higher than before.	• Although the program has posted several achievements, lower level governments co-financing is still too low and they claim that it is due to lack of central government support for the decentralization process.

		enabled a bottom-up program formulation.			
(Hanson, Lainez, Smyle, & Daiz, 2004)	Honduras	• A privatized system of extension with private companies contracted to work with the farmers. • Each village develops a proposal identifying the goals they want to accomplish in the upcoming year. Private companies work with villages in a participatory manner to implement the plan. • Villages choose from a broad range of areas or services.	• The technology transfer component is said to have been a success. Over 8,900 farmers above the targeted 6,500 farmers were served. • There was continuity in projects that started in first year. Out of 51 first year projects, 38 had been completed and continued in the second year. • Except for agricultural diversification and contour retention ditches, private companies far exceeded their planned for specific activities in both year one and two.	• The participatory extension approach may have accounted for a large measure of the success of this project in years one and two. • But to better serve the farmers, they need to be more involved in evaluating the private companies. • The need for significant administrative effort to protect the contractual integrity. • And government needs to provide and supervise training of the private companies.	

Source: summarized from (Rivera & Zijp, 2002).

How the NAADS program works

Uganda's NAADS was created as a semi-autonomous institution by Act of Parliament in November 2001 and charged with the objective of revamping Uganda's agricultural productivity through the provision of decentralized, demand-driven and privately-provided advisory services to the farmers (Republic of Uganda, 2000c). The NAADS secretariat oversees all NAADS activities in Uganda. These activities include but are not limited to financial management, development of farmer institutions, and monitoring and evaluation.

At its inception, six districts, namely, Arua, Kabale, Kibaale, Mukono, Soroti and Tororo were selected to pilot the NAADS. By 2005, the NAADS had covered 37 districts in 344 sub-counties in Uganda (Republic of Uganda, 2005c). The program rolls out to new districts and sub-counties on a fiscal year basis in line with Uganda's budget cycle and accounting framework, the Medium Term Expenditure Framework (MTEF). It is expected that NAADS will cover the entire country by 2008 (Republic of Uganda, 2005a).

The specific objectives of the NAADS program include increasing effectiveness, efficiency and sustainability of the extension delivery services, increasing farmers' access to and sustaining knowledge, information and communication, and increasing access to and sustaining effective and efficient productivity enhancing technologies to farmers. The NAADS program is built on the principles of farmer empowerment and participation, decentralization, cost-sharing, a publicly-financed/privately-provided extension system

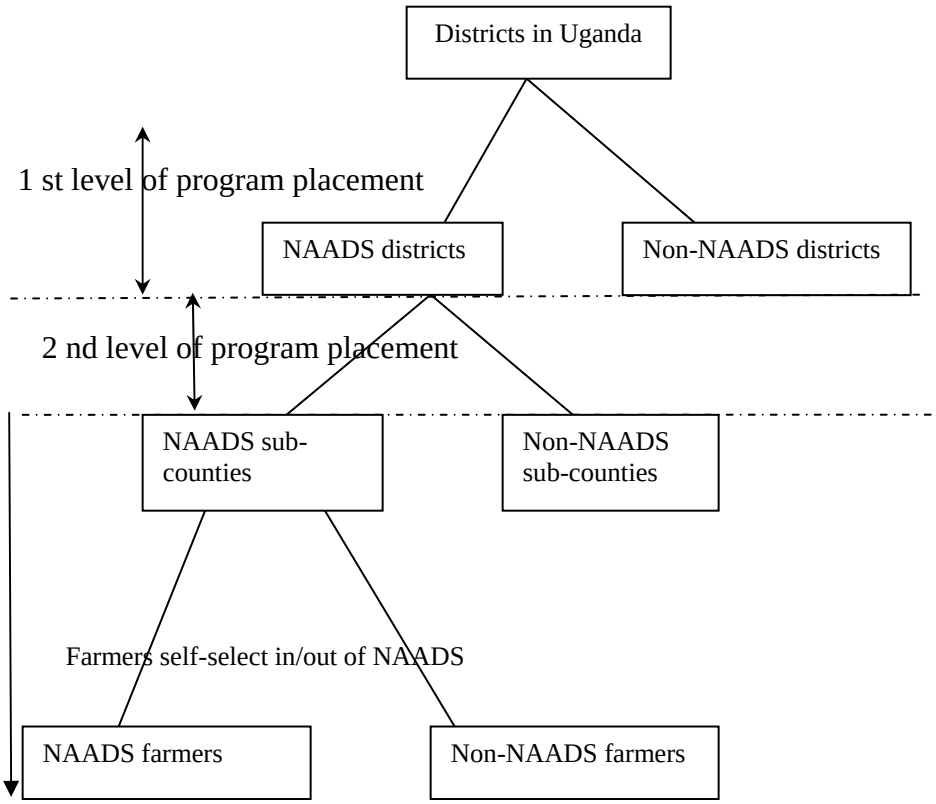
and embraces linkages with environment, gender, health, research, education and extension (Republic of Uganda, 2005c).

The placement decision

The NAADS program is presently a targeted, whereby some districts and sub-counties participate and others do not (Figure 1).[11] Furthermore, within a participating district, not all sub-counties participate and similarly, within participating sub-counties, not all farmers participate. Some farmers choose not to participate even if they are eligible and some who are ineligible choose to participate. It is decentralized in the sense that implementation is through local government structures, particularly the sub-counties, which are the lowest local program administrative units in Uganda's decentralized system of governance.

[11] Over time non-participating sub-counties and districts join the NAADS program. By 2008, it is planned that NAADS will be covering the entire country.

FIGURE 1: DESCRIPTION OF THE NAADS COVERAGE IN UGANDA



Source: Author

The factors that explain the NAADS program placement include performance indicators based on the government's Poverty Action Fund (PAF) and the Local Government Development Project (LGDP), and NAADS specific criteria.[12] The minimum conditions for qualification and participation by districts and sub-counties in the NAADS include the availability of a three-year rolling development/investment plan approved by the district, an annual budget approved by the district including planned

[12] One would suspect that political factors might contribute toward selection into the NAADS program. Our discussions with officials at the NAADS did not reveal existence of political pressures to include particular districts and or sub-counties in the NAADS program. This is a typical unobservable, whose effects on placement decisions are unknown to the modeler.

investments, and a below budget line for sub-county investments and human capacity to manage the program (Republic of Uganda, 2000c, 2001a).

Other than the decentralization-related criteria, other requirements include agricultural potential such as the rainfall level and distribution, altitude, soil type and depth, topography, presence of pests and diseases, and presence of irrigation that influences the production of agricultural commodities.

Financing of the NAADS program

The NAADS program has a vision for 25 years (Republic of Uganda, 2000c, 2001a). The first phase begun in the fiscal year 2001/2002 and will end in 2007/2008 (Republic of Uganda, 2000c). The cost of the first phase is estimated at about 108 million U.S. dollars. The main sources of the funds are donors, government of Uganda, participating local governments and participating farmers. The program is funded from a common basket to which participating stakeholders channel their contributions. The donors provide about 80 percent of the NAADS budget followed by the government of Uganda with a contribution of 8 percent. The local governments and farmers associations contribute 10 percent and 2 percent respectively.

The financing of extension in the NAADS sub-counties is through three sources. First, conditional transfers are determined by the NAADS secretariat based on a district resource allocation formula. The participating districts and sub-counties receive conditional transfers (specific for NAADS activities) from the central government, through the financial coordination of the NAADS secretariat and the Ministry of Finance,

Planning and Economic Development (MFPED). The funds are released on a quarterly basis to the participating districts' NAADS accounts. The participating districts transfer the funds to the participating NAADS sub-counties accounts at the district. Of the NAADS total budget, about 77 percent is targeted to the sub-counties. Further, 72 percent of the total NAADS budget is directed towards the advisory and information services component, 65 percent of which is targeted to the sub-counties.

Second, local-governments (districts and sub-counties) are supposed to co-finance NAADS (see Chapter One). The local governments raise this portion through local revenue (local taxes or fees). Finally, NAADS participating farmers are expected to co-finance the program by paying τ shillings per annum.[13] Each participating farmers' group is expected to pay annual farmers' co-funding contributions toward the NAADS program.

Annual group contributions range between 2.8 to 16.7 U.S. dollars.[14] Payment per member depends on group membership, typically ranging between 10 to 20 members (NAADS, 2005b-monitoring database).

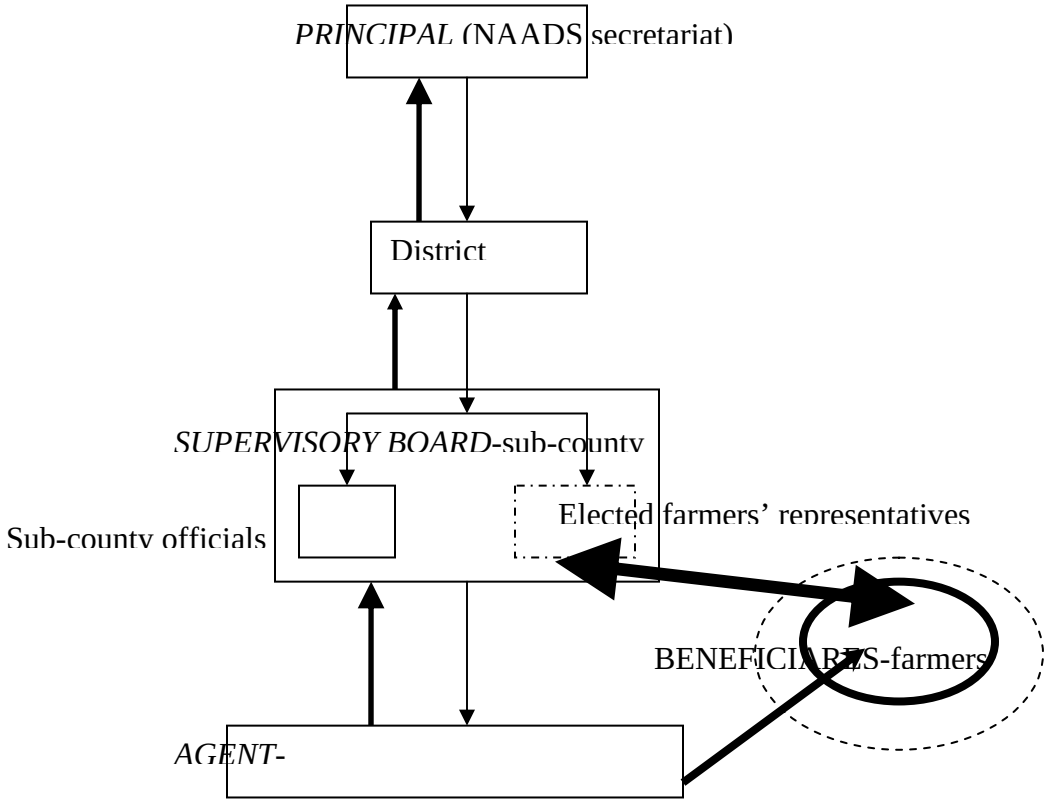
The role of sub-counties in NAADS activities

In this section we discuss the role of sub-county authorities under NAADS using the perspective of a hierarchical model of organizational theory. Figure 2 shows a

[13] Assume a fraction r of the sub-county population to be NAADS farmers. Assume N farmers' groups within a sub-county with each farmers' group comprising n farmers such that $r = nN$. The NAADS farmers within the sub-county are required to co-finance the NAADS in the amount of τ. However, the non-NAADS farmers do not. Each farmers' group contributes $\phi = \tau/N$. Each farmer is required to pay a fixed amount *f*, then $\phi = nf$ and thus $\tau = nfN = rf$.

simplified representation of the NAADS implementation design within a participating sub-county.[15] We only assume a single principal, supervisory board and single agent for exposition purposes. This assumption enables us to delineate the roles of the sub-counties and PSPs from the perspective of a simple Principal-Supervisor-Agent model.

FIGURE 2. SIMPLIFIED REPRESENTATION OF THE NAADS PROGRAM



Source: Author

[14] The conversion we use here is 1 U.S. dollar = 1,800 Uganda Shillings.

[15] A detailed NAADS program design is contained in the 2004/2005 NAADS revised implementation guidelines. In this exposition we omit the details at the district and national level where a structure similar to that of the sub-county NAADS 'supervisory board' exists. Both levels play important roles in supervision and in the program placement decisions. Here we concentrate on the details at the sub-county level, the main level of program implementation closer to the program beneficiaries.

The central government through the NAADS secretariat (principal) delegates the overall implementation of NAADS activities to the sub-county. The sub-county authorities in conjunction with farmers' representatives sub-contract PSPs (agent) who are expected to deliver according to the contractual obligations to serve the demands of advisory services for the beneficiaries-the participating farmers. The PSPs may be individuals or firms (including NGOs). The selection criteria for NGOs is coordinated at the district (Republic of Uganda, 2000b, 2001a) but the procurement committee at the sub-county selects the NGOs.

The thick circle denotes the registered NAADS farmers' groups. The dotted circle denotes the elected farmers' representatives from each farmers' group who form the sub-county farmer's forum. At the sub-county level, sub-county authorities (here we include the NAADS sub-coordinator since like the sub-county chief, he/she is paid by the center) and the elected farmers' representatives run the NAADS activities, although practically there are variations on the involvement of sub-county authorities in NAADS activities.

The light arrows denote the flow of directives or funds from the upper tier to the lower tier for execution of NAADS activities. The dark arrows denote the NAADS reporting mechanisms. For example, the PSP is supposed to report to the farmers and the farmers must confirm or sign that they have received the services from the PSP. Along the vertical structure, the PSP is also supposed to report to the sub-county, who in turn are supposed to report to the districts and eventually to the NAADS secretariat.

The dark double pointed arrow emphasizes the role of farmers' groups in aspects such as empowerment and also the crucial role of sub-counties in not only facilitating contractual obligations including monitoring and supervision, but in the mobilization

efforts for the formation of farmers' groups. Monitoring of the NAADS is a responsibility of all stakeholders. Ideally the farmers are expected to provide feedback on the quality of advisory services received. The farmers' representatives are expected to monitor NAADS projects and provide feedback to farmers and to the sub-county level. The sub-county authorities (especially the sub-county chief), NAADS sub-county coordinator and NAADS farmers' representatives at the sub-county are charged with the overall administration, management and coordination functions of NAADS activities.

We return to Figure 2 to discuss possible incentive problems; for now let us understand the role of the sub-counties in farmers' institutional development.[16] The essence of the farmers' groups is to facilitate collective decision making processes based on a bottom-up participatory approach to the strengthening of farmers' voices and power to demand for appropriate extension services. Members of a farmers' group are expected to have a common farming interest. Each group has an address and a leadership structure with elected members. Through participatory approaches farmers' groups identify the problems they face, participate in planning, mobilize internal resources, and engage in enterprise selection based on guided evaluations that incorporate cost-benefit analysis. Overall it is expected that strengthening farmer organizations will improve their knowledge and skills on issues such as record keeping, group financial mobilization and credit access and management as well as marketing to operate agricultural as a business.

The sub-county farmers' forum (SFF) is made up of farmers' representatives of all the farmers' groups in the sub-county. It provides a mechanism through which farmers discuss finance budgets and provision arrangements of advisory services including the election of their representatives, decisions on strategic enterprises and technologies to

invest in and choosing from a pool of PSPs. In addition, the SFF is expected to monitor and evaluate the services of the PSPs. A key feature of the sub-county farmers' forum (SFF) is that elected farmers' representatives are supposed to be benevolent; so is entire the sub-county local leadership.

The formation of the SFF follows a sequence of events, each in turn. First, a workshop is organized at the sub-county level to sensitize the sub-county leadership about the NAADS program. At this time the sub-county leadership gets to know their responsibilities with respect to the NAADS program. To initiate the process of the SFF formation, a list of existing farmer groups in the sub-county is complied by the sub-county leadership.[17]

Next, the sub-county chief and his local leadership invite farmers in the sub-county to attend a meeting at the sub-county headquarters. During this meeting the farmers' representatives from the different groups are elected to the interim SFF. Those invited to attend include at least one to three farmers from each of the existing groups, one farmer from each parish who is not yet a member of a farmers group; and women, youth and people with disabilities.

The criteria for the election of the 15 member SFF include: at least one representative from each parish; one farmer must represent farmers of the same interest; at least 4 members of the SFF should be women; one youth and one representative of the economically active people with disabilities. Councilors are not eligible for election to

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[16] A detailed account of this discussion is contained in the 2004/2005 NAADS implementation guideline.
[17] The Sub-county leadership includes sub-county NAADS coordinator, Community Development Officer and other extension workers existing in the sub-county (NAADS, 2004/2005b).

the SFF. Both the secretary for production and the sub-county NAADS coordinator are part of the SFF.

The rules at the polls include: the sub-county chief is the returning officer; prior to selection, consensus is reached on whether to vote by show of hands, lining behind candidates, or by secret ballot; group participants elect by the parish they come from and one representative must be elected to represent a particular parish; from those elected in the first round, a chairperson is elected based on his profile including his communication, inter personal and mobilization abilities. Three of the members of the SFF are elected by the elected SFF to the procurement committee that awards contracts for NAADS advisory services or goods. Until this point the SFF is interim, because it is composed of members who are drawn from groups which have not yet been registered. Further, the SFF may still comprise farmers who do not belong to any farmers' groups. After one year, the substantive SFF are elected to serve 3 years, renewable for one more term only.

The community based facilitators (CBFs) and the recently established Parish Coordinating Committees (PCCs) have been added to assist in sub-county NAADS activities. Imagine a sub-county having over 100 farmers' groups in NAADS with each represented by two elected members at the SFF meetings. This situation demands a lot of sub-county leadership to manage the proceedings on NAADS implementation. The PCCs have been created to provide support to the sub-county in this implementation.

Relevant for our modeling of the participation decision is the impact of local governance factors in explaining who participates in NAADS? Second, how to get farmers who do not belong to the farmers' groups at the time of the sensitization to attend at least the first meeting about NAADS (presumably through the local radio and local

NGOs)? Third, how far does the local political leadership disseminate the sensitization information (who gets to know and when)? Fourth, the perceptions of a farmer about the sub-county leadership and group work might affect his/her decisions to participate in the NAADS program.

The role of s (PSPs) in NAADS activities

Unlike the traditional public extension programs, service provision under decentralized contract extension is contracted out to PSPs. Under the NAADS program, the PSPs are expected to deliver according to the contractual obligations in the Memorandum of Understandings (MoUs) signed at the sub-county. The PSPs may be firms or individuals. They may also be NGOs. A procurement committee (PC) composed of farmers' representatives meets and vets applications of potential PSPs for the selected enterprises. The enterprises may range from procurement of advisory services on improved crop growing and animal rearing methods to establishment of Technology Demonstration Sites (TDS) (e.g., Irish Storage or piggery units) for demonstrating better methods of farming to physical provision of seeds (e.g., hybrid ground nuts, Irish potato seed) or supply of hybrid animals (e.g., hybrid cross (e.g., goats, pigs, bulls). The contract specifies the target group of beneficiaries, duration of contract, specification of items procured, contract value and mode of payment, and other administrative procedures that the contracting parties must abide with.

Conclusion

The implementation of contract extension in Uganda has created a platform for empowerment of the farmers. However, the above review and that based on the NAADS implementation progress reveal the complexities involved in advisory services provision under decentralized contract extension programs. For example, while some PSPs are commended for the services they endeavor to provide to the farmers, other PSPs' services are below the required standard. In our study sites there are instances in which PSPs do well on delivering contracted extension services (e.g., the Irish storage in Kyanamira sub-county, Kabale districts, the piggery project in Kasawo sub-county, Mukono district, and, Kisoko sub-county, Tororo district). At the same time, there are cases where the PSPs perform poorly on contracted extension services (e.g., the cases of poultry projects in Kasawo and Kisoko sub-counties). Furthermore, there is variation in the pro-activeness of farmers' groups to discipline the PSPs who fail to deliver according to the contractual obligations. Farmers in Bukinda sub-county, Kabale district, provide an example of strong farmers' institutions in protecting contractual integrity: they terminated a contract with a PSP due to poor quality services.

Despite the efforts by the NAADS secretariat to implement quality assurance, regulation and technical auditing of services, there are other institutional challenges that constrain the capacity building efforts of the PSPs. For example, the "de-layering" of public extension officers to create a competitive market with a pool of competent PSPs has been delayed by the Ministry of Public Service.[18]

[18] 'De-layering' is a term used to refer to having public extension officers relinquished of their duties as public officers; but with an implicit meaning that those retrenched/de-layered are re-trainable to join the pool of PSPs.

Another challenge is that it is much easier to crosscheck from sub-county records whether PSPs have delivered on contractual obligations under NAADS, but is difficult to know from the records whether the farmers were satisfied with the quality of extension services. It is even quiet next to impossible that interviewing PSPs will reveal their short comings. Under such circumstances, evaluating the impact of NAADS requires a survey of the program beneficiaries to elicit information about access to advisory services on agricultural outcomes. The next section lays out the methodology we used to accomplish such a task.

CHAPTER THREE. METHODOLOGY

Introduction

The goal of this chapter is to discuss the survey methodologies that were applied between September 2005-April 2006 in Uganda to elicit information on farmers' participation in the NAADS program, quality evaluations of PSP services and the impact of access to advisory services among participating farmers. Our methodology involved a triangulation of qualitative and quantitative methods with a view that the former complement the latter (Ravallion, 2003). First, we discuss the survey design and instrument, and then describe the site and sample selection. Sub-section 3.4 describes the units of analysis and measurement. Sub-section 3.5 briefly discusses the qualitative and quantitative methods applied including the type of questions we address. Sub-section 3.6 concludes with a discussion of the survey and the estimation challenges.

The survey design and instrument

Our goal is understand the impact of access to NAADS on the value of farm production per acre. The factors that affect the crop yield include innate unobservable farmer abilities (managerial and non-managerial), the agro-ecological conditions of the land (soil quality and weather), the inputs used in production (e.g., labor, capital [social, physical and human], land, time, fertilizers), location-specific factors, policy (e.g., availability of NAADS services in a particular sub-county), and the availability of infrastructure (markets, roads).

Other factors include the institutional environment in which farmers operate (e.g., land tenure system, insurance, opportunities, and laws), and risk and uncertainty faced by farmers (e.g., price variations, weather variability, crop diseases and pests) (Reardon & Glewwe, 2000b).

To address the research question, survey data are combined with administrative data. The survey is based on a revised LSMS module on agriculture (Reardon & Glewwe, 2000b). This module was complemented with additional questions drawn from the Uganda Bureau of Statistics (UBOS)'s Socio-Economic Survey (UNHS), and questions that we designed to address specific issues with respect to the NAADS program (see Table A1). The novelty of the LSMS is not only the depth with which one can understand factors affecting a particular outcome of interest (in our case crop yields) but also the potential flexibility with which one can apply them to address policy relevant questions.[19] However, adopting any module from the LSMS calls for greater resources in terms of time, expertise, organizational capacity and funding. Sub-section 3.6 discusses the fieldwork challenges.

The sections adopted from the agriculture module of the LSMS include the land owned, rented-in or rented-out, farm equipment, labor (household member and hired) and non-labor inputs, crop output, livestock and advisory services. We adopted the crop codes used in the UBOS's 1999 UNHS crop survey module (see Table A2). The questions modified from the UNHS include those on household background characteristics including health, education, sex, and age controls, housing conditions, assets and access to and sources of credit.

[19] A detailed account of the LSMS is contained in (Grosh & Glewwe, 1995, 2000).

The questions that we added to reflect our objective included farmer perceptions of local governance, participation and knowledge of local village voting processes, political connectivity, social networks, and awareness of the NAADS program.

To capture inter-farmer communications, the social network variables used included the number of days in a month a farmer interacts with fellow farmers, the number of days a farmer allocates to learning at the sub-county and the number of days a farmer allocates to social gathering functions. We define social gathering functions to include off-farm activities that bring farmers together for any reason. These were classified as functions such as entertainment, funeral ceremonies, religious functions, drinking (alcohol), and *"nigina."*[20]

Other questions included relate to the demand for advisory services, methods of advisory services, access to infrastructure, record keeping, perception on the quality of services provided by PSPs, farmers' source of price information for agricultural produce, willingness to purchase advisory services and co-financing of the NAADS program.

The administrative data include data on performance indicators for local governments, private service contracts, and agro-climatic data such as weather data. The qualitative methods applied included focus group discussions (FGDs) within each of the treatment sub-counties. The FGDs discussed issues of quality of services delivered by the PSPs, farmer institutional development, information flow between farmer leaders and the sub-county officials, monitoring of the program, and co-financing of the NAADS program. The FGDs were complemented with key informant interviews (such as the

[20] "*Nigina"* is a local "*Luganda"* language term that literally means "walk like the rich." Nigina Associations are social capital associations where people join efforts to help one another by giving money and household assets to group members in a rotation fashion. This form of social capital is increasingly becoming popular in Uganda; mostly in rural areas but also common in city suburbs.

farmers' representatives, sub-county NAADS coordinators, and community development officers).

The survey was implemented in stages. The first step involved consultations with the NAADS secretariat and technical personnel on survey implementation at UBOS and EPRC. It was followed by field pre-testing of the survey instrument and the training of field enumerators. The pre-test helped in modifying the questionnaire to suite local environment.[21] During the pre-testing stage we found that it takes about 3 hours to fill a questionnaire. This time is too long to maintain a conversation with a farmer who must take care of other farm or household activities. Although, we had scheduled appointments with local authorities and farmers before the survey, our experience revealed that the process was very demanding of the farmers. The consolation we had was that farmers were always very eager to be interviewed; although certainly when it comes to information on household assets, land and livestock, some feel uncomfortable. Always the assurance was that the data is not for government (especially tax) purposes but for purely academic purposes. We kept promising and reaffirming confidentiality all the time.

Given the variations in local languages spoken across our study sites, it was important that we recruit field assistants who have excellent command of the local languages, but also fluent in English. The process of recruitment was coordinated in close collaboration with the district planning officers, who then mobilized potential field assistants. The preferred candidates were those who have had previous experience with

[21] However, actual implementation was faced with a challenge on the disposition (post harvests) section of the module. Generally, farmers could hardly recall information on how much they consumed, stored or lost to animals. This section was thus dropped from the questionnaire to reduce on the time it takes to answer the questionnaire.

data collection, particularly with UBOS. Although the targeted candidates group was advanced level graduates, luck brought us university graduates and students. Training was conducted at the district headquarters. For each of the study sites a post survey was carried out to fill some of the gaps on questions which arose during the first round.

The data was captured using a database designed using Microsoft Access. The database was ready at the time of data collection; otherwise it would have been difficult to keep up with the data processing given the limited time.

The site selection and sample size

During the first year of implementation, six districts were selected for piloting the NAADS program. The selection was not random, as it took into account factors such as the rankings of a district in the local government performance indicators and the agricultural potential. The NAADS pilot districts at inception were Arua, Kabale, Kibaale, Mukono, Soroti, and Tororo (Map 1).[22] Within each of the initial districts, 4 sub-counties were selected to pilot the program. By December 2005, the NAADS program had extended to 37 districts covering a total of 334 sub-counties across Uganda (Republic of Uganda, 2005c).

The present study is based on a random selection out of the pilot NAADS districts. The reason for this choice is based on the fact that to understand the impacts of the NAADS program, one needs to study NAADS processes in those districts that have had the program much longer than the “newer” districts into the NAADS. The three

[22] If selection of these regions was based on them being good performers, then an upward bias might arise if we neglect the non-random program placement in our modeling (Morduch, 1998).

districts selected for this study were Kabale, Mukono and Tororo. These districts are hereafter referred to as NAADS (treatment) districts.

Within each of the treatment districts, one sub-county was selected out of the original 4 sub-counties. However, it is important to note that since its inception, the NAADS program has rolled out to other sub-counties within the treatment districts and that some sub-counties have not joined the NAADS program (Table 2).

Table 2. Number of sub-counties in each of the study districts

		Selected Districts			
		NAADS Districts			Non-NAADS District
		Mukono	**Kabale**	**Tororo**	**Kayunga**
Total no. of NAADS sub-counties (SCs)	Year of entry	# joined NAADS			
	2001/2002	4	4	3*	
	2002/2003	5	5	2	
	2003/2004	2	3	1	
	2004/2005	11		3	
	2005/2006	2			
	Total	24	12	9	
Total no. of SCs in district		28***	18	18	9
Total no. of Non-NAADS SCs closer** to selected NAADS SCs		1	1	2	
Total no. of NAADS SCs surveyed		1	1	1	
Total no. of non-NAADS SCs surveyed		1	1	1	1
Total no. of SCs surveyed in district.		2	2	2	1

Source: Author
* Although four sub-counties started with the program, Nagongera sub-county was scrapped from the program following mismanagement of the program in that sub-county.
** Ideally we considered those sub-counties that border with the selected NAADS sub-counties. However, for the case of Kisoko sub-county in Tororo district, the closest (bordering) non-NAADS sub-county was Nagongera, which was scrapped from the NAADS program. Since this sub-county could not qualify for selection in this study, Paya sub-county was selected as closer to Kisoko sub-county
***figure includes 4 urban municipalities.

The analogy applied in the selection of the treatment districts is the same applied in the selection of the treatment sub-counties. The selected sub-counties are hereafter

referred to as NAADS (treatment) sub-counties. These sub-counties were Kyanamira in Kabale district, Kasawo in Mukono district and Kisoko in Tororo district. Since within each selected treatment district some sub-counties do not participate in the NAADS program (see Figure 1), it is important to include a sample of them in the study. We refer to the selected sub-counties as Non-NAADS (control) sub-counties within the treatment district. The choice of these sub-counties was based on being in a similar geographical region with the selected treatment sub-county (The cultural backgrounds of farmers staying in two neighboring sub-counties [a treatment and a control] are likely to be similar). The selected non-NAADS sub-counties were Kaharo sub-county in Kabale district, Ntunda sub-county in Mukono district, and Paya in Tororo sub-county.[23] Therefore within each treatment district, one NAADS and one non-NAADS sub-county was selected.

Because the NAADS program had not yet rolled out to the rest of the country at the time of our study, we sample one district that had not joined the NAADS program. This district is referred to as a non-NAADS district or control district. The ideal case would have been selecting one control district in a geographical region close to each of the selected treatment district. However, due to budgetary and time limitations, it was not possible to execute the study in three control districts. Instead one control district of Kayunga, closer to Mukono district (selected treatment district) was selected. The Weakness of this decision is that Kayunga may serve as a better control for Mukono and

[23] At the time our interviews were conducted, Ntunda sub-county was still a non-NAADS sub-county within Mukono district. However, the sub-county has recently joined the NAADS program. Furthermore, the evaluation problem becomes complicated when the so called 'control' has other programs going on. An example is Kaharo sub County, which although not under NAADS, runs a similar program known as Area based Agricultural Modernization Program (AAMP). The presence of such 'parallel' programs causes evaluation as well as coordination problems. Harmonization of such programs with the NAADS program is very important.

not Kabale and Tororo. Within Kayunga district, one sub-county was selected as a non-NAADS sub-county in a Non-NAADS district. The chosen sub-county was Kangulumira sub-county.

Selection of the farmers

The farmers interviewed throughout the study were not drawn from a single village but instead spread across four villages, one in each of the four selected parishes within the sampled sub-counties.

The interviews were conducted at the household level. Every household selected in this study represents a farmer.[24] A household is defined as a NAADS farmer if any member of the household (usually husband or wife or both) is a registered member to one or more NAADS farmers' groups. A household is defined as a non-NAADS farmer if no member of the household has ever belonged to the NAADS farmers' groups. The selected farmers' residences were located with the help of community development officers, NAADS sub-county coordinators, and chairpersons of the NAADS farmers' fora at the sub-county.

Using the NAADS farmers' group listings in each treatment sub-county as our sampling frame, 47 farmers from Kasawo sub-county, 40 farmers from Kisoko sub-county, and 40 farmers from Kyanamira sub-county were randomly drawn (Table 2). These farmers are referred to as *NAADS (treated)* farmers.

It is worth pointing out that within each treatment sub-county, some farmers participate in the NAADS program and others do not (see Figure 1). Every farmer is

eligible to join the NAADS program, but ideally those with some assets (e.g., land) and the economically active farmers are likely to participate. Since some farmers self-select to join the NAADS program and others do not, it is important to sample some farmers who do not participate in the NAADS program. We refer to these farmers as *Non-NAADS (control)* farmers. In total 25 farmers from Kasawo sub-county, 25 farmers from Kisoko sub-county, and 22 farmers from Kyanamira sub-county were interviewed.

Within each non-NAADS sub-county in a treated district, 20 farmers were randomly selected from a sub-county population listing. Therefore, a total of 60 farmers were interviewed. These farmers constitute another control group from non-NAADS sub-counties within the treatment district. Lastly from the control district, a random sample of 50 farmers was selected from 4 parishes. These farmers constitute the third control group.

[24] We interchangeably use the term household to mean a selected farmer.

Table 3. Classification of households in study sub-counties

	Selected sub-counties from NAADS districts						Selected sub-county from a non NAADS district.
	NAADS sub-counties			Non-NAADS sub-counties			
	Kasawo	Kisoko	Kyanamira	Ntunda	Paya	Kaharo	Kangulumira
Total population*	31,149	15,062	19,328	13,412	30,912	17,974	43,703
Total no. of households*	6,683	2,927	3,976	3,025	6,549	3,635	9,453
No. of NAADS households**	1764	1044	1,268				
Total no. of non-NAADS households***	4919	1,883	2,708	3,025	6,549	3,635	9,453
	Treatment group (TF)						
NAADS households sampled	47	40	40				
Non-NAADS farmers sampled	Control group 1			Control Group 2			control group 3
	25	25	22	20	20	20	50

Source: Author
* Obtained from Uganda Bureau of Statistics, 2002 Census Report.
** Obtained from NAADS Secretariat based farmers' group information of fully registered NAADS households.
*** Computed by author as the difference between total number of households and total number of NAADS households in a NAADS sub-county.

An important point to note is that non-NAADS farmers outside the treatment sub-counties include farmers who probably would have participated in the NAADS if the program had been available to them.

The units of analysis and measurement

Reardon & Glewwe (2000b) note that in hard-to-survey situations, Uganda a case in point, farmers grow a variety of crops and rear a variety of animals typically on smallholder farms. The use of non-standard (local) units of measurement is common and only few of the daily transactions might involve cash. Farmers might have several small plots dispersed and sometimes controlled by different managers. Plots differ in terms of proximity to the farmer's dwelling, land quality and use, degree of land degradation and erosion and other characteristics.

Furthermore, there might be few or no literate adults in the household (Reardon & Glewwe, 2000b). These features are typical of Uganda's rural farmers. Given this setting, it is recommended that disaggregated data at a plot rather than the entire farm level and by season rather than by calendar year be collected to minimize the chances that the data will suffer from serious measurement error (Reardon & Glewwe, 2000b).[25] In addition, collection of data on a seasonal basis accounts for possibility that some farmers exhibit variations in access to extension, credit, and crop mix.

The number of agricultural seasons in a particular region and the exact timing of the survey are other issues that need to be considered (Reardon & Glewwe, 2000b). The recall period for recording agricultural output and inputs should be the cropping season, not the preceding 12 months, particularly for countries with two or more seasons per year (Reardon & Glewwe, 2000b). In Uganda, there are two agricultural seasons, since there are two rainy seasons per year. The first cropping season runs from April to August and

[25] There is an exception with respect to livestock. Questions related to livestock should be asked at the household level (Reardon & Glewwe, 2000b).

the second from November to January. The best timing for the interview is after the end of the cropping season. The survey commenced in September 2005 and ended in April 2006.

The person managing a particular plot is perhaps a better person to interview (Reardon & Glewwe, 2000b). This is because we are able to elicit the relevant information from the most knowledgeable person. We interviewed the plot managers (household heads or spouses or both).

To address the problem of non-standardized units of measurement, we collected data in its non-standardized form and applied unit conversions used by the UBOS in household surveys (Table A2). In addition, for specific crops such as water melons, cabbages, pineapples, and paw paws, we took weights for the smallest, medium and large sizes in selected markets in each of the study sites (see footnote Table A2). Failure to account for differences in weights of such crops may result in incorrect measurements of crop yields.

Qualitative and quantitative methods

The qualitative approaches applied in this study included document reviews, semi-structured interviews with farmers', focus group discussions, and direct observations (Chung, 2000). The purpose of the qualitative evaluations is to complement the quantitative analysis. It is argued that qualitative approaches can aid in explaining certain processes that we "may" fail to capture in modeling (Kanbur, 2003). However, by no means do such methods imply causation (Rao & Woolcook, 2003). The qualitative

methods were used to answer the following general questions: Are PSPs providing the services as stipulated in the contracts? How effective are different sub-county level players in monitoring NAADS activities? How effective are farmer groups in managing technology demonstration sites? Do the farmers and sub-counties co-finance their counterpart NAADS funds?

The quantitative analysis contains both the descriptive analysis and the causal (only the reduced form) analysis. The former is used to answer questions such as what crops (animals) do NAADS and non-NAADS farmers grow (keep)? Which households are using technologies under TDS? What agricultural inputs such as fertilizers, pesticides and farm equipment are used by NAADS and non-NAADS farmers? What households access credit and what are the sources of the credit? How effective are sub-counties perceived by NAADS and non-NAADS farmers? Are there variations among farmers (NAADS versus non-NAADS) in the participation of local political elections? Are there variations in the crop yields across NAADS and non-NAADS farmers?

Although the estimates from the descriptive analysis are approximations, they do not account for the behavior of agricultural households (Reardon & Glewwe, 2000b). For this reason we explore the causal analysis to answer the question of impact of access to advisory services on the value of farm production per acre.

Survey and estimation challenges

In the above sub-section we raised concern over the possibility of response bias. Households were reluctant to provide data on household assets, land and livestock. In

addition, missing data points were another problem, despite the training efforts to minimize the problem. Measurement errors are another possibility. Farmers faced recall problems in having to remember how much they harvested; although after explanations using local units of measurement some revealed more information than others.

The estimation problems we confront include both the non-random program placement and the self-selection in/out of the NAADS programs (see Chapter 1). In addition to these endogeneity problems, there is the problem of having to deal with clustered samples (Deaton, 1997; Wooldridge, 2002). Farmers staying in a particular village are likely to be more similar on a variety of ways. In order to correctly analyze the data, the correlations need to be taken into account. Failure to do so may result in underestimation of the standard errors. The problem is that the higher the intra cluster correlation, the less unique information each additional household member provides. Lastly, the failure to adjust for the sampling design would yield incorrect variance estimates (Stata Guide, 2005).

We address the non-random program placement and self-selection by applying the IV methods. First, we exploit political and geographical variables to explain participation into the NAADS program. The political variables include the political connectivity of the farmer to the sub-county leadership, whether or not the farmer is satisfied with sub-county in managing their activities and in mobilizing them to work together. We also ask about the farmer's awareness of local political voting processes and whether the farmer participated in the most recent local elections at the sub-county. The presumption is that these variables do not affect the agricultural outcome of interest. We test for whether the

IVs are good instruments.[26] In addition, other factors such as the local government assessment indicators are potential candidates for IVs considered in the placement decisions. However, we face the problem that some factors that affect the placement decision are correlated with the outcome of interest. For example, the agro-potential of the sub-county is a candidate in choosing whether a particular sub-county joins NAADS or not.

We adjust the variance estimations by computing probability weights using the procedure and data in Table A3. We also apply the clustered robust standard errors option in STATA to correct for the intra-cluster correlation. Our problem, however, is that computation of intra-cluster correlations requires a fair number of clusters, which we do not have.

Based on the review in Chapter two, and assuming we have controlled for the potential confounding problems, we would expect access to decentralized advisory services under NAADS to result in higher crop yields among NAADS farmers than non-NAADS farmers. The next chapter checks the validity of this hypothesis by presenting the empirical results.

[26] Really ‘‘good’’ instruments are not easy to come by (Deaton, 1997; Wooldridge, 2002).

CHAPTER FOUR. EMPIRICAL FINDINGS

Introduction

The goal of this chapter is to present the empirical findings on the impact of access to advisory services under the NAADS program. The chapter constitutes two main sub-sections. The first sub-section provides the quantitative analysis and the second provides the qualitative analysis. The qualitative findings are summarized in the form of responses to the questions raised in sub-section 3.5. The quantitative section applies the IV methods to estimate the impact of the NAADS program among participating farmers.

The review of the literature on agricultural extension in developing countries revealed mixed impacts of the Training and Visit (T and V) extension system on agricultural outcomes (Birkhaeuser et al, 1991). One of the outstanding challenges in the literature relates to the measurement and attribution of program impacts in face of econometric challenges such as self-selection in programs and non-random program placements. However, more recently, econometric procedures that seek to correct for such challenges have emerged; these include the application of the IV methods.[27] The next subsection describes and applies the IV method using farm level data collected from selected districts in Uganda.

The focus of this study is to analyze the program impact of the recent decentralized agricultural extension program, known as the NAADS, which started in 2001 in selected districts in Uganda. In the previous chapter, we discussed that the NAADS program focuses on farmer empowerment to demand and hold accountable service providers of agricultural extension services. In other words, the farmers, as clients

decide the type of agricultural and marketing knowledge that they need, and are also able to contract with PSPs selected from a pool on a competitive basis. The selection of the PSPs is based on guidelines laid out and developed by the central government and local authorities; with the later heavily involved in coordinating the delivery of agricultural extension services.

The NAADS program targets the economically-active poor, defined to include those with limited physical and financial assets (especially land), skills and knowledge. The very poor and the large-scale farmers are eligible to participate in the program although they are not the targeted population. However, unlike other targeted programs for which "strict" eligibility rules are supposed to apply, the NAADS program *does not* exclude participation within a participating sub-county.[28] Women and youth are encouraged to participate, although in practice it has not been easy to get youth to participate in the NAADS program. Our discussions with farmers in the farmers' groups pointed to the fact that the youth prefer off-farm enterprises (such as becoming *boda boda* cyclists) or migration to towns where they end up doing low-skill jobs.[29] Women, on the other hand, are eager to participate in NAADS; although there are still cultural

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[27] Blundell & Dias (2000) provide an overview of the evaluation methods for non-experimental data.

[28] An example of targeted programs applying eligibility rules are the three credit programs in Bangladesh discussed in (Morduch, 1998). The eligibility rule, although *doubtedly* adhered to requires that access to credit is limited to participants having less than half an acre of land. The absence of a clear eligibility rule under NAADS has implications for our analysis. For example, one could be poor with no assets such as land, but he/she rents-in land and then chooses to participate in NAADS. Similarly, a rich person may choose to participate, although the program seeks out to the economically active poor. There are certain unobservable characteristics that may compel one to belong to the program. Probably we can think of the economically active poor as those farmers who are "eager" to improve their welfare by exert higher effort (which is unobservable to the researcher) and at the same time they own or have access to some assets (e.g., land).

[29] *Boda Bodas* are motor cycles used for business to transport people, goods and services. Earlier users of the *boda boda* used bicycles. More recently, with the support of micro finance institutions, some old participants and new entrants in the Boda Bodas business have accessed loans to buy motor cycles. In other cases the youth work for the owner of a *boda boda* for a negotiable wage, usually on a daily basis. This form of transport is popular in all parts of Uganda today.

impediments that hinder women's participation in NAADS. This was particularly the case in Kasawo and Kisoko sub-counties. Women are expected to perform farm as well as household cores and in some cases refused by their husbands to participate in community participation activities including NAADS.

That said, a key characteristic of NAADS, an example of a recent anti-poverty program, is that some regions and therefore some households get the program and others do not.[30] The non-random placement of the program casts doubt on the exogeneity of assignment to NAADS and hence one must appeal to evaluation methods that might help isolate the variation in program placement that is exogenous. The IV method is adequate if we can find IVs that do not change outcomes conditional on participation and other covariates but do influence participation.

The literature shows that analysts of agricultural extension impacts are increasingly relying on non-random evaluation methods to address these econometric challenges. For example, Feder et al.(2004a) and Godtland et al.(2004) study the impacts of the Farmer Field Schools (FFS) approach. Feder et al. (2004a)) applied difference in differences (DD) methods to study the impact of FFS graduates on farm yields and pesticide use in Indonesia. They utilized a panel household survey dataset that covered both FFS farmers and non-FFS farmers. Their empirical results do not indicate that the FFS induced significant improvements in yields or reduction in pesticide use by graduates relative to other farmers. In addition, secondary diffusion effects on those exposed to graduates are also not significant.

Godtland et al. (2004) applied Propensity Score Matching (PSM) methods to study the impact of the FFS on farmers' knowledge among participating potato farmers in

Peru. This method is invoked so as to ensure that the bias in the impact estimate due to selection on observables is minimized. Similar to the NAADS program, selection of FFS villages was not random. An International NGO, CARE-Peru, had been running another rural development project called Andino. Selection of FFS participating villages was from the pool of villages participating in Andino. In addition, villages closer to the district capital were selected for participation. The FFS targeted the middle income population. All farmers in a selected village were eligible to participate in the program, but with the requirement that participants had to attend all the training sessions. Pre-existing farmers' groups took advantage of the call and enlisted first into FFS. They find that farmers who participated in the program have significantly more knowledge about Integrated Pest Management (IPM) practices than the non-participants. However, the authors note that if control over land and household assets proxies for wealth, it suggests that FFS is better taken advantage of by the wealthier, while traditional transfer-of-technology approaches cater to less endowed farmers. The FFS extension method is thus better fit for younger farmers and for farmers with greater endowments.

With regard to the NAADS program, few studies have been carried out to analyze its impacts on the program beneficiaries. These include Scangari study (Republic of Uganda, 2005c) and a study by the International Food Policy Research Institute (IFPRI) in collaboration with the NAADS secretariat (hereafter, NAADS/IFPRI) in 2005. Both studies found that farmers are accessing advisory services much more than they used to during the old extension system. However, despite the positive effects of NAADS on adoption of improved production technologies and practices, the NAADS/IFPRI study did not find significant differences in yield growth between NAADS and non-NAADS

[30] (Ravallion, 2006) provides a comprehensive discussion on the evaluation of such anti-poverty programs.

sub-counties for most crops. In addition, the NAADS/IFPRI study did not find evidence of strong impacts of NAADS on farmers' sense of empowerment. However, the Scangari study did find strong evidence of farmer empowerment.

The Scangari study was purely based on qualitative survey approaches and document reviews. The NAADS/IFPRI study is perhaps the first attempt in quantifying the impacts of the NAADS program. Although the NAADS/IFPRI study conducted comparative statistics between participating and non-participating farmers, it did not control for the non-random program placement as well as the self-selection of farmers into the NAADS program.

The objective of this study is to estimate the impact of access to the NAADS program by applying the IV techniques to take into account the econometric challenges discussed above. The goal is to account for the potential sources of bias in measuring program impacts. Three sources of biases can emerge in the NAADS program (see Godtland et al, 2005 for a similar analogy). NAADS participants are likely to differ from non-participants in the distribution of their observed characteristics, leading to a bias from selection on observables. Such a bias is likely to arise because of the criteria used for selecting NAADS sub-counties. Such criteria included local government assessment indicators, which are not expected to have an impact on agricultural outcomes. The second problem is that of potential diffusion of knowledge in NAADS sub-counties. In the presence of such biases, comparison of NAADS and non-NAADS farmers in the same sub-county is likely to underestimate the program impact. Third, NAADS farmers/participants may differ from non-participants in the distribution of unobserved characteristics such as the farming ability that affects both the decision to participate in

NAADS and the outcomes of interest such as yields, resulting in a bias due to selection on unobservables.

The analytical framework

This section lays out the estimation approach based on the IV methods. Let y denote our measure of agricultural productivity. The dependent variable y can take two values for each farmer: y_1 denotes the value of y when treatment is received (belonging to the NAADS) and y_o denotes the value of y without treatment. The impact evaluation problem that we face is one of missing data, in the sense that for any given farmer, we only observe y_1 or y_o but not both at any given point in time (Wooldridge, 2002). Let *tof* denote a dummy variable indicating treatment. If *tof* =1, then $y = y_1$ and if *tof* = 0, then $y = y_0$. The objective is to estimate the benefit of belonging to the NAADS that is to estimate: $y_1 - y_0$, the variation in gains from the NAADS.

The testable hypothesis is that farmers participating in NAADS get access to better advisory services provided by the PSPs and thus are likely to access and adopt better agricultural knowledge and skills, which in turn will lead to better agricultural outcomes. The agricultural outcome of interest is the value of farm production per acre defined as the total of the value of crop production and value of livestock adjusted by the total farm land used for farming. Price data to compute the values of crop production was collected from three neighboring markets in each of the study sites. The instrument used to collect this data is attached in Table A1. The details of how the prices were computed are provided in Table A4).

Data on output were collected using the farmers' questionnaire. In the survey we asked the farmer to identify which crops had been grown and harvested in each of the two agricultural seasons outlined in Chapter 3. Using the conversion factors in Table A2, crop yield was computed as the product of the amount harvested and the corresponding conversions of the non-standard units in kilograms. The derived output was multiplied by the price per kilogram to derive the value of crop production for each crop harvested by the farmer. By aggregating over the value of crop production on each plot by season, we derived the value of total crop production. The survey also asked questions on the number of animals reared and the farmer's own valuation of the value of each animal if a price to purchase that animal was offered. The data from these questions is used to compute the value of animals, which is a capital stock. We assume 10 percent of this capital stock as the value of the income flow from rearing the animals. The sum of the value of crop production and value of the income flow are adjusted by the total farm land used for farming to derive the value of farm production per acre.

Using the value of the farm production per acre as the dependent variable in analyzing the NAADS impact is better than focusing on either the value of crop agricultural production alone or the value of animals reared. The NAADS program is promoting both crop farming and animal rearing but with focus on value addition through, among others, the procurement of high breed seed and animal varieties and to some extent "off-farm" enterprises (e.g., fish farming). The value of the farm production per acre measure takes into account the notion that households diversify their farm activities to reduce their risk exposure. This study does not, however, analyze the impact of NAADS on other agricultural outcomes that the NAADS program is expected to

affect. These include the impact on non-farm enterprises such as fish farming and bee keeping. Such activities are still on a small scale in rural areas of Uganda.

We apply the IV method to account for the non-random NAADS program placement and self-selection in/out of NAADS. The presumption is that the IVs affect participation but not the outcome equation. The IVs used in identifying the outcome equation are the local government assessment indicators that were in part used in deciding whether a particular sub-county or district participates in the NAADS program or not.[31]

Since 2000, the Ministry of Local Government has institutionalized the annual assessment of minimum conditions and performance measures for all local governments irrespective of the donors supporting them. Before then, the assessment was conducted under the first district development performance in 31 districts and 13 municipalities.

The 2001 assessment comprised measures to verify local government compliance to the provisions of the laws and regulations to assist local governments to identify functional capacity gaps which if addressed would lead to increased outputs and ultimately improved service delivery and poverty reduction and to reward good performance and sanction poor local government performance as a strategy for institutional strengthening. The parameters used include the quality of development plan (qdp), monitoring and evaluation (ME) mentoring, communication and accountability (CA); and local revenue performance (LRP). Overall, the assessments of local governments are aimed at deepening the decentralization policy in general.

[31] The assessment of local governments is conducted each year and seeks to establish the degree of local governments' conformity to stipulated laws and regulations as provided for in the Local Government Act 1997, Local Government Financial and Accounting Regulations 1998 and the Local Governments Tender Board Rules and Regulations.

For each of the parameters considered, a local government is assessed on performance as follows: (i) the local government scoring at least 7 of 10 points in the assessment qualifies for that parameter; (ii) local government scoring 5 or 6 points out of 10 are considered "static" for that parameter; (iii) local governments scoring less than 5 out of 10 are considered for a penalty for that parameter. A local government forfeits its status for a bonus or static under performance measures if it did not meet the minimum conditions.

Table 4 below presents the scores on selected parameters for each of the sub-counties included in our sample. The performance measures are based on the 2003 local government assessment report. The report contains assessment for the year 2002. The assessments reflect factors that the authorities might have taken into account in rolling out the NAADS program implementation in 2002.

Table 4. Local government assessment indicator scores of sampled sub-counties

	Mukono		Kabale		Tororo		Kayunga
	NAADS	Non-NAADS	NAADS	Non-NAADS	NAADS	Non-NAADS	Non-NAADS district
Performance measure	Kasawo	Ntunda	Kyanamira	Kaharo	Kisoko	Paya	Kangulumira
Quality of development plan	7	10	10	8	8	6	8
Monitoring and Evaluation mentoring	8	10	9	9	7	7	9
Communication and Accountability	9	10	8	7	3	4	5
Local Revenue Performance	7	5	8	8	4	2	5

Source: Ministry of Local Government, 2003.

The empirical specification

We assume that the value of the farm production per acre by a farmer is influenced by factors such as the vector of shares of area planted to different types of crops, land management practices, household's endowment of physical capital, human capital and social capital, hired labor, agro-ecological conditions, and access to markets and infrastructure.

Certain crops flourish in specific agroecological conditions. We would expect that the value of crop production and thus, the value of the farm production per acre would be positively affected by better agroecological conditions. As noted by Nkonya et al.(2004) and Pender & Gebremedhin (2006) perennial crops such as coffee and bananas generally grow better in bimodal, higher rainfall areas, such as the high potential bimodal zones, than in the drier, unimodal zones. Perennial crops are likely to be found in the more humid bimodal rainfall zones. In areas of generally higher agricultural potential, such as in highland areas having favorable rainfall and fertile volcanic soils, we would expect the higher value commodities such as horticulture crops (including fruits, vegetables). Lower-value commodities, such as cereals, are more likely to be grown in areas of lower potential, along with complementary livestock production (McIntire, Bourzat, & Pingali, 1992).

Given the substantial transaction costs of storing, transporting, and marketing commodities, access to markets and roads is critical for determining the comparative advantage of a location, given its agricultural potential (Pender & Gebremedhin, 2006).

Better access to markets and roads is expected to increase the use of purchased inputs and the capital intensity of agriculture by increasing the profitability and availability of such inputs and increasing access to credit (Binswanger & McIntire, 1987). However, as pointed out by Pender & Gebremedhin (2006), the impacts of markets and roads access are ambiguous. To the extent that better access promotes production of higher-value crops, increases the local prices of crops, and promotes more intensive use of inputs, it tends to increase the value of crop production and thus the value of the farm. However, better access may also reduce the labor intensity of crop production and thus could reduce the value of the output.

Access to credit programs may enable farmers to purchase inputs or acquire physical capital, thus contributing to technology adoption and increased capital and input intensity in agriculture (Feder, Just, & Zilberman, 1985). This may promote increased production and marketing of high-value crops or intensification of livestock production and permit reduction of subsistence production. If credit availability helps relax credit constraints, this can reduce the extent to which households discount the future. Credit may also facilitate labor hiring and thus promote labor intensification. However, credit availability may enable households to invest in nonfarm activities, and thus may contribute to less intensive management of land and other agricultural resources. The net impact of credit on crop production is thus ambiguous.

Education is likely to increase households' opportunities for salaried employment off farm, and may increase their ability to start up various nonfarm activities (Barrett, Reardon, & Webb, 2001; Deininger & Okidi, 2001). Education may increase access to credit, as well as cash income, thus helping to finance purchases of physical capital and

purchased inputs. This may help to promote high-value crop and intensive livestock production, as well as promoting greater use of such capital and inputs in producing traditional food crops. Education may also facilitate changes to income strategies and technologies, by increasing access to information about alternative market opportunities and technologies (Feder et al., 1985). However, more educated households may be less likely to invest in inputs or labor intensive land investments and management practices, because the opportunity costs of their labor and capital may be increased by education. As a result, the net impact of education on crop production is ambiguous.

If factor markets (markets for land, labor, and capital) do not function efficiently, then there may be significant differences among households in their land management practices and agricultural productivity (de Janvry, Fafchamps, & Sadoulet, 1991). In the context of imperfect labor and land markets, agricultural households with less land or a larger family labor endowment per unit of land can be expected to use land more intensively in agricultural production. The impact of smaller farm size or large family size on the value of crop production per hectare is likely to be positive if labor and land markets are imperfect, or zero, if these markets function well.

Similar to the methodology by Pender & Gebremedhin (2006), we model the value of farm production per acre to depend on the choice of crops and the farm-level prices of these crops, the inputs and land management practices used in producing them and the natural conditions of the plot. Because the choice of crops planted varies among households and regions in Uganda, we do not explicitly include crop prices as determinants of the value of crop production, instead, we assume that farm-level prices are determined by village-level factors determining local supply including agro-

ecological factors, demand, and transportation costs of commodities and household-level factors affecting transaction costs an marketing abilities.

However, instead of running a structural equation, we run estimates of a semi-reduced form of the value of the farm production per acre. The causal factors considered include agroecological zones, access to markets and roads, farm size, access to credit, a dummy variable capturing participation in NAADS, physical assets, such as equipment and livestock. Farm size is measured as the logarithm of acres of total farm land owned under cultivation. Household and social attributes include family size, education, age, health status, and sex of the farmer.

The model specification is given by (1):

$$y_i = \alpha_0 + \alpha_1 IP_i + \alpha_2' X_i + \alpha_3' Z_i + \mu_i \qquad [1]$$

where Yi is the value of farm production per acre, IPi denotes participation in NAADS, Xi denotes household characteristics, and Zi denotes geographical characteristics such as the agricultural potential of the area as measured by agro climatic conditions, $\alpha = (\alpha_1, \alpha_2, \alpha_3)$ denotes the parameters of interest. Equation (1) models the outcome, Yi as linearly dependent on IPi, Xi, and Zi. Equation (1) cannot be estimated using OLS because *IP* may be correlated with μ. Estimation of equation (1) without controlling for self-selection, non-random program placement, and spillover effects leads to biased estimates of the NAADS impact α. Failure to account for the self-selection into the program leads to biased estimates (Heckman, 1979).

X and Z are assumed to be orthogonal to μ_i. However, IPi is correlated with μ_i. Equation 1 has limitations. Linearity in IP entails that the program has the same marginal impacts for everyone. However, consistent estimation allowing for idiosyncratic impacts

on outcomes at given X and Z is not possible unless the idiosyncratic factors do not influence program placement (Baker, 2000).

Recall from Chapter 3 that some farmers in control sub-counties in a treatment sub-county would have participated if their sub-county had not been excluded. This feature of "partial decentralization" is the subject of (Ravallion, 2006), who observes that the possibility to find suitable control variables for geographical placement may help solve the problem of non-random program placement since the problem can then be cast as that of selection on observables. Controlling for sub-county fixed effects and taking into account program placement rules, we can estimate the impacts of NAADS on the participants. In essence selection of a particular sub-county to participate is choosing individuals in that sub-county to participate in the program (although, as we noted the previous section not all farmers choose to participate). Therefore, the allocation of NAADS to a particular individual depends on whether or not the program has been placed in his/her area of residence, denoted by the geographical placement, GP. The model for individual placement is denoted by

$$IP_i = \beta_0 + \beta_1 GP_i + \alpha_2' X_i + \nu_i \qquad (2)$$

where v is an error term capturing the unobserved influences on individual placement and $\beta = (\beta_0, \beta_1, \alpha_2)$ denotes parameters of interest. The endogeneity of program placement implies that the error term in equation (1) is correlated with the error term in equation (2). Assuming that GP_i is not correlated with μ_i, We can obtain consistent estimates of program effects with a single cross-section survey (Baker, 2000; Ravallion, 2006). However, biased estimates can result if there is omitted geographic heterogeneity which jointly is correlated with program placement and the value of farm production per acre.

Descriptive statistics

The next sub-section presents the descriptive statistics to answer some of the questions raised in sub-section 3.5. We perform simple statistical tests on whether there is a difference between the means of selected variables across NAADS and non-NAADS farmers. Under the null hypothesis that there is equality in means between NAADS and non-NAADS farmers, we reject the null if the p-value is less than the level of significance (at 1 percent, 5 percent or 10 percent). However, caution must be taken in generalizing these results, since they are based on simple comparisons between NAADS and non-NAADS farmers and thus, do not take into account the non-random program placements and self-selection problems.

Table 4 compares the average characteristics of NAADS farmers with the different control groups. Panel A compares selected variables between NAADS and non-NAADS farmers in a NAADS district and a non-NAADS district. Since Kayunga district was chosen as a control district in our sample, it is useful to compare non-NAADS farmers in Kayunga district to NAADS farmers in the neighboring NAADS district of Mukono. The NAADS farmers are those interviewed in Kasawo sub-county, a NAADS sub-county in Mukono district. The non-NAADS farmers sampled from Kayunga district are from Kangulumira sub-county, a neighboring sub-county to Kasawo.

At the 10 percent statistical significance, the equality of means is rejected for the education level of the household head, vanilla and cattle dummies, value of livestock and proximity to sub-county. For all these variables, the NAADS averages exceed those of non-NAADS farmers. NAADS farmers have more years of schooling. Relative to non-

NAADS farmers, more NAADS farmers grow vanilla. More NAADS farmers rear cattle than non-NAADS farmers. In addition, NAADS farmers are more likely to stay closer to where a technology demonstration site is located than the non-NAADS farmers.

At the 5 percent statistical significance, the equality of means is rejected for the value of farm equipment, amount of land owned and rented, and the number of farmers rearing poultry, goats or sheep. The null is also rejected for whether a farmer kept farm records or not and whether a farmer stays near a feeder road or not. For all these variables, the averages for NAADS farmers exceed those of non-NAADS farmers. For the rest of the variables, the null cannot be rejected.

Panel B compares NAADS farmers with all non-NAADS farmers in non-NAADS sub-counties within NAADS districts in the sample. This case excludes non-NAADS farmers within NAADS sub-counties and farmers in non-NAADS districts. At the 10 percent statistical significance, the null is rejected for the value of household assets, the dummy for growing root tubers, and whether a farmer has used manure or not. For these variables, the NAADS averages exceed the non-NAADS averages. At the 5 percent statistical significance, the null is rejected for education of the household head, dependency ratio, value of farm equipment, value of livestock, days spent learning at the sub-county, says spent attending at the farm, whether a farmer is aware of any local village political elections after 2001, closeness to a periodic market, and if a farmer participated in the most recent local political elections. For these variables the average characteristics of NAADS farmers exceed those of the non-NAADS farmers except for dependency ratio, number of days spent on the farm, and proximity to the market. Non-

NAADS farmers on average have many children less than 14 years old, spend on average 24 days on the farm, and are more likely to be closer to the nearby markets.

Panel C compares NAADS farmers with all non-NAADS farmers in the sample. At the 10 percent statistical significance, the null is rejected for whether the farmer keeps records or not, whether the farmer is satisfied with the management by the sub-county authorities, and whether a farmer participated in the most recent local political elections. At the 5 percent statistical significance, the null is rejected for the education of the household head, dependency ratio, the number of days spent on social gatherings and attending to the farm, whether a farmer was aware of any local village political elections after 2001, and whether a farmer is satisfied with the mobilization efforts of the sub-county authorities. At the 1 percent statistical significance, the null is rejected for the dummy for root tubers, whether a farmer used manure or not and the days spent learning at the sub-county. NAADS farmers spend an average of 2 days a month in learning at the sub-county. Overall, the null is not rejected for most of the variables in Table 5.

Table 4. Descriptive statistics for selected variables, NAADS and non-NAADS farmers in the study sites

		Panel A			Panel B			Panel C		
Variable	Description	NAADs	Non-NAADs	p-value	NAADs	Non-NAADs	p-value	NAADs	Non-NAADs	p-value
	Number of observations	45	47		129	60		129	176	
Sex	Sex of household head (1=male)	0.767	0.766	0.983	0.782	0.759	0.735	0.782	0.798	0.739
Age	Age of household head	47.04	45.53	0.517	49.53	44.1	0.121	49.53	44.869	0.06**
Educ	Education level of head in years	8.953	6.48	0.054*	8.51	6.044	0.049**	8.507	6.916	0.109
Hhsize	Household (hh) size	6.56	5.71	0.274	6.73	5.43	0.114	6.73	5.98	0.175
Depratio	Dependency ratio = number of young hh members (less than 14 years old) to hhsize	0.391	0.41	0.663	0.376	0.419	0.011**	0.376	0.42	0.042**
Vhhassets	Value of household assets+	1747	1549	0.478	1952	1413	0.074*	1952	1942.9	0.987
Fequip	Value of farm equipment+	32.1	22.6	0.046**	33.3	19.7	0.025**	33.3	26.1	0.136
Totareao	Amount of land owned (in acres)	4.92	4.002	0.044**	4.363	3.998	0.146	4.363	4.201	0.702
Totarear	Amount of land rented (in acres)	2.19	1.22	0.029**	1.567	1.258	0.567	1.56	1.53	0.947
B117	Access to credit= 1 if access any form of credit; 0 otherwise	0.219	0.341	0.558	0.568	0.228	0.22	0.568	0.307	0.199
cyval	Value of crop yield (in kilograms per acre)+	169.9	186.1	0.697	155.8	196.1	0.27	155.8	200.3	0.165
Fru_veg	Fruit and vegetables	0.233	0.228	0.899	0.277	0.208	0.414	0.278	0.271	0.934
Coffee	Coffee	0.465	0.239	0.255	0.196	0.295	0.353	0.196	0.219	0.815
Matooke	Matooke	0.5116	0.375	0.493	0.265	0.444	0.124	0.265	0.3718	0.252
Vanilla	Vanilla	0.326	0.094	0.059*	0.129	0.118	0.908	0.129	0.1087	0.826
Grain	Grains	0.627	0.792	0.242	0.810	0.756	0.411	0.81	0.835	0.712
Rice	Rice	0.093	0.033	0.297	0.068	0.282	0.531	0.068	0.052	0.787
Legume	Legumes	0.767	0.717	0.611	0.806	0.688	0.185	0.806	0.686	0.141
Gnuts	Groundnuts	0.1627	0.188	0.767	0.124	0.211	0.287	0.124	0.235	0.315
Tuber	Tuber	0.837	0.726	0.113	0.818	0.705	0.058*	0.818	0.716	0.003***
Irish	Irish				0.328	0.044	0.287	0.328	0.1294	0.354
Vlstock	Value of livestock	517.6	271.4	0.095*	511.3	214.3	0.024**	511.3	330.4	0.131
Poultry	Poultry	0.833	0.626	0.021**	0.597	0.657	0.787	0.598	0.6751	0.787
Goat/sheep	Goat/Sheep	0.785	0.656	0.048**	0.744	0.647	0.273	0.743	0.6478	0.273
Cattle	Cattle	0.619	0.512	0.07*	0.552	0.514	0.662	0.552	0.5138	0.662
Pigs	Pigs	0.643	0.302	0	0.435	0.305	0.223	0.436	0.3051	0.223

Bee keeper	Bee keeper	0	0.006	0.19	0.015	0.002	0.188	0.015	0.0024	0.188
Usedfert	Whether used fertilizer	0.0697	0.107	0.151	0.125	0.094	0.665	0.125	0.088	0.487
Usedman	Whether used manure	0.534	0.412	0.247	0.623	0.344	0.059*	0.623	0.342	0.008***
Kprecord	Whether keep farm records	0.452	0.207	0.014**	0.343	0.192	0.25	0.343	0.159	0.083*
B120l	Learning at sub-county	1.814	0.807	0.210	1.97	0.485	0.021**	1.978	0.642	0.000***
B120i	Interacting with fellow farmers	2.883	4.374	0.186	3.07	4.67	0.157	3.07	4.18	0.1652
B120s	Social gatherings (e.g., attending weddings)	2.906	5.14	0.048**	3.66	5.4	0.109	3.656	5.094	0.055**
B120a	Attending to farm	23.63	23.43	0.909	21.76	24.2	0.024**	21.76	23.61	0.012**
Local	=1 if farmer was aware of any local village political elections after 2001; 0 otherwise	0.953	0.906	0.26	0.976	0.885	0.01**	0.976	0.918	0.029**
Nearroad	Near road	0.711	0.947	0.041**	0.808	0.965	0.256		0.8778	0.554
Nearsc	Near sub-county	0.595	0.774	0.062*	0.744	0.757	0.885	0.744	0.7686	0.747
nearTDS	Near Technology Demonstration Site	0.833	0.776	0.64	0.713	0.805	0.378	0.713	0.5745	0.386
nearpmkt	Near periodic Markets	0.609	0.789	0.305	0.591	0.842	0.056**	0.591	0.738	0.142
Sat_man	=1 if farmer was very satisfied or satisfied with management of activities at sub-county; 0 otherwise	0.93	0.860	0.145	0.919	0.846	0.151	0.919	0.835	0.073*
Sat_mob	=1 if farmer was very satisfied or satisfied with mobilization efforts by the sub-county; 0 otherwise	0.976	0.875	0.1	0.947	0.862	0.197	0.947	0.8509	0.021**
B115	=1 if a farmer participated in the most recent local political elections; 0 otherwise	0.837	0.719	0.379	0.887	0.668	0.05**	0.887	0.748	0.073*
B119	=1 if a farmer has close and good relations with lower levels leaders at village or SC; 0 else	0.883	0.878	0.83	0.87	0.882	0.426	0.871	0.887	0.408
vfm	Value of the Farm+	230.1	221.8	0.825	193.0	235.3	0.187	193.0	222.7	0.421

[1] The dummies were created by classifying specific crops out of the 40 crops listed in the questionnaire in Table A1. frui_veg dummy =1 if crops are fruits (lemons, oranges, passion fruits, pineapples, mangoes, paw paws, water melon) and vegetables (onions, cabbages, tomatoes, spinach, carrots, others) and zero otherwise. Matooke dummy =1 if type of bananas is sweet, food-type or beer-type and zero otherwise. Grain dummy =1 if crop is maize, finger millet, sorghum and zero otherwise. Legumes dummy =1 if crop is beans, field peas, cow peas, soya beans, and sim sim and zero otherwise; Gnuts =1 if crop is ground nuts; zero otherwise. Tuber =1 if crop is cassava, sweet potato; zero otherwise. Irish =1 if crop is irish potato; zero otherwise. Other cash=1 if crop is tea or tobacco; zero otherwise. Vanilla =1 if crop is vanilla.

+ One U.S. Dollar is equivalent to 1800 Uganda Shillings

*, **, and *** denote statistical significance at 10 percent, 5 percent and 1 percent respectively.

Panel a = Control group is non-NAADS farmers within non-NAADS district; Panel b = Control group is non-NAADS farmers within non-NAADS sub-counties in NAADS districts; and Panel c = Control group is non-NAADS farmers in the entire sample.

Next, we present additional descriptive statistics with respect to the additional questions that we asked only NAADS farmers. These questions were specifically aimed at eliciting information from program participants to understand how they perceived specific aspects of the NAADS program. Caution must be taken to interpret these results since they are drawn from a selected sample (only NAADS farmers). Table 6 presents the descriptive statistics for participating (NAADS) farmers. We found that on average 88 percent and 75 percent are satisfied with the services of the PSPs and are willing to purchase advisory services (if there was a private company providing advisory services at some fee) respectively. However, these numbers conceal the variations in satisfaction across different enterprises. For example, participating farmers are generally satisfied with the services under certain enterprises such as Irish and piggery projects but not poultry.

On average most farmers belong to more than one farmers' group, probably revealing how important different enterprises are to the farmers' quest for improved farming or how important farmer institutional development is under NAADS. The average co-funding (and other expenses such as contributions to run demonstration sites) varies across farmers. On average a farmer contributes 3.15 U.S. dollars a year in co-funding. However, some farmers do not pay but still belong to the program. Over 94 percent of the farmers have paid their co-funding. This figure is consistent with the evidence from the document reviews at the NAADS secretariat. Generally, the efforts to improve the farmers' organizational abilities through improved record keeping are low with only 39 percent of the farmers indicating that they keep records on output and inputs (our random checks with some farmers to produce the records revealed that even those

who said keep records could not produce them at interview claiming either they were too far or locked up somewhere in the house).

Table 5: Additional descriptive statistics for participating (NAADS) farmers

Variable Name	Definition	Obs.	mean	Std. dev	Min	Max
Quality of Extension and Access , Farmer Institutions, Co-financing, and Technology Access						
satq_psp	Satisfied with services of PSPs	127	0.882	0.324	0	1
nfgroup	No. of farmers' groups a farmer belongs	126	1.667	0.876	1	4
paidcf	Have you paid co-funding?	125	0.944	0.230	0	1
Avgfg	Average payments made in co-funding**	126	3.153	4.444	0	25
Will	Willing to purchase extension	125	0.75	0.433	0	1
Kprecord	Do you keep output and input records?	125	0.392	0.490	0	1
nearTDS	Are you near a TDS?	83	0.723	0.450	0	1
visitTDS	Have you visited a TDS before?	118	0.779	0.416	0	1
Train6	Received agric. training in last 6 months	126	0.849	0.359	0	1
Attend	Attended last advisory/farmer group meetings	125	0.912	0.284	0	1
Source of information on prices of agric. Output (percentage reported)						
		1st choice (n= 120)		*2nd choice (n =112)*		*3rd choice (n=83)*
	PSPs	5.83		1.79		10.84
	Radio	12.50		16.07		4.82
	Nearby Market	34.17		28.57		18.07
	Neighbor/Friend	9.17		23.21		21.69
	Price offered by buyer	8.33		5.36		12.05
	I negotiate (buyer and farmer)	28.33		24.11		31.33
	Other	1.67		0.89		1.20
How did you learn about NAADS?						
		1st choice (n=128)		*2nd choice (n=121)*		*3rd choice (n=98)*
	Extension agent/PSPs	26.56		19.83		16.33
	Radio/Television	17.19		24.79		15.31
	Neighbor/Friend	9.38		15.70		18.37
	Local government Official (SC chief, L.C)	21.09		19.01		15.31
	Member of Parliament	0.78		-		-
	NAADS Coordinator/Official	20.31		18.18		31.63
	Others	3.91		2.48		3.06
Rating the relevance of different sources of extension sources (percentage reported)						
		Most	*Least*	*Not*	*Don't know*	
	PSPs (n =123)	90.24	6.50	1.63	1.63	
	Neighbors (n = 119)	47.90	39.50	10.92	1.68	
	Manuals/Flyers (n =100)	17	33	24	26	
	Television (n=95)	16.84	12.63	40	30.53	
	Radio (n=85)	56.47	27.06	12.94	3.53	
	Cell phone (n =71)	19.72	16.90	35.21	26.76	

Source: Author's computation.

** Assumption:1 U.S. dollar = 1,800 Uganda Shillings.

We found that over 90 percent of the participating farmers attended the last advisory services session or the farmers' group meetings. About 85 percent revealed to have received agricultural training in the last 6 months and over 70 percent have at least visited a technology demonstration site before. Most participating farmers revealed satisfaction with the way the sub-county manages sub-county activities or mobilizes them to work together. Participating farmers are also active in local political decision making processes.

It turns out from our sample that farmers mostly obtain information about prices of agricultural output from nearby markets (34.2 percent) and the least from PSPs (5.83 percent). Negotiations (between the buyer and the farmers), radio and neighbors are also a common source of information of price determination. However, PSPs are rated the most relevant source of extension services among farmers. The radio and the neighbors are also rated highly as sources of extension services. Also, most farmers reveal that they first learnt about NAADS from PSPs, local government officials and NAADS coordinators. Unfortunately, Members of Parliament (MPs) are an unimportant source about NAADS.

Testing for endogeneity

We begin the analysis by testing for endogeneity using the Durbin-Wu-Hausman (DWH) test for endogeneity in IV estimation. Applying IV estimation when indeed the regressors are uncorrelated with the disturbance term results in loss of efficiency (Wooldridge, 2006). The asymptotic variance of the IV estimator is always larger than

the asymptotic variance of the OLS estimator (Baum, 2006). The Hausman (1978) test for endogeneity is formed by choosing OLS as the efficient estimator and the IV as the inefficient but consistent estimator. In other words, by choosing OLS, only efficiency is lost by turning to IV (Baum, 2006). As shown in the Table 6 the Wu-Hausman F test (with p-value = 0.6386) and the DWH chi-square test statistic (with p-value = 0.6225) failed to reject the null hypothesis of an exogenous type of farmer (NAADS) *tof* variable. This result is contrary to the earlier expectation that the type of farmer is endogenously determined. However, since the Hausman tests does not explicitly state an alterative hypothesis and therefore need not have high power against particular alternatives Cameron & Trivedi (2005), it is not surprising that we don't reject the null. Despite this result, we present both results of IV and OLS for comparison.

Table 6. IV Estimation, identification and related tests

Test statistic	Statistic value	p-value
Tests for endogeneity		
Wu-Hausman F test	0.21981	0.6396
Durbin-Wu-Hausman Chi-square test	0.2424	0.6225
Tests for overidentifying restrictions		
Sargan NR-squared	1.873	0.3921
Basmann test	1.702	0.4271
Shea-partial R-squared	0.3937	0.000
Anderson Canonical LR statistic	133.09	0.000
Tests for heteroskedasticity		
Pagan-Hall General test statistic	28.581	0.2818
Pagan-Hall test w/assumed normality	32.716	0.1383
White/Koenker nR2 test statistic	33.835	0.1115
Breusch-Pagan/Godfrey/Cook-Iisberg	39.019	0.0367

Source: Author's computation

Keeping the assumption that *tof* is endogenous implies loss of efficiency. However, if OLS is biased and inconsistent, then the loss of efficiency due to IV may be worth (Baum, 2006). For this reason, we proceed to model the IV estimation using as instruments for *tof* the quality of development plan (qdp), the level of monitoring and

evaluation capacity of the local government (ME), the level of accountability (AC) and the local revenue performance (LRP).

Identification, tests for overidentifying restrictions and testing for Weak instruments

The parameters in an equation are said to be identified when we have sufficient valid instruments so that the 2SLS estimator produces unique estimators. The parameters of exactly identified equations can be estimated by IV. Under the null hypothesis that the instruments are uncorrelated with the error term, we test for overidentification using the Sargan and Basmann tests (Baum, 2006). The results are presented in Table 6. The p-values of the Sargan and Basmann tests are 0.3921 and 0.4271 respectively indicating that we cannot reject the null hypothesis that the instruments are excludable from the second stage equation. We also performed tests for the relevance of instruments using the R-squared of the first-stage regression with the included instruments partialled out. This statistic proposed by Bound, Jaeger, & Baker (1995) can diagnose instrument relevance only in the presence of one endogenous regressor. We also performed a conditional likelihood ratio test of Weak instruments proposed by (Moreira & Poi, 2001).[32] The partial R-squared (based on the first stage results) from performing this test was 0.486. Our IVs are not quite highly correlated with the endogenous variable.

Another measure reported here is Shea's partial R-squared measure that takes the intercorrelations among the instruments into account. The rule of thumb is that if an

[32] A weak instrument is said to occur in the presence of multiple regressors with only one endogenous when the partial R-Squared is low or the partial F-Statistic is small (Cameron and Trivedi, 2005; Stock, Wright, and Yogo, 2002). This test was conducted using condivreg command in Stata. The post estimation testing and construction of confidence intervals were conducted using, condtest and condgraph commands in stata.

estimated equation yields a large value of the standard partial R-squared and a small value of the Shea measure, we conclude that the instruments lack sufficient relevance to explain the endogenous regressor (s). In other words, the model is underidentified. Lastly, we also report the Anderson's likelihood ratio-test. A failure to reject the null hypothesis for this test calls the identification status of the equation into question. Lastly, we report results of the redundancy test. Under the null hypothesis that the specified instruments are redundant, the statistic is distributed as a chi-square with degrees of freedom equal to the number of endogenous regressors times the number of instruments being tested. The results are presented in Table 6. The tests indicate that the instruments specified in the value of crop production are relevant.

Lastly, we tested for heteroskedasticity in the IV model. Under the null of conditional homoscedasticity in the 2SLS, the Breush-Pagan test and Whites tests for heteroskedasticity are reported in Table 6. The tests based on the *ivhetest, all* command in Stata reveals that heteroskedasticity is not a problem in the estimated equation's disturbance process. Table 7 presents the IV estimates of the value of the farm production per acre discussed below. The first stage regression results of *tof* are reported in the Table A8.

The results in that Table A8 indicate that education and age of the household head are positively and statistically significant in the participation equation. Sex is positive and statistically insignificant in the participation equation. Similarly, household size is positive and statistically significant in the NAADS participation equation. Access to credit is positive and statistically significant in the participation equation. However, although the availability of land is positively related to participation in NAADS, it is not

statistically significant. Closeness to markets is positive, statistically insignificant in the participation equation. Closeness to a feeder road is negative, statistically insignificant in the participation equation. Having farm equipment is positively related to participation in NAADS, although statistically insignificant. The availability of household assets is negatively related and statistically insignificant in the participation equation.

Although sub-counties with better communication and accountability mechanisms and with a better local revenue performance positively influence participation in NAADS, the presence of a quality development plan at the sub-county is negatively related to participation in NAADS. The governance factors are each statistically significant in the participation equation. Household awareness of local voting processes and whether he/she is satisfied with the management of sub-county authorities are positive but statistically insignificant in the participation equation. Political connectivity of a farmer is negative and statistically insignificant.

Table 7. IV and OLS estimates for the log of the value of farm production per acre

	OLS Estimates		**IV Estimates**	
	Coefficient	***Standard Errors***	**Coefficient**	***Standard Errors***
Type of farmer (1= NAADS; 0, otherwise)	0.179*	*0.099*	-0.021	*0.172*
Agro climatic dummy (1= southern highlands; zero elsewhere)	0.677	*0.412*	0.430	*0.451*
Agro climatic dummy (1 = Eastern region; zero elsewhere)	-0.908***	*0.220*	-0.754**	*0.246*
Average rainfall for the period 2004-2005.	0.042**	*0.013*	0.033*	*0.015*
Dummy for near period market (1 = near market)	-0.101	*0.096*	-0.089	*0.097*
Near feeder road (1 = near road; 0 otherwise)	-0.098	*0.111*	-0.090	*0.112*
Land in acres (logarithm)	-1.565***	*0.108*	-1.548***	*0.110*
Square of land in acres (logarithm)	0.091*	*0.037*	0.086*	*0.037*
Logarithm of farm equipment	0.093*	*0.046*	0.092*	*0.047*
Logarithm of household assets	0.154***	*0.043*	0.147***	*0.044*
Education of the household head in years of schooling	-0.013	*0.012*	-0.011	*0.012*
Logarithm of age of household head	-0.152	*0.185*	-0.102	*0.190*
Log of household size	0.185	*0.115*	0.199*	*0.117*
Dependency ratio	0.059	*0.238*	0.063	*0.240*
Access to credit (1= access to credit; 0 otherwise)	0.080	*0.106*	0.114	*0.109*
Sex of household head (1 = male;0 = female)	0.115	*0.126*	0.110	*0.127*
Whether household has had a sick member	-0.006	*0.093*	-0.005	*0.094*
Whether household participated in local elections	-0.005	*0.232*	0.022	*0.235*
Political connections of the farmer	-0.210	*0.142*	-0.215	*0.143*
Whether farmer is satisfied with management of sub-county authorities management	0.069	*0.126*	0.093	*0.128*
Constant term	6.177***	*1.563*	6.995***	*1.678*
R-Squared	0.724		0.719	
Number of Observations	266		266	

Source: Author's computations.

Participation in the NAADS program as captured by the *tof* variable is expected to positively impact crop production and animal rearing and as a result on the value of the farm production. The 2SLS and OLS estimates of the impact of NAADS on the value of farm production per acre are almost identical. That indicates that the OLS estimates are not biased by the possible endogeneity of participating in NAADS. The 2SLS is less efficient (with larger standard errors) than OLS. The results indicate that NAADS has had a positive and statistically significant impact of approximately 20 percent on the value of

farm production per acre. The interpretation does not significantly change when we apply a sub-county fixed effects regression (Table A9).

Better access to markets and roads can have strong positive impacts on the value of the farm production per acre. Surprisingly, however, the estimates presented in this study do not support this claim. Access to markets and roads are negatively related to the value of the farm production per acre, although the coefficients are statistically insignificant. As noted by Nkonya et al.(2004), farmers in remote areas are likely to be faced with high agricultural marketing transaction costs that make it unprofitable to produce surplus for the market.

The availability of farm equipment (e.g., hoes and pangas) influences the activities on the farm. We find the logarithm of farm equipment to be positive and statistically significant.

Primary education may be associated with more intensive use of labor. In this study we find a negative impact of education on the value of farm production per acre; however, this is statistically insignificant.

Awareness of local political processes is negatively related to the value of the farm production per acre, but statistically insignificant. However, satisfaction with the management of sub-county authorities is positively related to the value of the farm production per acre. Local political connectivity is negatively related to value of the farm production per acre, but statistically insignificant.

We would expect that having a sick member in the household negatively affects the value of the farm production since the farmer not only loses time but also financial resources (taken away from farm activities). We find that having a sick member in the

household is negatively related to the value of the farm, although statistically insignificant.

We find positive and statistically insignificant impacts on the value of the farm production per acre of the dummy variable capturing agro-climatic zone two (southern highlands), a negative but statistically significant coefficient of the dummy for Eastern region (includes Tororo district); and a positive and statistically significant coefficient the availability of rainfall over 2004-2005. The southern highland (where Kabale district is located) are fertile lands, but are also heavily populated with small farms, possibly explaining the statistically insignificant dummy.

The coefficient on the logarithm of land is negative and highly statistically significant. In other words, small firms are more productive than large firms. This result might be interpreted to mean that, compared with hired labor, family labor is of better quality, more safely entrusted with valuable animals or machinery and needs less monitoring or as an optimal response by small farmers to uncertainty (see Deaton, 1997). The square of the logarithm of land in acres is positive and statistically significant. We rejected the null that the joint hypothesis of the coefficient on land and land squared are both equal to zero.

Household size has a positive and statistically significant coefficient. Having more family members aged less than 14 years is positively associated with value of farm production, although this coefficient is statistically insignificant. Access to credit is positively related to the value of farm production per acre; although statistically insignificant. Age of the household head is negative and statistically insignificant. Sex is

positive and statistically insignificant coefficient on the value of farm production per acre. The coefficient on household assets is positive and statistically significant.

Qualitative analysis

This section seeks to provide answers to specific questions such as: Do the PSPs provide the services as stipulated in the contracts; how effective are the different sub-county level players in monitoring NAADS activities?; and do farmers and sub-counties co-finance their counterpart NAADS funds? Before providing answers to these questions, a description of the NAADS enterprises carried out in each of the sub-counties is provided. Table A5-A7 summarizes the NAADS enterprise profiles for the selected study sites since inception of the program in 2001. Some observations from Table A5-A7 deserve discussion.

First, there is variation in the selected enterprises across the three study sites in each of the fiscal years. For example, although banana growing is common in Kasawo sub-county and in isolated areas in Kisoko sub-county, it is not a major NAADS enterprise in Kabale. However, Irish potato growing enterprise is a very important enterprise in Kabale and not in Mukono and Tororo. The variation of projects across the three study sites reflects the different emphasis that farmers place on different farming activities. This may be driven by agro climatic conditions, cultural/historical reasons, and the need to diversify farming activities. For example, coffee and vanilla growing are common in Kasawo and not in Kisoko and Kyanamira. Historically, areas around Lake Victoria (of which Mukono district belongs) have been known for Robusta coffee growing. However, during the 1990s and early 2000, a “new” crop known as vanilla was

introduced in Uganda. This crop was mainly introduced as a money maker as many farmers cut down coffee and/or abandoned other food crops in response to the growing demand for vanilla at high prices. During the late 1990s and early 2000, Indonesia and Madagascar, the World's leading producers of vanilla experienced a decline in production, partly due to weather related causes.

By 2002, a farmer could earn between 15-25 U.S. dollars per kilogram of vanilla. Unfortunately, at the time of our interview, farmers expressed concern over what some called "wasted investments, time and energy" because vanilla prices have dropped to less than 2 U.S. dollars per kilogram (see Table A4). Some farmers have in fact cut down vanilla plants and resorted back to other food crops they grew before the "vanilla boom". Hybrid coffee varieties and improved methods of Vanilla growing and processing are some of the activities that are being promoted by NAADS through PSPs. Our interviews with farmers showed that they questioned the relevance of the investments in vanilla improvements; ironically, it is the farmers who chose these enterprises for investment support under NAADS. My interpretation of this is that probably at the time farmers chose vanilla investment, they had little knowledge about the relationships between their production decisions and the international supply, which in part influence the price they receive.

Second, goat management projects appear in all the three study sites. Goats are easier to look after, profitable, multiply faster, and a quick source of money to cushion negative shocks that rural households are prone to. The NAADS program is promoting the rearing of high breed goats (e.g., Boer goats) for meat production. In all study sites, farmers expressed satisfaction with the quality of the goats that are procured at the sub-

county. One farmer in Kisoko sub-county lamented that: “with goat production, every farmer in NAADS in Tororo will go out of poverty”.

The contracts for goat procurement stipulate among others the expected goat size, weight, and breed type of the goats. All study sites have opportunities to expand goat meat production which is on high demand in both rural and urban markets. However, farmers pointed to the lack of adequate land to rear goats on a large scale.

Third, fish farming is predominant in Kyanamira as opposed to Kasawo and Kisoko sub-counties. This is because Kabale (and thus, Kyanamira) is a hilly area with low valleys that are suitable for fish farming. At the time of this study, very few fish ponds were operational in Kyanamira. Two of the operational fish ponds we visited are run by a NAADS youth farmers group in Muyumbu parish. The youth group had harvested and sold fish on two occasions, albeit in small quantities. Two other fish ponds located near Kyanamira sub-county were not yet operational, although record checks with the NAADS sub-county coordinator revealed that a PSP had been contracted to do the renovation. This enterprise is a promising one but not without limitations and problems. First, there is the concern of inadequate fish fries supply. At the time of the study, we were told that fish fries are obtained from a single producer located in Kajjansi, near the shores of Lake Victoria (near the capital city, Kampala). The second concern is that it could be a viable project if farmers could access financial assistance to expand the projects. However, although farmers think that fish farming is a viable enterprise, they expressed concern over the environmental damage created by the construction of fish ponds.

Known for the production of passion fruits, Kabale is also spearheading the growing of apples in Uganda under the support of the NAADS program. Apple growing in Kabale was earlier on supported by the International Center for Research in Agro forestry (ICRAF). At the time of our study, few farmers were growing apples. An interview with a NAADS farmers' representative and a female farmer in Kyanamira revealed that the enterprise is profitable and they wish that it can be expanded to many farmers. However, farmers believe that the PSPs teaching about apple management are "not practical" and have varying approaches to teaching the farmers.

The chairperson, farmers' representative, Kyanamira sub-county said: "Some of us (farmers) are more knowledgeable than the so called PSPs on apple management, but are not given a chance under existing rules to become providers". Thus, some farmers do believe that they can "even be better PSPs" than those currently teaching them about apple management. However, at the time of our study, the regulations prevented farmers from becoming PSPs.

Lastly, Mukono and Kayunga districts specialize in the production of pineapples, water melons, and papaws. These districts are arguably among the leading suppliers of pineapples, water melons and papaws to the capital city, Kampala. During our field visits, we came across trucks that had come from neighboring Kenya to transport fruits from Mukono and Kayunga to Kenyan markets. The major concern that farmers raised is the trade off between having to grow pineapples on a large area (farmers claimed that good pineapples do not need tree shades) and the clearance of trees, thereby exposing land to soil erosion. The only crops intercropped with pineapples are bananas.

The purpose of the above enterprise description was to highlight some of the NAADS activities carried in the study sites that we visited. The strengths and the general concerns of the selected enterprises are also noted. In the next sub-section, analysis of specific NAADS program features is conducted. This is accomplished by answering the questions raised in the previous chapter. Our focus is on the role of PSPs, the local government authorities and farmers' institutions.

Are PSPs providing the services as stipulated in the contracts?

A NAADS farmer in Kasawo sub-county, commented: generally, PSPs do their job: they deliver the services; however, the quality of these services is usually poor, particularly for poultry in Kasawo sub-county. we interviewed NAADS sub-county coordinators, community development officers and farmers' representatives to provide their own assessments on the above question. The assessment involved file reviews of past PSP contracts as well as understanding the progress and challenges met in implementing each of the contracts with the PSPs. Table A5-A7 shows the assessments of the PSP contracts since the inception of the NAADS program in the study sites.

Generally, in all study sites most PSPs do complete their contractual obligations to the farmers; however, there are concerns with respect to the quality of the services. From Table A5-A7, examples of unsatisfactory PSP services include the banana, vanilla, and local chicken improvement projects in Kasawo sub-county. In Kisoko sub-county concerns were mainly with the quality of services under the local poultry contracts. In the previous section we noted that in Kyanamira sub-county farmers expressed concerns about the variations in training approaches among apple PSPs. This observation was

found to be consistent with respect to the responses from the focus-group discussions in Kyanamira.

With respect to the Irish potato growing scheme, farmers are generally satisfied with the training provided by the PSPs under NAADS; however, they pointed out the inadequacy of the potato seeds supplied to the farmers. In addition, farmers were generally dissatisfied with the knowledge they were taught on pest control for Irish potato. Indeed, pests are a major problem facing Irish potato growers in Kyanamira that require immediate attention from the concerned authorities (i.e., NAADS, MAAIF). In addition, farmers in Kyanamira sub-county suggested the need for an extra component of training in the preparation of potato seeds.

Other challenges affecting the status of enterprises include the untimely implementation (e.g., toward the end of the agricultural season), and the availability of few competent service providers. The desk reviews revealed that some sub-counties have to source PSPs from distant areas. This raises the costs associated with contracting advisory services. There is also the problem of low skilled staff at the sub-county. This slows the decision making processes as well as the utilization of resources and the reporting and accountability for program funds.

Farmers are grateful for the access to knowledge through demonstration sites. However, the replication of the technologies by the farmers is mixed. In Kyanamira, although farmers expressed their satisfaction with the knowledge acquired from the establishment of modern storage facilities, adoption to their own farms as revealed by the farmers in discussion groups is still limited. The same finding is supported by the interviews with key informants.

The procurement committees (PCs) are vigilant in canceling contracts with PSPs whenever sub-standard work is delivered. They are also vigilant in ensuring that the reporting mechanisms by the PSPs are adhered to. The PSPs must sign the farmers' group visitors' book whenever training is conducted. The members of the farmers' fora get a copy of the planned work schedule (e.g., training) by the PSPs and use it in checking whether the work has been done or not. Our assessments reveal that the farmers are aware and practice the reporting mechanism. Farmers sign attendance sheets after confirming that they have received training or the expected deliverables.[33]

Sub-counties enforce the payment schedules of the contracts and in some cases institute extra measures to delay extra payments to the PSP unless the amount of work done is satisfactory. This was particularly the case in Kyanamira sub-county, Kabale district. In the neighboring sub-counties of Rubaya and Bukinda, PSPs that had not delivered on the stipulated work were made to refund the monies and their contracts were terminated.

However, there are obstacles that the sub-county authorities face. For example, they mentioned the delay of funds either from the district or the center. Of more concern is that some disbursements of quarterly releases come late, and this puts pressure on the local authorities to spend the money before the end of the quarter. As a result, the

[33] The exception to this is a story of what happened in Nagongera sub-county, neighboring Kisoko sub-county in Tororo district. Nagongera was one of the "early NAADS sub-counties" but one which was scrapped off the program due to collusion between local government authorities and the PSPs. Exploring the ignorance of farmers, a PSP colluding with sub-county authorities reported that he had conducted training yet it was not true. Fortunately, the NAADS district authorities and the Secretariat intervened; although the repercussions eventually resulted in suspension of Nagongera from the NAADS program. Probably scrapping the program was not the best thing to do; since the beneficiaries were also penalized-but the fact that swift measures were taken depicts the existence of measures within NAADS to enforce/terminate contracts.

processes of contracting are done in a rush, which NAADs sub-coordinators admit may affect value for money. Also, although there is almost 100 percent match between what the sub-counties budget and the actual releases, limited funds are earmarked for monitoring NAADS activities. For example, based on the 2004 NAADS funds release estimates, the budget per sub-county (i.e., sub-counties one year old with NAADS) earmarked for monitoring and evaluation was 1.98, 2.0 and 1.83 million Uganda shillings for Mukono, Kabale and Tororo districts, respectively (NAADS MIS, 2004). [34]

The farmers' forum is supposed to monitor the PSPs and in general do routine supervision of NAADS activities in the sub-county; due to inadequate funds for monitoring, the forum hardly does so. In fact, the concern raised by all the NAADS coordinators in all the study sites is that members of the farmers' forum only monitor if they know that their allowances for monitoring are available; otherwise they don't.

How effective are the different sub-county level players in monitoring NAADS activities?

A NAADS coordinator said: Monitoring by farmers' representatives has been monetized; without money, they cannot monitor...And local political leaders tend to intensify monitoring of NAADS programs when local elections are nearby.

On a scale of 1-4 (1 = Weak [don't monitor], 2 = fair [sometimes monitor], 3 = active [often monitor], and 4 =very active[regularly monitor]), we asked the NAADS sub-coordinators to rank and explain the effectiveness of farmers, farmers'

[34] Roughly this translates into about 1,000 U.S. dollars per sub-county per year (assuming 1 U.S. dollar = 1,800 Uganda shillings).

representatives, local political leadership, sub-county chiefs and sub-county NAADS coordinators in monitoring NAADS activities at the sub-county.

Farmers are not active (but fair) in communicating to the sub-county authorities about the progress of NAADS activities in their sub-counties. The sub-county NAADS coordinators claim that this is attributed to the illiteracy levels of the participating farmers. However, the recent formation of Parish Coordinating Committees (PCCs) is expected to bridge the information flow gap between the farmers and the sub-county. [35] The farmers' representatives are active in monitoring NAADS activities in the sub-counties. However, we found that farmers' representatives do monitor only when there are funds available for them to monitor NAADS activities. Given that the earmarked funds for monitoring at the sub-county are limited and have to be allocated among various monitoring agents (e.g., sub-county NAADS coordinators, farmers' representatives), monitoring of NAADS activities as noted above is in general limited. This raises a very important question of whether the services provided by the PSPs are accomplished according to the contractual obligations. It also becomes very difficult to keep track of what types of PSPs (individuals, NGOs, private firms) are delivering the right services to the farmers. If we are to expect increased agricultural outcomes (e.g., increased crop yields and knowledge) and thus anticipate increased household incomes

[35] Parishes are the next lower administrative units after sub-counties; however, unlike sub-counties, parishes are not the core unit of decentralized service delivery. In fact, the administrative structures of sub-counties have been established from the colonial days in the 1960s. In the study sites we surveyed, a typical sub-county constitutes between 4 to 6 parishes. At the inception of the NAADS program, parishes had no role to play in agricultural extension service delivery. However, implementation of the NAADS program became much harder without involving parish level authorities (e.g., chiefs) who are much closer to the farmers than do the sub-county authorities. Prior to the formation of the PCCs, NAADS farmers hardly got feedback from their representatives on the deliberations held at the sub-county. This was the case in all the study sites we visited. However, the PCC lacks the capacity and equipment (e.g., bicycles) to perform their duties. In addition, there are no incentives in terms of better allowances for them to monitor the NAADS program.

and poverty reduction, there must be a clear strategy on monitoring the PSPs to ensure that the kind of services received are those that the farmers actually demand.

We found that some NGOs are responsive to the needs of the farmers and indeed farmers expressed satisfaction of their services. An example is World Vision, an International NGO that is actively involved in NAADS activities in Mukono district. On the other hand, some private individual providers are not very responsive to farmers' needs. This is particularly true in Kasawo sub-county poultry projects; however, in Tororo and Kabale districts, individual service providers are much more proactive and likely to deliver their services according to the contractual obligations.

The sub-county political leader of government business, known as the LC3 Chairpersons, are said to be active in monitoring NAADS activities. However, in general the other LC3 council members representing the different parishes with a particular sub-county and groups of people in the sub-county do not. The council members too monitor only when there are allowances from the sub-county for them to do so. The sub-county chiefs are ranked fair (meaning they sometimes monitor), with variations. The SNC are rated active (meaning that thy regularly monitor); but constrained because NAADS activities have grown and this implies many responsibilities. They reported that the monitoring resources are limited. Generally, SNC officials revealed that they execute their assigned duties as per NAADS guidelines, but complained of "being overstretched into doing other sub-county activities".

Farmer group dynamics and technology demonstration site (TDS) management

Since the NAADS program focal point is farmers' groups, it is important to ask questions relevant for farmer group formation and sustainability. One of the successes of NAADS since its inception is the formation of active farmers' groups. Although, some groups dropped out at inception (probably because of different expectations of NAADS), registered farmers groups have increased to over 13,202 in 2005. As we noted in Chapter 2, farmer group member representation takes into gender into account. Farmers groups hold meetings regularly, mobilize funds, and are eager to learn at the sub-counties. This was especially true in Kyanamira and Kisoko sub-counties than in Kasawo sub-county. In the latter, some farmers claimed lack of transparency among some group members when it comes to seed sharing and the placement of technological demonstration sites.

In general, there are challenges with respect to TDS management. First, in some groups farmers have neglected the collective responsibility of looking after TDS. The examples include the piggery projects in Kisoko and Kasawo sub-counties where some host farmers have solely taken over the care and feeding obligations yet it is supposed to be a group responsibility. There are also isolated instances in which the some TDS host farmers have neglected the responsibilities delegated to them by fellow group members. An example is that of a bull TDS host farmer in Kasawo who abandoned the bull without feeding and care until the SNC came to its rescue. A working solution is currently being implemented were the host farmer agrees to pass-on the young ones (e.g., piglets) to each group member so that responsibility is shared.

Do the farmers and sub-counties co-finance their counterpart NAADS funds?

A NAADS sub-county coordinator in Kabale; a farmers' representative in Kyanamira sub-county, and a female farmer on the procurement committee in Tororo said: Farmers are eager to co-finance under NAADS. Indeed many of them contribute with happiness because they own NAADS.

We asked farmers (both in the survey and in the focus group discussions) about their co-financing obligations of the NAADS program. We found that farmers are active and most of them have paid up their required co-funding of the NAADS program. This perhaps reveals how important the participating farmers feel about the co-ownership and expectations about the NAADS program. On the contrary, sub-county governments barely meet their annual co-financing contributions towards the NAADS program. Based on the study sites, Kasawo and Kisoko sub-counties had not paid co-funding requirement for the fiscal year 2005. The responses for the failure of sub-counties to co-finance lead to the general answer that they lack revenue sources, especially following the scrapping of graduated tax and market dues, which were the main tax handles at the sub-county level. In addition, there have been delays in releasing the compensation funds that the central government pledged as a replacement for the revenue loss at the sub-counties.

Unfortunately, we find that farmers are beginning to shoulder the burden of the sub-county in addition to meeting their financial obligations. This is either in the form of farmers' groups putting money together to assist the local government or planting a garden for the sub-county or increasing their co-funding requirements. This was the case in Kisoko and Kasawo sub-counties. Although this reveals how farmers are getting attached to contract extension, there is urgent need to address the imbalance since the

sub-county authorities claim they will meet their co-funding obligations only when central government sends the promised grants to cushion their inability to collect enough taxes.

CHAPTER FIVE. CONCLUSIONS AND POLICY IMPLICATIONS

Policies to increase agricultural productivity are a subset of the many interventions that the Government of Uganda is vigorously implementing to eradicate rural poverty. The NAADS program is among such interventions that started in 2001 with the aim of improving farmers' knowledge about farming and marketing outcomes through adoption of modern technologies and access to advisory services tailored to the local needs. Moreover, the program is implemented through decentralized structures of local government, thereby increasing the likelihood that the local needs are matched and thus, efficient and effective extension service delivery is expected.

Being a relatively new intervention that started in 2001, and one involving huge financial resources, a fundamental question that echoes through the stakeholders (e.g., farmers, NGOs, the implementers and development partners) is whether the program is having a positive impact on the livelihoods of the poor. This fieldwork-based thesis contributes to the literature on the impacts of the NAADS program by analyzing survey data collected from selected farmers in selected districts in Uganda. The data come from a sample of 305 farmers collected during September 2005-April 2006 from 7 sub-counties in 4 districts in rural Uganda.

The methods applied included a mix of both quantitative and qualitative techniques, all aimed at understanding the impact of access to the NAADS program on the value of farm production per acre. Qualitative analysis was used to complement the quantitative analysis. The data were collected using a questionnaire collecting plot-level data by agricultural seasons. The questionnaire combined sections of the LSMS module

on agriculture, and household background characteristics and asset sections of the Uganda National Household Survey (UNHS). Additional questions capturing NAADS specific issues were appended to the questionnaire. Notwithstanding the fieldwork challenges, there are important findings, lessons and conclusion that emerged from this research.

We cannot reject the null that the NAADS program has had an impact. The 2SLS results show no program impact; however, the OLS results show that the program had a positive impact on the value of farm production per acre of about 20 percent. Access to markets and roads are negatively related to the value of the farm production per acre, although the coefficients are statistically insignificant. The availability of farm equipment has a positive and statistically significant impact on the value of farm production per acre. We find a negative but statistically insignificant impact of education on the value of farm production per acre.

Awareness of local political processes is negatively related to the value of the farm production per acre, but is statistically insignificant. However, satisfaction with the management of sub-county authorities is positively related to the value of the farm production per acre. Local political connectivity is negatively related to value of the farm production per acre, but is statistically insignificant.

The availability of land is negative and highly statistically significant. In addition, the square of the logarithm of land in acres is positive and is statistically significant.

Household size has a positive and significant coefficient. In addition, having more family members aged less than 14 years is positively associated with value of farm production, although this coefficient is statistically insignificant. Access to credit is

positively related to the value of farm production per acre; although statistically insignificant. Age of the household head is negative and statistically insignificant. Sex has a positive and statistically insignificant coefficient on the value of farm production per acre. Household assets are positively and statistically significantly related to the value of the farm production.

What factors might explain a positive impact of NAADS on the value of farm production per acre among participants?

We find that NAADS farmers participate in the local decision making processes governing the program. Unlike the previous traditional extension system, which was based on a top-bottom approach, the NAADS program enables the program beneficiaries to engage in the enterprise choice of what they want to invest in. Moreover, farmers are empowered to hold PSPs accountable.

The development of farmer institutions aligned to the farmers' investment interests at the village level (thereby incorporating cultural and climatic characteristics) has changed the perspectives of farmers to view agriculture as a viable enterprise. Farmers' groups are a source of voice and inclusion (e.g., of women and youth). Voting structures are underpinned by clear guidelines. Through the farmers' fora and the sub-county farmers' forum, farmers get to learn about the NAADS activities taking place in the sub-county. These institutions have served as a strong mechanism to reduce the information asymmetries that impede farmers' decision making processes.

We find that, although farmers do not have a history of paying for extension, they are contributing to program financing through co-financing. A majority of NAADS farmers have paid up their co-funding requirements in the study sites. This may be

interpreted to mean that the farmers have appreciated the benefits from the program and/or they are beginning to own the NAADS processes. However, it is still a long way to go before farmers' contributions grow to displace the central government transfers. Agricultural extension, as a public good, will always require a strong involvement of public support.

The ability for farmers to diversify their enterprise choice is yet another benefit among NAADS farmers. We found that NAADS farmers are likely to participate in not only crop farming but also animal rearing. Increasingly, participating farmers grow fruits and vegetables. These fruits and vegetables are not only a good source of supplementary income (beyond that from traditional sources of food or cash crops) but also supplement the nutritional needs of the farmers.

The participation in advisory service provision has increased partnerships between NGOs, CBOs and the private sector. Engaging NGOs and CBOs that work with local communities can enhance service provision as shown by Barr, Fafchamps, & Owens (2005). However, the effectiveness in service delivery of the different private sector players is partly influenced by their motives, and the human capacities. Established NGOs with a reputation to protect have built strong human capacity and tend to fulfill their contractual obligations. At the same time, opening the opportunities to individual PSPs created employment for potential graduates from higher institutions of learning. However, our fieldwork reviews revealed that such graduates find it difficult to adjust to the needs of the farmers.

The NAADS program has invested heavily in technology development sites. Our interviews revealed that the farmers are utilizing the TDS facilities and are heavily

involved in their establishment. The hope is that farmers adopt modern farming techniques demonstrated and thus, agricultural outcomes are likely to improve in the future.

Despite finding a positive impact of NAADS on the value of farm production per acre, we discuss the factors outside of the NAADS program and those inherent in the current system of NAADS that might impede further gains from NAADS program.

There are problems facing local governments in Uganda such as inadequate financial resources, inadequate capacity to monitor programs, and the reluctance of local authorities to implement the NAADS program. After the elimination of the local graduate tax revenues and market dues, local governments do not have a strong local revenue tax base from which to get financial resources to co-finance the NAADS, and later on to facilitate the monitoring of the program. This is a serious problem that will require urgent attention if decentralization of agricultural extension is to become sustainable.

Despite the increased administrative decentralization, local governments are still faced with low human capacity to plan and implement government programs. Lastly, local government authorities have been less keen to facilitate the implementation of NAADS activities, and where they have done so, it is only an individual effort (e.g., the community development officers) and not as a team at the local level. This problem will require a broader mandate coordinated across the line ministries or agencies of agriculture and local government to devise ways of ensuring local government authorities pay attention to NAADS as they do for other government programs running at the local level.

With respect to the NAADS design, there are challenges at varying layers of the organizational structure. At the lowest level, there are some concerns of the poor quality of services provided by the service providers. This problem partly stems from the absence of well trained, although qualified individual PSPs. Individual PSPs require re-tooling in terms of the skills required to deal with the complex problems in rural areas.

There is weak monitoring of the program, particularly by the program beneficiaries themselves. Some farmers pay less attention to reporting on the progress of the activities of the PSPs, although there are situations where farmers' groups have held PSPs accountable and thus taken actions to nullify contracts and in some cases asked the PSPs to refund the funds.

The problem of delayed disbursement of NAADS funds is prevalent at the sub-county level. The cause of this problem is "*claimed"* to be at the district level. There is need to find out why this is the case. Late disbursing followed by the need to spend before the end of the fiscal year imply quick and often less efficient contracting procedures, which may adversely affect the program outcomes.

Despite the establishment of farmers' groups, there are specific issues that will need attention with respect to strengthening these institutions. There are challenges in the management of technology demonstration sites and in the need to strengthen communication among group members.

The next question is whether the NAADS program is sustainable? We offer insights to this issue based on the fieldwork results. In terms of fiscal sustainability, the NAADS budget is largely donor funded and this raises the question of whether the government of Uganda will reduce on the borrowing to finance the NAADS program by

scaling up on the portion of domestic resources earmarked to the NAADS program? This is dependent on how fast the transformation of the agricultural sector from subsistence to commercial levels happens, and whether the required marketing systems and value addition beyond agro-processing but toward some "sort of agro-manufacturing" (e.g., fruit canning) become a reality. The good news is that farmers are paying their co-finance; but the bad news is that local governments are not co-financing their required obligations. Moreover, despite the government's commitment to continued financing of NAADS, there has been difficulty for the government to increase its spending to the agricultural sector, citing the ceiling of the MTEF.

How then do we strengthen decentralization of agricultural extension with inadequate fiscal capacity? There is an urgent need of addressing the local fiscal capacities of sub-governments if they are to take charge of decentralized extension. Local governments have no major tax sources from which they can generate resources to co-finance the NAADS program. Moreover, it is not sustainable for the government to continue providing compensations for the elimination of the gradated taxes and market dues, which were the main sources of tax revenues to local governments. It is also unlikely that farmers will shoulder the financial burden of local governments. Farmers are themselves in a great need of support in terms of marketing support to promote their activities. At the same time the central government can continue to channel earmarked transfers to support NAADS.

In terms of human resources, there is a thin structure of program managers at the district and sub-county level. NAADS managers at the lower levels of government perform many tasks that the quality/effectiveness of their activities may be compromised.

This has had implications on the monitoring of NAADS activities in the light of a limited budget. Typically, at the sub-county, the NAADS sub-coordinator and the community development officer are the only officials engaged actively in NAADS activities. Support from other local government officials is limited. This problem must be addressed through coordination of NAADS activities by the MoLG and MFPED.

With respect to institutional and social sustainability, the NAADS program has revamped the farmers' organizations in Uganda. NAADS farmers' groups are active in deciding what to choose for investment and they take the lead in the selection of PSPs to deliver contracted extension. Farmers' groups have united farmers and created a forum for bargaining. However, farmers need further guidance in making the right enterprise choices.

Generally, advisory information on marketing of agricultural produce seems to be limited. The farmers we interviewed in the focus group discussions expressed their dissatisfaction of the competence of most individual and private firms' advisory services on marketing of agriculture produce. Despite the NAADS efforts to integrate marketing, it seems in general that there is until now no clear marketing strategy of farmers' produce from the rural areas to the road-side and urban markets.

Coordination of NAADS activities among line ministries must be strengthened. This coordination will have to embrace the different donor agencies in Uganda's agricultural sector. There is need to harmonize the activities to be funded within the agricultural sector over the medium term and to guide the process of which responsibilities are handled by the different ministries. The main output from coordination should be a clear policy on the role of sub-national governments in NAADS

activities. Our findings reveal that sub-counties consider NAADS activities as being a secondary responsibility. This is consistent with findings from the NAADS mid-term reviews. Until now, the NAADS program is not well conceived in local government structures.

In conclusion, this study finds a statistically significant impact of access to advisory services under NAADS on the value of farm production per acre. We caution the reader to recognize that this study did not analyze all the impacts of NAADS on other agricultural outcomes. In addition, the study suffers from the failure to control for spillover effects, and other general equilibrium that affect program impacts.

Further research will be needed to confirm this finding and to also find the impact of the NAADS program on other agricultural outcomes that were not a focus of this study. Lastly, to the extent that the NAADS program is not the only intervention expected to improve rural farmers' livelihoods, there is need to focus on other complementary interventions to fix the problems of low agricultural productivity in Uganda. To recap the words of Nkonya et al. (2004) there is no "one-size-fits all" solution to the complex problems of small farmers in the diverse circumstance of rural Uganda.

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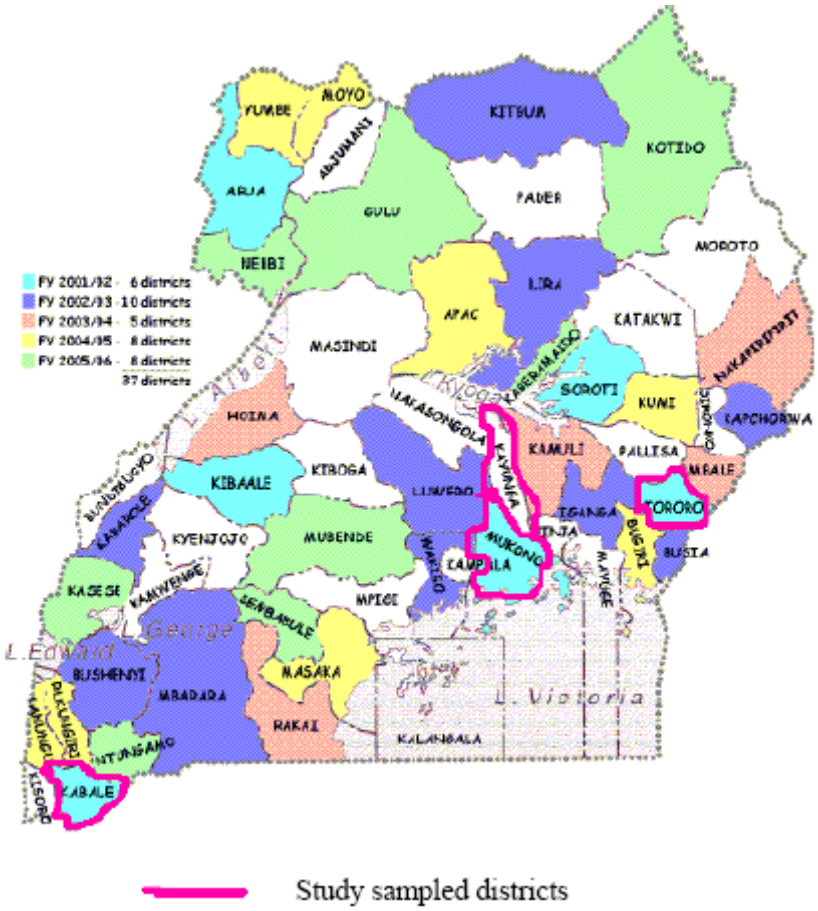
MAP 1. NAADS COVERAGE IN UGANDA



Study sampled districts

Source: National Agricultural Advisory Services (NAADS).

APPENDICES

Table A1. Survey Questionnaire [attached in separate file]

Table A2. Unit conversions for computing crop yield

Unit	Code on questionnaire	Conversion factor: unit to kgs
Kilograms	01	1
Sack (120 kgs)	09	120
Sack (100 kgs)	10	100
Sack (80 kgs)	11	80
Sack (50 kgs)	12	50
Sack (unspecified)	13	20
Jerrican (20 liters)	14	20
Jerrican (10 liters)	15	10
Jerrican (5 liters)	16	5
Jerrican (3 liters)	17	3
Jerrican (2 liters)	18	2
Jerrican (1 liter)	19	1
Tin (20 liters)	20	20
Tin (5 liters)	21	5
Plastic basin (20 liters)	22	20
Kimbo/Cowboy/Blueband Tin (2 kg)	29	1
Kimbo/Cowboy/Blueband Tin (1 kg)	30	0.5
Kimbo/Cowboy/Blueband Tin (0.5 kg)	31	0.25
Basket (20 kg)	38	20
Basket (10 kg)	39	10
Basket (5 kg)	40	5
Heap (unspecified)	65	1.5
Bundle (unspecified)	67	1
Bunch (Big)	68	15
Bunch (Medium)	69	10
Bunch (Small)	70	7
Cluster (unspecified)	71	2
Number of units (general)	86	Depends on crop*

Source: Uganda National Bureau of Statistics. Code extracted from UNHS 1999/00.

* Across the study sites certain crops such as cabbages, pineapples, water melons, and paw paws were harvested in varying sizes. To capture this variation, data on Weights of these crops was collected from three different markets within each study sub-county and for each crop I sampled the small, medium and large taking the average weight for a particular sub-county over the same crops.

Table A3. Procedure and data used to compute sampling weights

Sampling Weights for non-NAADS households in the non-NAADS district

Equal the number of households in the entire district divided by the number of household sampled. Each farmer gets the same weight

Sampling Weights for non-NAADS households in non-NAADS sub-counties in NAADS districts

Equals the number of non-NAADS households in non-NAADS sub-counties in the district divided by the number of non-NAADS households sampled in this sub-county MULTIPLIED by the ratio: the number of non-NAADS households in non-NAADS sub-counties in the six NAADS districts divided by the number of non-NAADS households in non-NAADS sub-counties in the three selected NAADS districts.

Sampling Weights for non-NAADS households in NAADS sub-counties in NAADS districts

Equals the number of non-NAADS households in all the NAADS sub-counties in the district divided by the number of non-NAADS households sampled in this sub-county MULTIPLIED by the ratio of the number of non-NAADS households in NAADS sub-counties in the six NAADS districts divided by the number of non-NAADS households in NAADS sub-counties in the three selected NAADS districts.

Sampling Weights for NAADS households in NAADS sub-counties in NAADS districts

Equals the total number of NAADS households in the district divided by the number of NAADS households in NAADS sub-counties in NAADS districts sampled

MULTIPLIED by the total number of NAADS households in all six NAADS districts divided by the total number of NAADS households in the three selected districts.

District level data

District (i)	Mukono	Kabale	Tororo	Arua	Soroti	Kibaale	Kayunga	Total
Total # of hhs in district (a)*	187967	95071	80334	151851	70455	85038	62039	732755
Total # hhs living in NAADS SCs (b)*	181507	60491	41120	79355	60687	83902	0	507062
Estimated # hhs participating in NAADS (c)**	31968	39114	8226	27450	21726	21636	0	150120
Estimated # of hhs not participating in NAADS but live in NAADS SCs (d=b-c)***	149539	21377	32894	51905	38961	62266	0	356942
Estimated # of hhs not participating in NAADS in non-NAADS SCs (e =a-b)***	6460	34580	39214	72496	9768	1136	62039	163654
Estimated # of non-NAADS hhs in district (f=d+e)***	155999	55957	72108	124401	48729	63402	62039	582635

Sources: * UBOS's population census; ** NAADS Secretariat; and *** Authors' Computations.

Sub-county level data

District (i)	**Mukono**	**Kabale**	**Tororo**	**Kayunga**
Selected NAADS Sub-counties	**Kasawo**	**Kyanamira**	**Kisoko**	
Total # of hhs living in selected NAADS sub-county in district "I" (g)*	6683	3976	2927	
Estimated # of hhs participating in NAADS within a NAADS sub-county (h)**	1764	1268	1044	
Estimated # of hhs not participating in NAADS but live within a NAADS sub-county (k=g-h)***	4919	2708	1883	
Number of NAADS hhs sampled in study (m)***	44	44	40	
Number of non-NAADS hhs within NAADS SC sampled (n)***	25	19	23	
Selected non-NAADS sub-counties	**Ntunda**	**Kaharo**	**Paya**	
Total # of hhs living in selected non-NAADS sub-county in district "I" (o)*	3025	3635	6549	13209
Number of sampled hhs living in selected non-NAADS sub-county (p)***	20	18	18	
Selected non-NAADS SC in non-NAADS district				**Kangulumira**
Total # of hhs living in selected non-NAADS SC in non-District (q)*				9453
Number of households sampled (r)***				51

Sources: * UBOS's population census; ** NAADS Secretariat; and *** Authors' Computations.

Table A4. Average price data of selected crops grown in the study sites.

Crop name	Tororo	Kabele	Mukono
matooke-food type	619	764	560
matooke-beer type	214		71
matooke-sIet type		311	400
maize		467	323
finger millet		450	583
sorghum		373	417
rice	980	793	1083
beans	567	600	1100
field peas		467	
cow peas			867
pigeon peas			300
ground nuts		1233	1960
soya beans			550
sim-sim			1150
cotton			
irish potatoes	500	190	367
sIet potatoes	233	117	278
cassava	200	500	311
coffee			700
tea			
tobacco			
trees			
flowers			
oranges	250	110	300
passion fruits	683	717	1267
pineapples	253	217	233
mangoes	147	77	
pawpaw	433	340	167
other fruits		800	83
onions	1033	350	1533
cabbages	358	187	143
dodo	131	103	300
tomatoes	1058	450	1333
carrots	317		
other vegetables			
vanilla			2667

Source: Author.

Table A5. Summary data on (PSP) contracts in NAADS study sites (Kasawo subcounty)

Kasawo sub-county in Mukono district.					
Year of contract	Type (s) of Enterprise	PSP company	Contract value (1 U.S. dollar =1800 Uganda Shillings)	Contract duration (days)	Status of contract/Remark on quality of services
2002/03	Bananas	KasimI Consults	4444	132	Completed- not satisfactory
	Vanilla	Uganda marketing serv	4444	132	Terminated-not satisfactory. Inability to complete assignment
	Coffee	Rocagric	3889	119	Completed-satisfactory and good
	Diary cattle I	Rocagric	2528	77	Completed-satisfactory and good
	Diary cattle II	Manpower associates	2528	77	Completed-satisfactory and fair
	Diary cattle bull scheme establishment	Rocagric	2406	44	Completed-satisfactory and good
2003/04	Local chicken	Green Pastures	2889	88	Completed-satisfactory and fair
	Piggery	Rocagric	6484	88	Completed-satisfactory and good
	Diary Cattle	Manpower Associates	3250	99	Not completed-delayed implementation
	Diary cattle/bull scheme establishment	Rocagric	3190	44	Completed-satisfactory and good
	Vanilla	Rocagric	2889	88	Completed-satisfactory and good
	Goat	Manpower Associates	2528	77	Completed-not satisfactory
	Vegetable I	Banda quality pdts	2167	66	Not completed-delayed implementation
	Vegetables II	Green World Environment Consult	2501	77	Not completed-delayed implementation-time elapsed
2004/05	Piggery	Agrovet Ltd	3611	110	Completed-not satisfactory-poor quality of pig structures-but training was okay.
	Local chicken	PASSATA (U) Ltd	3611	110	Completed-not satisfactory-poor quality
	Diary Cattle	PASSATA (U) Ltd	3613	110	Completed-satisfactory-fair
	Vanilla post harvest	AWA Global ltd	3057	88	Completed-not satisfactory-poor quality of structures and poor training

Source: Author

Table A6.Summary data on (PSP) contracts in the NAADS study sites (Kisoko subcounty)

Kisoko sub-county in Tororo district					
year	Type of enterprise	Name of PSP	Contract duration (days)	Amount (1 UD =1800 UgShs)	Status of contract/remarks on quality of services
2002/03	Commercial pig production	AGRUDAS	110	2632	Terminated due to untimely implementation. However, quality was fair.
2002/03	Local chicken improvement	AGRUDAS	132	3757	Terminated due to untimely implementation.
2002/03	Pineapple production	Individual	88	1526	Completed but delayed due to delayed flow of funds
2002/03	Goat management	Individual	132	3200	Completed but delayed due to delayed flow of funds
2002/03	Banana production	Individual	110	2528	Completed but delayed due to delayed flow of funds
2002/03	Groundnuts production/improvement	ROMTEC (firm)	132	3552	Completed a season later due to low financial capacity of PSP and slow release of NAADS funds
2003/04	Pig production	Individual	70	1733	Completed according to schedule-quality very good
2003/04	Groundnuts production	Tororo Women Uplift ltd (firm)	64	1960	Completed according to schedule-quality very good
2003/04	Local Poultry Management	Tororo District Farmers Association (TODIFA)	120	3611	Terminated due to slow implementation and poor quality of demonstration sites
2003/2004	Soya bean production	Individual	110	2489	Completed but a cropping season later due to poor germination of demonstrations in the 1st season
2003/2004	Groundnuts production	Individual	97	3474	Completed well in time-very good quality of work
2004/2005	Groundnut production	Individual	100	3422	On-going-good progress
2004/2005	Local Chicken Improvement	RUDI (firm)	120	4221	On-going, good progress
2004/2005	Pig production	RAVE (firm)	100	3392	On-going, good progress

Source: Author

Table A7.Summary data on (PSP) contracts in the NAADS study sites (Kyanamira subcounty)

Kyanamira sub-county in Kabale district					
year	Type of enterprise	Name of PSP	Contract duration (days)	Amount (1 USD =1800 UgShs)	Status of contract/remarks on quality of services
2002/2003	Irish potato production and management	Kigezi Service network	5 months	2230	Completed-status satisfactory and good quality
2002/2003	Fish pond farming	Individual	2 months	1239	Incomplete-but satisfactory performance
2002/2003	Temperate fruits management	Individual	8 months	3213	Completed-satisfactory-good quality
2002/03	Irish potato production	Kigezi service network	143 days	4892	Completed-satisfactory performance
2002/03	Management of Small animals	Rural Agric Services Support Company	3 months	3323	Not satisfactory
2002/03	Coffee management	FODRA Holding ltd	6 months	3246	Not satisfactory-poor quality of services
2004	Mushroom growing	Prominent services	4 months	2369	Not satisfactory
2004	Irish Potato Production	Individual	110 days	7139	Completed-satisfactory-good quality
2005	Apple Growing and Management	Denta services ltd	88 days	3083	Completed but not very good quality
2005	Management of meat goats	Sunshine protects ltd	66 days	6458	Completed-satisfactory
	Irish potato production	Firm	36 days	3273	Completed-good job done-satisfactory quality
	Fish pond farming	Individual	88	3036	On-going with good progress
	Goat management	Firm	88 days	5237	On-going with good progress

Source: Author.

Table A8. First stage regression results from 2SLS.

tof	Coef.	Std. Err.	P-value
agrocl2	-3.102	0.312	0.000
agrocl3	3.222	0.333	0.000
Average rainfall for the period 2004-2005.	-0.177	0.016	0.000
Dummy for near period market (1 = near market)	0.023	0.051	0.661
Near feeder road (1 = near road; 0 otherwise)	-0.055	0.059	0.358
Land in acres (logarithm)	0.041	0.058	0.475
Square of land in acres (logarithm)	-0.001	0.020	0.960
Logarithm of farm equipment	0.017	0.025	0.487
Logarithm of household assets	-0.025	0.023	0.274
Education of the household head in years of schooling	0.018	0.006	0.006
Logarithm of age of household head	0.214	0.098	0.029
Household size	0.047	0.061	0.438
Dependency ratio	0.099	0.126	0.433
Access to credit (1= access to credit; 0 otherwise)	0.154	0.056	0.006
Sex of household head (1 = male;0 = female)	-0.036	0.067	0.598
Whether household has had a sick member	0.016	0.049	0.754
Whether household participated in local elections	0.156	0.123	0.206
Political connections of the farmer	-0.024	0.075	0.749
Whether farmer is satisfied with management of sub-county authorities management	0.060	0.068	0.373
Quality of development plan	-10.272	1.259	0.000
Communication and Accountability	2.048	0.320	0.000
Local Revenue Performance	1.142	0.188	0.000
Constant	21.625	2.167	0.000
R-Squared	**0.4863**		
Number of Observations	**266**		

Source: Author.

Table A9. Sub-county fixed effects

	Coef.	Std. Err.
Type of farmer	0.280	0.121
Near market dummy	-0.088	0.097
Near road dummy	-0.060	0.112
Availability of land	-1.540	0.109
Land squared	0.079	0.037
Availability of land	0.084	0.046
Household wealth	0.148	0.044
Education level of household head	-0.016	0.012
Age of household head	-0.185	0.186
Household size	0.183	0.115
Dependency ratio	0.017	0.238
Availability of credit	0.056	0.106
Sex of the household head	0.109	0.127
Whether any household member is sick	-0.006	0.093
Awareness of local voting processes	-0.002	0.233
Political connectivity	-0.208	0.141
Whether satisfied with sub-county management	0.094	0.128
Constant	10.610	0.931
Number of observations	266	
R-squared	**0.71**	

Source: Author.

VITA

Abdu Muwonge was born in 1975 in Uganda, and grew up in Kampala, Uganda. As an undergraduate, he attended Makerere University in Uganda and received a Bachelor of Science Degree in Economics and Statistics in 1999. From September 1998 to September 1999, he taught at Mbarara University of Science and Technology. He then joined the University of Dar Es Salaam in Tanzania and received a Masters of Arts in Economics degree in 2001. Upon graduation, he worked in Uganda as a Young Professional at the Economic Policy Research Center, Makerere University, and as a Part-Time Lecturer in economics at Makerere University.

In August 2002, he was accepted into the economics doctoral program at the Andrew Young School of Policy Studies, Georgia State University, USA. He completed all the requirements for the Doctor of Philosophy in Economics Degree at the Andrew Young School of Policy Studies of Georgia State University in April 2007. In September 2006, he joined the Young Professionals Program of the World Bank. His fields of professional interest are public finance, development economics and applied econometrics.

TABLE A1. NAADS FARMERS' QUESTIONNAIRE

STRICTLY CONFIDENTIAL

PURPOSE: This questionnaire is to elicit information on the impact of advisory services on agricultural productivity

QTN ID | | | | |
DISTRICT S/C VILLAGE H/H

SECTION Z1: GENERAL IDENTIFICATION INFORMATION

NAME OF DISTRICT

NAME OF SUB-COUNTY

PARISH

NAME OF VILLAGE/LC

NAME OF HOUSEHOLD HEAD

Name of Interviewer _____

INTERVIEW INFORMATION:

	hours	minutes
START TIME:		
END TIME:		

Name of Supervisor _____

GPS COORDINATES
(UGANDA Between the following degrees 1 South and 4 North, 29 and 35 East)

GPS READINGS FOR RESPONDENT'S HOME (FH)

1								
E								

GPS READINGS FOR SUB-COUNTY OFFICE

1								
E								

SECTION Z2: FARMERS' BACKGROUND CHARACTERISTICS (RESPONDENT)

I.D.	Names of occupants at respondent's home	for how long has [name] stayed in the household during the last 12 months?	Relation ship of name to household head	Sex 1. Male 2. Female	Name's Age in years	What is [name's] marital status?	Highest Education level attained
.(1)	.(2)	.(3)	.(4)	.(5)	.(6)	.(7)	.(8)

CODE FOR RELATIONSHIP OF NAME

Head	1
Spouse	2
son/daughter	3
grand child	4
step child	5
parent of head or spouse	6
Sister or brother of head or spouse	7
nephew/Niece	8
other relatives	9
servant	10
non relative	11
other	12

CODE FOR MARITAL STATUS

Umarried	1
Married/Cohabiting	2
Divorced	3
Widowed	4

SECTION Z3. HOUSING CONDITIONS

ROOF	WALL	FLOOR
Type of material used for construction of the roof.	Type of material used for construction of the wall.	Type of material used for construction of the floor.
.(9)	.(10)	.(11)
CODES		
1 thatch/straw	1 thatch/straw	1 earth
2 mud	2 mud/poles	2 earth & dung
3 wood/planks	3 tiles	3 wood
4 iron sheets	4 unburnt bricks	4 bricks
5 asbestos	5 burnt bricks& mud	5 stones
6 tiles	6 burnt bricks &cement	6 tiles
7 tin	7 tin	7 cement
8 cement	8 cement blocks	9 other
9 other	9 other	

CODE FOR EDUCATION LEVEL

NO EDUCATION AT ALL	1
pre-primary/nursery	22
Completed P.1	2
Completed P.2	3
Completed P.3	4
Completed P.4	5
Completed P.5	6
Completed P.6	7
Completed P.7	8
Completed J.1	9
Completed J.2	10
Completed J.3	11
Completed S.1	12
Completed S.2	13
Completed S.3	14
Completed S.4	15
Completed S.5	16
Completed S.6	17
Completed Post Primary/Certificate/Spec Training	18
Post Secondary/Diploma	19
Degree	20
don't know	21

SECTION Z4. OTHER GENERAL ISSUES

Q12. What is your ***GENERAL*** rating of the sub-county authorities in ***managing all activities*** in this sub-county?

1 Very satisfactory
2 Satisfactory
3 not satisfactory (IF 3 WHY?.....)

Q13. What is your rating of the sub-county authorities in ***mobilizing people to work together***?

1 Very satisfactory
2 Satisfactory
3 not satisfactory (IF 3 WHY?.....)

Q14. When was the last time you held local political elections in this village?

Q15. Did you participate in the previous (most recent) local political elections?

1 YES
2 NO (>> 16)

Q16. If no, why did you not participate in the previous local elections?

1 Was not eligible to vote (less than 18 years)
2 Was sick or had family problems that I could not make it.
3 I did not know there were elections.
4 I do not trust the local political leadership.
5 Others (attending to my farm/travelled)

Q17. Do you have access to any form of credit/microfinance? 1 YES 2 NO

Q18. Whom do you go to in case of the following?/Your first contact to get assistance in the event of the following:

	1st choice	2nd choice
Credit Assistance (skip if NO to Q17.)		
Farm Advice		
Getting Seedlings for your Crops		
Loss of a loved one		

CODES FOR QTN 18.

Neighbor/friend/fellow farmer	1
sub-county	2
family member	3
money lender (informal)	4
Bank	5
shops	9

Q19. Do you or any other household member have close and good relations with the LC 1, LC2, or LC 3 chairman or with the parish or sub county chief?

1 YES
2 NO

Q20. How many ***days in a month*** do you allocate to the following activities?

	DAYS in a Month
Interact with fellow farmers.e.g farmer groups	
Attending to your farm	
Learning at the sub/county	
Social gatherings	

Specify which type of Social Gathering _____

Q21. Do you have ***physical disabilities*** that affect your normal daily agricultural activities?

1 YES
2 NO

Q22. Do you have ***any health complications*** that affect your normal daily agricultural activities?

1 YES (>> ***Q.24***)
2 NO

If YES, specify health complication

.....

Q23. Have ***you*** suffered from ***illness/sickness*** in the last 12 months that affected your normal agricultural activities?

1 YES
2 NO

Q24. Has ***any member of your household*** suffered from illness/sickness in the last six months that affected your normal agricultural activities?

1 YES
2 NO

If YES, specify illness/sickness

.....

.....

Q25. Have you heard about a ***programme aimed at improving farms' welfare through better methods of farming called NAADS***?

1 YES (>> Q26)
2 NO

Q26. If YES in Q25, How did you learn about NAADS?

1 Extension agent/private service provider
2 Radio/TV
3 Neighbor/Friend
4 Local government official (e.g. sub-county chief, L.C., e.t.c)
5 Member of Parliament
6 NAADS Coordinator/Official (Sub-county or district or from secretariat)
7 Other (specify_____)

1st choice
2nd choice
3rd choice

1. During the last two cropping seasons (from NOV 2004 to AUG 2005), has any member of your household cultivated crops, harvested forest products, raised aquatic products, or raised animals on any land owned by your household?" YES..1 NO...2 (»PART A2)

PLOT CODE	2. Please tell me about each plot of land belonging to your household that has been cultivated by a member of your household during the last two cropping seasons (from NOV 2004 to AUG 2005? Please describe or give me the name of each plot. NAME OF PLOT	3. Who in this household is most familiar with this plot of land? WRITE DOWN ID CODE OF HOUSE-HOLD MEMBER. ASK THIS PERSON QUEST- ID CODE	4. What is the area of the plot? AREA CODES: ACRES.....1 HECTARES..2 OTHER (SPECIFY)... .....3 AMOUNT	AREA CODE	5. What kind of land is this? Is it currently being used to grow annual crops or tree crops, or is it forest land, pasture land or water surface? ANNUAL CROP LAND.1 TREE CROP LAND.....2 FOREST....3(»8) PASTURE...4(»8) WATER SURFACE...5(»7) OTHER(SPE-CIFY___).6	6. What crops have you grown on this plot during the last two cropping seasons (from NOV 2004 to AUG 2005? CROP CODES (ONE OF WHICH IS FALLOW) SEASON 1 MAIN CROP	SEASON 1 2ND CROP	SEASON 2 MAIN CROP	SEASON 2 2ND CROP	7. Is this plot irriga-ted? YES.1 NO..2	8. How did your household acquire this land? PURCHASED....1 LEASED.....2 INHERITED.....3 CLEARED.....4 PROVIDED FREE OTHER THAN INHERITANCE...5 OTHER (SPECIFY).....6	9. What legal title or ownership rights do you have for this plot of land? DEED.....1 SALES RECEIPT.2 CUSTOMARY RIGHT...3 OTHER(SPE-CIFY__)..4 NONE.....5	10. If you were to sell this plot of land today, how much could you sell it for?	11. What soil type/ land quality is this plot? SOIL QUALI-TY CODES	12. What kind of improvements does this plot have, such as bunding, terracing or mulching? ROCK BUNDS.1 SOIL BUNDS.2 MULCHING...3 TERRACES...4 GRASS LINES.....5 OTHER (SPECIFY)..6 NONE.....7 1ST	12. 2ND	12. 3RD	13. From today, how many years has it been since this plot was fallow, or cleared from the bush? YEARS	14. In general, what is the slope of this plot? FLAT..1 SLIGHT SLOPE.2 MODERATE SLOPE.3 STEEP SLOPE.4 SWAMPY AREA.5 VALLEY (NOT SWAMPY)....6
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					

Code for QTN.3

Husband and wife (family) jointly	1
Wife more than husband	2
Husband more than wife	3
Wife only	4
Husband only	5
Others	9

Crops and their codes

Matooke-food type	01
Matooke beer type	02
Matooke sweet type	03
Maize	04
Finger Millet	05
Sorghum	06
Rice	07
Beans	08
Field Peas	09

Cow peas	10
Pigeon Peas	11
Ground nuts	12
Soya Beans	13
Sim-sim	14
Cotton	15
Irish Potatoes	16
Sweet Potatoes	17
Cassava	18

Coffee	19
Tea	20
Tobacco	21
Trees	22
Flowers	23
Oranges	24
Passion Fruits	25
Pineapples	26
Mangoes	27

Paw paws	28
Water Mellon	29
Onions	30
Cabbages	31
Dodo	32
Tomatoes	33
Carrots	34

Vanilla	35
Other vegetables	36
Tangerine	37
Lemon	38
Other crops	39

1. During the last two cropping seasons (from NOV 2004 TO AUG 2005), has your household rented or borrowed agricultural land belonging to someone else?

YES..1
NO...2 (»PART A3)

PLOT CODE	2. Please tell me about each plot belonging to someone else that was rented or lent to this household. Please describe and give me the name of NAME OF PLOT	3. Who in this household is most familiar with this plot of land? WRITE DOWN ID CODE OF HOUSEHOLD MEMBER. ASK THIS PERSON QUESTIONS 4-17. ID CODE	4. What is the area of the plot? AREA CODES: ACRES.....1 HECTARES..2 OTHER (SPECIFY)... .....3 AMOUNT / AREA CODE	5. What kind of land is this? Is it being used to grow annual crops or tree crops, or is it forest land, pasture land or water surface? ANNUAL CROP LAND..1 TREE CROP LAND.....2 FOREST..3(»9) PASTURE.4(»9) WATER SURFACE.5(»8) OTHER (SPECIFY_).6	6. In which seasons have you or the members of your household farmed this land during the last two cropping seasons? SEA-SON 1..1 SEA-SON 2..2 BOTH...3	7. What crops have you grown on this plot in the last two cropping seasons (from NOV 2004 TO AUG 2005)? CROP CODES (ONE OF WHICH IS FALLOW) SEASON 1: MAIN CROP, 2ND CROP; SEASON 2: MAIN CROP, 2ND CROP	8. Is this plot irri-gated? YES.1 NO..2	9. What soil type/land quality is this plot? SOIL QUALI-TY CODES	10. What kind of improvements does this plot have, such as bunding, terracing or mulching? ROCK BUNDS.1 SOIL BUNDS.2 MULCHING...3 TERRACES...4 GRASS LINES.....5 OTHER (SPECIFY_).6 NONE.....7 1ST / 2ND / 3RD	11. From today, how many years has it been since this plot was fallow, or cleared from the bush? YEARS	12. In general, what is the slope of this plot? FLAT.....1 SLIGHT SLOPE....2 MODERATE SLOPE...3 STEEP SLOPE....4 SWAMPY AREA....5 VALLEY (NOT SWAMPY)... 6	13. From whom was this plot rented or borrowed? RELATIVE.....1 FRIEND.....2 OTHER HOUSEHOLD....3 LOCAL AUTHORITY....4 PRIVATE ORGANIZATION.5 GOVERNMENT...6 OTHER (SPECIFY__)..7
21												
22												
23												
24												
25												
26												
27												
28												

Code for QTN.3

Husband and wife (family) jointly	1
Wife more than husband	2
Husband more than wife	3
Wife only	4
Husband only	5
Others	9

Crops and their codes

Matooke-food type	01
Matooke beer type	02
Matooke sweet type	03
Maize	04
Finger Millet	05
Sorghum	06
Rice	07
Beans	08
Field Peas	09

Cow peas	10
Pigeon Peas	11
Ground nuts	12
Soya Beans	13
Sim-sim	14
Cotton	15
Irish Potatoes	16
Sweet Potatoes	17
Cassava	18

Coffee	19
Tea	20
Tobacco	21
Trees	22
Flowers	23
Oranges	24
Passion Fruits	25
Pineapples	26
Mangoes	27

Paw paws	28
Water Mellon	29
Onions	30
Cabbages	31
Dodo	32
Tomatoes	33
Carrots	34

Vanilla	35
Other vegetables	36
Tangerine	37
Lemon	38
Other crops	39

Crops and their codes

Matooke-food type	01
Matooke beer type	02
Matooke sweet type	03
Maize	04
Finger Millet	05
Sorghum	06
Rice	07
Beans	08
Field Peas	09

PLOT CODE	14. During the last two cropping seasons (from NOV 2004 TO AUG 2005) what kind of arrangement was made with the owner of the land for you to use it? RENTAL.....1 (»16) SHARECROP..2 NO PAYMENT....3 (»NEXT PLOT) EXCHANGE OF THIS PLOT FOR ANOTHER....4 (»NEXT PLOT) OTHER (SPECIFY_).5 (»16)	15. What share of the output is given to the landlord? PER-CENTAGE	16. How much money did you or will you give to the owner for the use of this land during the last two cropping seasons? IF NO MONEY PAYMENT, WRITE ZERO.	17. How much did you or will you give to the owner in kind for the use of this land during the last two cropping seasons? IF NOTHING GIVEN IN KIND, WRITE 0 IN ALL COLUMNS. AMOUNT	UNIT CODE	CROP CODE
21						
22						
23						
24						
25						
26						
27						
28						

r codes

01	
02	
03	
04	
05	
06	
07	
08	
09	

Cow peas	10
Pigeon Peas	11
Ground nuts	12
Soya Beans	13
Sim-sim	14
Cotton	15
Irish Potatoes	16
Sweet Potatoes	17
Cassava	18

Coffee	19
Tea	20
Tobacco	21
Trees	22
Flowers	23
Oranges	24
Passion Fruits	25
Pineapples	26
Mangoes	27

Paw paws	28
Water Mellon	29
Onions	30
Cabbages	31
Dodo	32
Tomatoes	33
Carrots	34

Vanilla	35
Other vegetables	36
Tangerine	37
Lemon	38
Other crops	39

1. During the last two cropping seasons (from NOV 2004 TO AUG 2005), has your household rented or lent out any of its land to another household?

YES..1
NO...2 (»PART B)

PLOT CODE	2. Please tell me about each plot of land belonging to your household that was rented or lent out to another household? Please describe or give me the name of each plot. NAME OF PLOT	3. Who in this household is most familiar with this plot of land? WRITE DOWN ID CODE OF HOUSEHOLD MEMBER. ASK THIS PERSON QUESTIONS 4-20. ID CODE	4. During the last two cropping seasons, in which seasons did you rent or lend this plot out to another household? SEASON 1..1 SEASON 2..2 BOTH.....3 IF BOTH, »QUESTION 6	5. COPY THE PLOT CODE FOR THIS PLOT USED IN PART A1. »QUESTION 16 PLOT CODE	6. What is the area of the plot? AREA CODES: ACRES.....1 HECTARES..2 OTHER SPECIFY.....3 AMOUNT	AREA CODE	7. What kind of land is this? Is it being used to grow annual crops or tree crops, or is it forest land, pasture land or water surface? ANNUAL CROP LAND..1 TREE CROP LAND.....2 FOREST.....3 (»9) PASTURE....4 (»9) WATER SURFACE....5 OTHER (SPECIFY).6	8. Is this plot irrigated? YES.1 NO..2	9. How did your household acquire this land? PURCHASED....1 RENTED.....2 LEASED.....3 INHERITED.....4 CLEARED.....5 PROVIDED FREE OTHER THAN INHERITANCE...6 OTHER (SPECIFY).....9	10. What legal title or ownership rights do you have for this plot of land? DEED.....1 SALES RECEIPT...2 CUSTOMARY RIGHT.....3 OTHER(SPECIFY____)..4 NONE.....5	11. If you were to sell this plot of land today, how much could you sell it for?	12. What soil type/land quality is this plot? SOIL QUALITY CODES
41												
42												
43												
44												
45												

Crops and their codes

Matooke-food type	01
Matooke beer type	02
Matooke sweet type	03
Maize	04
Finger Millet	05
Sorghum	06
Rice	07
Beans	08
Field Peas	09

Cow peas	10
Pigeon Peas	11
Ground nuts	12
Soya Beans	13
Sim-sim	14
Cotton	15
Irish Potatoes	16
Sweet Potatoes	17
Cassava	18

Coffee	19
Tea	20
Tobacco	21
Trees	22
Flowers	23
Oranges	24
Passion Fruits	25
Pineapples	26
Mangoes	27

Paw paws	28
Water Mellon	29
Onions	30
Cabbages	31
Dodo	32
Tomatoes	33
Carrots	34

Vanilla	35
Other vegetables	36
Tangerine	37
Lemon	38
Other crops	39

PLOT CODE	13. What kind of improvements does this plot have, such as bunding, terracing or mulching? ROCK BUNDS.1 SOIL BUNDS.2 MULCHING...3 TERRACES...4 GRASS LINES.....5 OTHER (SPECIFY_).6 NONE.....7 — 1ST / 2ND / 3RD	14. From today, how many years has it been since this plot was fallow, or cleared from the bush? YEARS	15. In general, what is the slope of this plot? FLAT.....1 SLIGHT SLOPE....2 MODERATE SLOPE...3 STEEP SLOPE....4 SWAMPY AREA....5 VALLEY (NOT SWAMPY)... 6	16. To whom is this plot rented or lent out? RELATIVE.....1 FRIEND.....2 OTHER HOUSEHOLD....3 LOCAL AUTHORITY....4 PRIVATE ORGANIZATION.5 GOVERNMENT...6 OTHER (SPECIFY_)...7	17. During the last two cropping seasons what kind of rental or use arrangement was made with the renter using the land? RENTAL.....1(»19) SHARECROP..2 NO PAYMENT.3(»NEXT PLOT) EXCHANGE OF THIS PLOT FOR ANOTHER....4(»NEXT PLOT) OTHER (SPECIFY_).....5(»19)	18. What share of the output is given to your household by the tenants? PERCENTAGE	19. How much money did you or will you receive for the use of this land during the last two cropping seasons? IF NO MONEY PAYMENT, WRITE ZERO.	20. How much did you or will you receive in kind for the use of this land during the last two cropping seasons? IF NOTHING RECEIVED IN KIND, WRITE 0 IN ALL COLUMNS. AMOUNT / UNIT CODE / CROP CODE
41								
42								
43								
44								
45								

Crops and their codes

Matooke-food type	01
Matooke beer type	02
Matooke sweet type	03
Maize	04
Finger Millet	05
Sorghum	06
Rice	07
Beans	08
Field Peas	09

Cow peas	10
Pigeon Peas	11
Ground nuts	12
Soya Beans	13
Sim-sim	14
Cotton	15
Irish Potatoes	16
Sweet Potatoes	17
Cassava	18

Coffee	19
Tea	20
Tobacco	21
Trees	22
Flowers	23
Oranges	24
Passion Fruits	25
Pineapples	26
Mangoes	27

Paw paws	28
Water Mellon	29
Onions	30
Cabbages	31
Dodo	32
Tomatoes	33
Carrots	34

Vanilla	35
Other vegetables	36
Tangarine	37
Lemon	38
Other crops	39

EQUIPMENT CODE	TYPE OF FARM EQUIPMENT	1. During the last two cropping seasons (from NOV 2004 TO AUG 2005), **has any member** of your household **owned** a [....]? FIRST ASK QUESTION 1 FOR ALL ITEMS, THEN ASK QUESTIONS 2-16 FOR EACH ITEM BEFORE GOING TO THE NEXT ITEM. YES..1 NO...2 (»NEXT ITEM)	2. How many [....] did your household own at the ***end of the last*** cropping season? DO NOT COUNT SHARES JOINTLY OWNED BY OTHER HOUSEHOLDS.	3. At the end of the last cropping season, **did your household own** any [...] jointly with any other household? YES..1 NO...2 (»6)	4. How many [...] were **owned with another household** at the end of the last cropping season?	5. What **share** of these [....] belonged to your household? IF SHARE DIFFERS OVER ITEMS, PUT IN AVERAGE SHARE.	6. If you **sold** one of those [...] today, how much money could you get for it? IF MORE THAN ONE ITEM, ASK FOR AVERAGE VALUE. AVERAGE SHOULD INCLUDE FULL VALUE OF ITEMS SHARED WITH OTHER	7. Did your household **buy** any [....] in the during the last two cropping seasons? YES..1 NO...2 (»10)	8. How many [....] ***were bought during the last TWO*** cropping seasons? IF SHARED WITH ANOTHER HOUSEHOLD, PUT IN FRACTION BELONGING TO THIS HOUSEHOLD.
1	Tractor								
2	PUMP (BOMBA)								
3	Sprinkler/Water Can								
4	thresher								
5	Ox plough								
6	Wheel barrow								
7	Hoes								
8	Knives (includes pangas, slashers)								
9	Axes								
10	Rakes								
11	Shovels								
12	Sickles/Reaping hooks								
13	Other 1_____								
14	Other 2_____								
15	Other 3_____								

EQUIPMENT CODE	TYPE OF FARM EQUIPMENT	9. What was the **total amount paid** for all these [.....] bought during the ***last two*** cropping seasons?	10. Did your household **sell** any [....] during the **last two** cropping seasons? YES..1 NO...2 (»13)	11. **How many** [....] **were sold** during the last two cropping seasons? IF SHARED WITH ANOTHER HOUSEHOLD, PUT IN FRACTION BELONGING TO THIS HOUSEHOLD.	12. What was the **total amount received** for all these [.....] sold during the ***last two*** cropping seasons?	13. Did your household ***rent out*** any of its [....] during the ***last two*** cropping seasons? YES..1 NO...2 (»16)	14. How much money did your household **earn from renting** its [....] during the ***last two*** cropping seasons ? DO NOT INCLUDE THE VALUE OF IN KIND PAYMENTS	15. What is the value of any ***in kind payments earned*** by your household from **renting** its [...] during the ***last two cropping*** season ? IF NO IN KIND PAYMENT, WRITE ZERO	16. How much did you ***spend on maintenance*** for all of your [....] during the ***last two*** cropping seasons? »»NEXT ITEM
1	Tractor								
2	PUMP (BOMBA)								
3	Sprinkler/Water Can								
4	thresher								
5	Ox plough								
6	Wheel barrow								
7	Hoes								
8	Knives (includes pangas, slashers)								
9	Axes								
10	Rakes								
11	Shovels								
12	Sickles/Reaping hooks								
13	Other 1_____								
14	Other 2_____								
15	Other 3_____								

1. LOOK AT SECTIONS A1 AND A2. WRITE DOWN THE PLOT NAMES, PLOT CODES, AND NAME OF MOST KNOWLEDGEABLE PERSON FOR EACH PLOT IN A1 AND A2 FOR WHICH THERE IS INFORMATION.

2. ASK THIS QUESTION OF THE PERSON MOST KNOWLEDGEABLE OF THIS PLOT.
I would like to ask about the amounts harvested from each of the plots you or members of your household have farmed during the last two cropping seasons. Let's begin with the plot [DESCRIBE PLOT]. Could you please tell me how much you harvested of each crop you grew on this plot during [SEASON 1]?

SEASON ONE

UNIT CODES REFER TO ATTACHED UNIT CODES

STRICTLY REFER TO FIRST SEASON

	PLOT NAME	PLOT CODE	NAME OF MOST KNOWLEDGE-ABLE PERSON	FIRST CROP				SECOND CROP				THIRD CROP				FOURTH CROP			
				CROP CODE	AMOUNT	UNIT CODE	SEASON CODE	CROP CODE	AMOUNT	UNIT CODE	SEASON CODE	CROP CODE	AMOUNT	UNIT CODE	SEASON CODE	CROP CODE	AMOUNT	UNIT CODE	SEASON CODE
1							1				1				1				1
2							1				1				1				1
3							1				1				1				1
4							1				1				1				1
5							1				1				1				1
6							1				1				1				1
7							1				1				1				1
8							1				1				1				1

PAY ATTENTION TO SIX THINGS:

1. **SEASON ONE**
2. **PLOT NAME**
3. **MOST KNOWLEDGEABLE**
4. **CROP CODE**
5. **AMOUNT**
6. **UNIT CODE (SEPARATE SHEET)**

Crops and their codes

Matooke-food type	01
Matooke beer type	02
Matooke sweet type	03
Maize	04
Finger Millet	05
Sorghum	06
Rice	07
Beans	08
Field Peas	09

Cow peas	10
Pigeon Peas	11
Ground nuts	12
Soya Beans	13
Sim-sim	14
Cotton	15
Irish Potatoes	16
Sweet Potatoes	17
Cassava	18

Coffee	19
Tea	20
Tobacco	21
Trees	22
Flowers	23
Oranges	24
Passion Fruits	25
Pineapples	26
Mangoes	27

Paw paws	28
Water Mellon	29
Onions	30
Cabbages	31
Dodo	32
Tomatoes	33
Carrots	34

Vanilla	35
Other vegetables	36
Tangerine	37
Lemon	38
Other crops	39

	1. LOOK AT SECTIONS A1 AND A2. WRITE DOWN THE PLOT NAMES, PLOT CODES, AND NAME OF MOST KNOWLEDGEABLE PERSON FOR EACH PLOT IN A1 AND A2 FOR WHICH THERE IS INFORMATION.	2. ASK THIS QUESTION OF THE PERSON MOST KNOWLEDGEABLE OF THIS PLOT. I would like to ask about the amounts harvested from each of the plots you or members of your household have farmed during the last two cropping seasons. Let's begin with the plot [DESCRIBE PLOT]. Could you please tell me how much you harvested of each crop you grew on this plot during [SEASON 2]? **SEASON TWO** UNIT CODES REFER TO ATTACHED UNIT CODES STRICTLY REFER TO SECOND SEASON																	
	PLOT NAME	PLOT CODE	NAME OF MOST KNOWLEDGE-ABLE PERSON	FIRST CROP				SECOND CROP				THIRD CROP				FOURTH CROP			
				CROP CODE	AMOUNT	UNIT CODE	SEASON CODE	CROP CODE	AMOUNT	UNIT CODE	SEASON CODE	CROP CODE	AMOUNT	UNIT CODE	SEASON CODE	CROP CODE	AMOUNT	UNIT CODE	SEASON CODE
1							2				2				2				2
2							2				2				2				2
3							2				2				2				2
4							2				2				2				2
5							2				2				2				2
6							2				2				2				2
7							2				2				2				2
8							2				2				2				2

P/ PAY ATTENTION TO SIX THINGS:

1 1. **SEASON TWO**
2 2. **PLOT NAME**
3 3. **MOST KNOWLEDGEABLE**
4 4. **CROP CODE**
5 5. **AMOUNT**
6 6. **UNIT CODE (SEPARATE SHEET)**

Creps and their codes

Matooke-food type	01
Matooke beer type	02
Matooke sweet type	03
Maize	04
Finger Millet	05
Sorghum	06
Rice	07
Beans	08
Field Peas	09

Cow peas	10
Pigeon Peas	11
Ground nuts	12
Soya Beans	13
Sim-sim	14
Cotton	15
Irish Potatoes	16
Sweet Potatoes	17
Cassava	18

Coffee	19
Tea	20
Tobacco	21
Trees	22
Flowers	23
Oranges	24
Passion Fruits	25
Pineapples	26
Mangoes	27

Paw paws	28
Water Mellon	29
Onions	30
Cabbages	31
Dodo	32
Tomatoes	33
Carrots	34

Vanilla	35
Other vegetables	36
Tangerine	37
Lemon	38
Other crops	39

			SEASON ONE					SEASON TWO				
LINE NUMBER	1. LOOK AT SECTION C1 AND COPY, IN THE SAME ORDER, THE PLOT NAMES, PLOT CODES AND NAME OF THE PLOT MANAGER. QUESTIONS 2-11 SHOULD BE ANSWERED BY THE PLOT MANAGERS.		2. Now I would like to ask you some questions about the labor that household members have contributed to the plots cultivated by your household during the last two cropping seasons. Let's begin with the plot [DESCRIBE PLOT]. Did any members of your household work on this plot during [SEASON 1]?	3. How many days of labor did the members of your household contribute in [SEASON 1] to prepare or sow this plot?	4. How many days of labor did the members of your household contribute in [SEASON 1] to apply fertilizer, manure, irrigation, pesticides, herbicides or other inputs to this plot? other inputs to this plot?	5. How many days of labor did the members of your household contribute in [SEASON 1] to weed or prune this plot?	6. How many days of labor did the members of your household contribute in [SEASON 1] to harvest crops grown on this plot?	7. Did any members of your household work on this plot in [SEASON 2]?	8. How many days of labor did the members of your household contribute in [SEASON 2] to prepare or sow this plot?	9. How days of labor did the members of your household contribute in [SEASON 2] to apply fertilizer, manure, irrigation, pesticides, herbicides or other inputs to other inputs to this plot?	10. How many days of labor did the members of your household contribute in [SEASON 2] to weed or prune this plot?	11. How many days of labor did the members of your household contribute in [SEASON 2] to harvest crops grown on this plot?
	PLOT NAME	NAME OF PLOT MANAGER	YES..1 NO...2 (»7)	LABOR DAYS	LABOR DAYS	LABOR DAYS	LABOR DAYS	YES..1 NO...2 (»NEXT PLOT)	LABOR DAYS	LABOR DAYS	LABOR DAYS	LABOR DAYS
1												
2												
3												
4												
5												
6												
7												
8												

PAY ATTENTION TO THE FOLLOWING:

1. SEASONS [QUESTIONS 2-6 REFER TO SEASON ONE] [QUESTIONS 7-11 REFER TO SEASON TWO]

2. PAY MORE ATTENTION TO THE UNDERLINED WORDS.

3. READ THE QUESTION CAREFULLY

4. PROBE TO GET RIGHT RESPONSE.

5. STRICTLY REFER TO HOUSEHOLD

DEAR ENUMERATOR, THIS IS A POTENTIAL SOURCE OF RECALL PROBLEMS. YOUR SKILL IN PROBING AND UNDERSTANDING THE QUESTION IS IMPORTANT

			SEASON ONE						SEASON TWO	
LINE NUMBER	1. LOOK AT SECTION C1 AND COPY, IN THE SAME ORDER, THE PLOT NAMES, PLOT CODES AND NAME OF THE PLOT MANAGER. QUESTIONS 2-31 SHOULD BE ANSWERED BY THE PLOT MANAGERS.		2. Now I would like to ask you some questions about labor that you hired and inputs that you used for each plot that was farmed by your household during the last two cropping seasons. Let's begin with the plot [DESCRIBE PLOT]. Did you hire any labor to work on this plot during [SEASON 1] during the last two cropping	3. For this plot, how many days of labor did you hire in [SEASON 1] for all tasks during that season? Include all tasks, such as preparing and sowing the plot, applying fertilizer, manure, pesticides and other inputs, weeding and pruning, and harvesting.	4. What kind of tasks did you hire this labor for on this plot in [SEASON 1]? PREPARING AND SOWING.....1 APPLYING INPUTS..2 WEEDING AND PRUNING.....3 HARVESTING.....4 OTHER (SPECIFY___).....5			5. How much did you pay for these days of labor? IF PAID IN KIND, ASK FOR VALUE OF PAYMENT	6. Did you hire any labor to work on this plot during [SEASON 2] during the last two cropping seasons?	7. For this plot, how many days of labor did you hire in [SEASON 2] for all tasks during that season? Include all tasks, such as preparing and sowing the plot, applying fertilizer, manure, pesticides and other inputs, weeding and pruning, and harvesting.
	PLOT NAME	NAME OF PLOT MANAGER	YES..1 NO...2 (»6)	LABOR DAYS	FIRST	SECOND	THIRD		YES..1 NO...2 (»10)	LABOR DAYS
1										
2										
3										
4										
5										
6										
7										
8										

	SEASON TWO				SEASON ONE												
LINE NUMBER	8. What kind of tasks did you hire this labor for on this plot in [SEASON 2]? PREPARING AND SOWING.....1 APPLYING INPUTS..2 WEEDING AND PRUNING.....3 HARVESTING.....4 OTHER (SPECIFY___)....5			9. How much did you pay for these days of labor? IF PAID IN KIND, ASK FOR VALUE OF PAYMENT	10. Now let's talk about physical inputs for this plot, beginning with [SEASON 1]. Did you use any purchased seeds or seedlings on this plot in [SEASON 1]? YES..1 NO...2 (»12)	11. How much did you pay for all purchased seeds and seedlings used on this plot in [SEASON 1]? IF PAID IN KIND, ASK FOR VALUE OF PAYMENT	12. Did you apply chemical fertilizer to this plot in [SEASON 1]? YES..1 NO...2 (»14)	13. Please tell me the amount of each type of fertilizer applied to this plot in [SEASON 1]. UREA.....1 AMMONIA BICARBONATE.....2 PHOSPHATE.....3 NITROGEN.....4 OTHER (SPECIFY_____).....5									14. Did you apply any manure to this plot in [SEASON 1]? YES..1 NO...2 (»19)
								FIRST FERTILIZER			SECOND FERTILIZER			THIRD FERTILIZER			
	FIRST	SECOND	THIRD					TYPE	AMOUNT	UNIT CODE	TYPE	AMOUNT	UNIT CODE	TYPE	AMOUNT	UNIT CODE	
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	

SEASON ONE

LINE NUMBER	15. Was any of the manure that you applied in [SEASON 1] produced by your household? YES..1 NO...2 (»17)	16. How much of each kind of home-produced manure did you apply in [SEASON 1]? CHICKEN.....1 PIG.....2 SMALL RUMINANT.....3 LARGE RUMINANT.....4 HUMAN.....5 GREEN.....6 OTHER (SPECIFY_____)..7						17. Did you purchase any of the manure that you applied in [SEASON 1]? YES..1 NO...2 (»19)	18. How much of each kind of purchased manure did you apply in [SEASON 1]? CHICKEN.....1 PIG.....2 SMALL RUMINANT.....3 LARGE RUMINANT.....4 HUMAN.....5 GREEN.....6 OTHER (SPECIFY_____)..7						19. Did you apply any pesticides, herbicides or fungicides to this plot in [SEASON 1]? YES..1 NO...2 (»21)
		FIRST MANURE			SECOND MANURE				FIRST MANURE			SECOND MANURE			
		TYPE	AMOUNT	UNIT CODE	TYPE	AMOUNT	UNIT CODE		TYPE	AMOUNT	UNIT CODE	TYPE	AMOUNT	UNIT CODE	
1															
2															
3															
4															
5															
6															
7															
8															

SEASON ONE

SEASON TWO

LINE NUMBER	20. Please tell me how much you applied to this plot in [SEASON 1] for each type of pesticide, herbicide or fungicide? PUT CODES HERE									21. Now let's talk about physical inputs for this plot in [SEASON 2]. Did you use any purchased seeds or seedlings on this plot in [SEASON 2]? YES..1 NO...2 (»23)	22. How much did you pay for all purchased seeds and seedlings used on this plot in [SEASON 2]? IF PAID IN KIND, ASK FOR VALUE OF PAYMENT	23. Did you apply chemical fertilizer to this plot in [SEASON 2]? YES..1 NO...2 (»25)	24. Please tell me the amount of each type of fertilizer applied to this plot in [SEASON 2]. UREA.....1 AMMONIA BICARBONATE.....2 PHOSPHATE.....3 NITROGEN.....4 OTHER (SPECIFY_____).....5								
	FIRST			SECOND			THIRD						FIRST FERTILIZER			SECOND FERTILIZER			THIRD FERTILIZER		
	TYPE	AMOUNT	UNIT CODE	TYPE	AMOUNT	UNIT CODE	TYPE	AMOUNT	UNIT CODE				TYPE	AMOUNT	UNIT CODE	TYPE	AMOUNT	UNIT CODE	TYPE	AMOUNT	UNIT CODE
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				

SEASON TWO

LINE NUMBER	25. Did you apply any manure to this plot in [SEASON 2]?	26. Was any of the manure that you applied in [SEASON 2] produced by your household?	27. How much of each kind of home-produced manure did you apply in [SEASON 2]?						28. Did you purchase any of the manure that you applied in [SEASON 2]?	29. How much of each kind of purchased manure did you apply in [SEASON 2]?						30. Did you apply any pesticides, herbicides or fungicides to this plot in [SEASON 2]?
			CHICKEN.....1 PIG.....2 SMALL RUMINANT.....3 LARGE RUMINANT.....4 HUMAN.....5 GREEN.....6 OTHER (SPECIFY_____)..7							CHICKEN.....1 PIG.....2 SMALL RUMINANT.....3 LARGE RUMINANT.....4 HUMAN.....5 GREEN.....6 OTHER (SPECIFY_____)..7						
	YES..1 NO...2 (»30)	YES..1 NO...2 (»28)	FIRST MANURE			SECOND MANURE			YES..1 NO...2 (»30)	FIRST MANURE			SECOND MANURE			YES..1 NO...2 (»NEXT PLOT)
			TYPE	AMOUNT	UNIT CODE	TYPE	AMOUNT	UNIT CODE		TYPE	AMOUNT	UNIT CODE	TYPE	AMOUNT	UNIT CODE	
1																
2																
3																
4																
5																
6																
7																
8																

SEASON TWO

LINE NUMBER

31.

Please tell me how much you applied to this plot in [SEASON 2] for each type of pesticide, herbicide or fungicide?

PUT CODES HERE

	FIRST			SECOND			THIRD		
	TYPE	AMOUNT	UNIT CODE	TYPE	AMOUNT	UNIT CODE	TYPE	AMOUNT	UNIT CODE
1									
2									
3									
4									
5									
6									
7									
8									

1. Has any member of your household raised or owned livestock, poultry or any other domesticated animal during the last two cropping seasons?

YES..1
NO...2 (»PART F)

	2. During the last two cropping seasons, has any member of your household raised any [...]? FIRST ASK QUESTION 2 FOR ALL ANIMALS, THEN ASK QUESTIONS 3-20 FOR EACH ANIMAL BEFORE GOING TO THE NEXT ONE.		3. How many [...] were owned by your household at the end of the last cropping season? IF ZERO, GO TO QUESTION 5.	4. If you sold one of those [...] today, how much money could you get for it?	5. How many of your [...] did you sell during the last two cropping seasons? IF ZERO, GO TO QUESTION 7.	6. How much did your household receive for the sale of all these [...] during the last two cropping seasons? INCLUDE VALUE OF IN KIND PAYMENTS	7. How many of your [...] did you eat during the last two cropping seasons?	8. How many of your [...] died or were lost during the last two cropping seasons?	9. How many of your [...] were given away during the last two cropping seasons?	10. How many [...] did your household purchase during the last two cropping seasons? IF ZERO, GO TO QUESTION 12.	11. How much did you pay for these [...] purchased during the last two cropping seasons? INCLUDE VALUE OF IN KIND PAYMENTS	12. How many [...] were born or received as gifts by your household during the last two cropping seasons?
	ANIMAL	YES..1 NO...2 (»NEXT ANIMAL)	NUMBER OF ANIMALS		NUMBER OF ANIMALS		NUMBER OF ANIMALS	NUMBER OF ANIMALS	NUMBER OF ANIMALS	NUMBER OF ANIMALS		NUMBER OF ANIMALS
1	Beef cattle											
2	Milk cows											
3	Breeding bulls											
4	Pigs for Breeding											
5	Sheep											
6	Goats											
7	Chickens											
8	Ducks											
9	Other Poultry											
10	Rabbits											
11	Bee Products											
12	Other (Specify__)											

	ANIMAL	13. Did your household buy any feed for your [...] during the last two cropping seasons? YES..1 NO...2 (»15)	14. How much did you spend on feed for your [...] during the last two cropping seasons? INCLUDE VALUE OF IN KIND PAYMENTS	15. How much did you spend on veterinary services and medicine for your [...] during the last two cropping seasons? INCLUDE VALUE OF IN KIND PAYMENTS	16. How much did you spend on labor hired to watch animals or build enclosures for your [...] during the last two cropping seasons? INCLUDE VALUE OF IN KIND PAYMENTS	17. How much did you spend on other expenses for your [...], such as equipment, taxes, slaughter fees, materials for enclosures, transportation, insurance and stud fees, during the last two cropping seasons? INCLUDE VALUE OF IN KIND PAYMENTS	18. Did your household sell any fresh byproducts from your [...] during the last two cropping seasons? EXCLUDE PRODUCTS USED BY HOUSEHOLD BUSINESSES YES..1 NO...2 (»NEXT ANIMAL)	19. What was that fresh byproduct? EGGS.....1 MILK.....2 BLOOD.....3 SKIN.....4 MEAT.....5 HONEY.....6 MANURE.....7 OTHER (SPECIFY__)...8		20. How much did you obtain from the sales of these [...] byproducts during the last two cropping seasons? INCLUDE VALUE OF IN KIND PAYMENTS
								FIRST	SECOND	
1	Beef cattle									
2	Milk cows									
3	Breeding bulls									
4	Pigs for Breeding									
5	Sheep									
6	Goats									
7	Chickens									
8	Ducks									
9	Other Poultry									
10	Rabbits									
11	Bees									
12	Other (Specify__)									

NAADS FARMER'S QUESTIONNAIRE PART F: ADVISORY AND INFORMATION SERVICES: PART F1: ACCESS TO AND USE OF AGRICULTURAL EXTENSION SERVICES

1. Did anyone in your household visit an agricultural extension agent or an agricultural extension center during the last two cropping seasons (from MONTH, YEAR to MONTH, YEAR) to seek advice or assistance on growing crops?

   YES...1
   NO....2 (»7) ☐

2. How many times during the last two cropping seasons did members of your household visit an agricultural extension agent or an agricultural extension center to discuss growing crops? ☐

   DO NOT COUNT VISITS BY AN EXTENSION AGENT TO THE HOUSEHOLD — TIMES ☐

3. For what crops were these consultations made? ☐

   CROP CODES ☐

   IF MORE THAN 3, LIST 3 MOST IMPORTANT ☐

4. What kinds of assistance or information were requested?

   USE OF FERTILIZER.....1
   IRRIGATION.....2
   NEW SEED VARIETIES....3
   PEST INFESTATION.....4
   BLIGHT PROBLEM.....5
   SOIL PROBLEMS.....6
   WEATHER PROBLEMS.....7
   MARKETING ADVICE.....8
   HELP GETTING CREDIT...9
   GENERAL ADVICE.....10
   OTHER (SPECIFY___)...11

   1ST ☐
   2ND ☐
   3RD ☐
   4TH ☐
   5TH ☐

   ALLOW UP TO FIVE RESPONSES

5. Did you have to pay for this assistance?

   YES...1
   NO....2 (»7) ☐

6. How much did you pay for this assistance? ☐

7. Did anyone in your household visit an agricultural extension agent or an agricultural extension center during the last two cropping seasons (from MONTH, YEAR to MONTH, YEAR) to seek advice or assistance on raising animals?

   YES...1
   NO....2 (»13) ☐

8. How many times during the last two cropping seasons did members of your household visit an agricultural extension agent or an agricultural extension center to discuss raising animals? ☐

   DO NOT COUNT VISITS BY AN EXTENSION AGENT TO THE HOUSEHOLD — TIMES ☐

9. For what animals were these consultations made? ☐

   ANIMAL CODES ☐

   IF MORE THAN 3, LIST 3 MOST IMPORTANT ☐

10. What kinds of assistance or information were requested?

    VACCINATION SERVICES..1
    ANIMAL DISEASES.....2
    ANIMAL FEED/NUTRITION.3
    INSEMINATION SERVICES.4
    MARKETING ADVICE.....5
    HELP GETTING CREDIT...6
    GENERAL ADVICE.....7
    OTHER (SPECIFY___)....8

    1ST ☐
    2ND ☐
    3RD ☐

    ALLOW UP TO THREE RESPONSES

11. Did you have to pay for this assistance?

    YES...1
    NO....2 (»13) ☐

12. How much did you pay for this assistance? ☐

13. During the past two cropping seasons, did any agricultural extension agent visit your household?

YES...1
NO....2(»19) ☐

14. How many times did any agricultural extension agent visit your household during the last two cropping seasons?

TIMES ☐

15. How many of these visits were requested by members of your household? How many of these visits were unsolicited?

VISITS THAT WERE REQUESTED ☐

UNSOLICITED VISITS ☐

16. Did you have to pay for any of these visits?

YES...1
NO....2(»18) ☐

17. How much did you pay for these visits? ☐

18. What kind of service did you get from these visits?

USE OF FERTILIZER.....1
IRRIGATION.....2
NEW SEED VARIETIES....3
PEST INFESTATION.....4
BLIGHT PROBLEM.....5
SOIL PROBLEMS.....6
WEATHER PROBLEMS.....7
GENERAL CROP ADVICE...8
VACCINATION SERVICES..9
ANIMAL DISEASES.....10
ANIMAL FEED/NUTRITION.11
INSEMINATION SERVICES.12
MARKETING ADVICE.....13
HELP GETTING CREDIT...14
GENERAL ANIMAL ADVICE.15
OTHER (SPECIFY___)....16

1ST ☐
2ND ☐
3RD ☐
4TH ☐
5TH ☐

ALLOW UP TO FIVE RESPONSES

19. Have you also received information from other government sources, such as radio, television, a newspaper article or a pamphlet, during the last two cropping seasons?

YES...1
NO....2(»END OF SECTION) ☐

20. What kind of information source was it?

RADIO.....1
TELEVISION.....2
NEWSPAPER.....3
PAMPHLET.....4
OTHER (SPECIFY___)....5

1ST ☐
2ND ☐
3RD ☐

ALLOW UP TO THREE RESPONSES

SECTION F2: TOWARD FARMER DEMAND FOR EXTENSION

Q1 Were you educated about the concept of paying for extension?

1 YES
2 NO

Q2 If there was private company providing advisory services but at some fee, would you be willing to purchase advisory services?

1 YES (>> Q3)
2 NO

Q3 If yes, how would you pay for this information?

1 Pay a one time fixed fee as an individual
2 pay whenever I need the advice
3 pay as a group
4 Other specify (_____)

Q4 If no, why would you not purchase that information/advisory services?

1 Because NAADS is providing
2 My neighbors/friends can help
3 Other speify (_____)

SECTION F3: FARMERS' UNDERSTANDING OF METHODS OF ADVISORY SERVICES

Q5 How would you rate the following extension services in terms of their relevance?

Extension advisors/Private Service provviders
Neighbors
Manuals/flyers
TV
Radio
Cellphone information
OTHER (SPECIFY_____)

1 most relevant
2 least relevant
3 not relevant
4 I don't know

Q6. If a buyer comes here to buy_____(pick any crop from what farmer grows), how do you know what price to charge him/her?

1. The Private service provider would inform me
2. The price i heard over the radio
3. the price in the nearby market
4. The price that my neighbor/friend told me
5. The price offered by the buyer
6. We negotiate
7. Other (_____)

1st choice
2nd choice
3rd choice

Q7. Do you keep records on inputs and outputs of your farm?
1 YES
2 NO
[ ] If YES request to have access to records

Q8. If yes, since when did you start keeping records? YEAR [ ]

Q9. Have you had any training in agricultural practices during the last six months?
1 YES
2 NO
[ ]

Q10. Did you participate in the last advisory services session/farmer group meetings?
1 YES
2 NO
[ ]

SECTION F5: ACCESS TO INFRASTRUCTURE (MARKETS; ROADS; TDS)

Q11. Do buyers pick up from your farm/home? 1 YES 2 NO [ ]

Q12. Is there.....within or outside the boundaries of the community? 1 YES 2 NO

1.	nearest daily market	[ ]
2.	nearest periodic market	[ ]
3.	nearest highway/feeder road to city	[ ]
4.	sub-county headquarters	[ ]
5.	TDS/DS	[ ]

Q13. Have you ever visited a TDS? 1 YES 2 NO [ ]

Q14. If yes, when was the last time you visited the TDS?

month	year

Q15. What was the purpose of your visit to the TDS? _____

Q16. What mode of transport was used to visit the TDS?

1 WALK	1ST CHOICE	
2 BICYCLE	2ND CHOICE	
3 MOTORCYCLE/BodaBoda	3RD CHOICE	
4 CAR		
5 OTHER (SPECIFY_____)		

Q17. How do you transport your farm produce to the market?

1 WALK	1ST CHOICE	
2 BICYCLE	2ND CHOICE	
3 MOTORCYCLE/BodaBoda	3RD CHOICE	
4 CAR		
5 OTHER (SPECIFY_____)		

Q18. Cost, Time and Distance using this mode of transportation to go nearest market?

	cost (Ushs)	time (hrs)	distance (kms)
1 WALK			
2 BICYCLE			
3 MOTORCYCLE (BodaBoda)			
4 CAR			
5 OTHER (SPECIFY_____)			

SECTION F6: PRIVATE SERVICE CONTRACTS AND CO-FUNDING

QG1 Are you satisfied with the services provided by the private service providers?

1 YES (>>QG2)
2 NO (>>QG3)

QG2 Mention the activities provided by the private service providers that you are satisfied with?

_____

_____

_____

QG3 In whats ways are you not satisfied with the private service providers?

_____

_____

_____

QG4 How many farmers' groups do you belong? ☐

QG4 Name the farmers' group (S) you belong to:

1 _____

2 _____

3 _____

4 _____

QG5 Have you paid your NAADS contribution toward the farmers' group (S)?

1 YES (>>QG6)

2 NO (>>QG7)

☐

QG6 How much did you pay PER GROUP?

1 _____

2 _____

3 _____

4 _____

QG7 Why have you been unable to meet your contribution?

_____

_____

THANK YOU VERY MUCH FOR YOUR COOPERATION

NAADS Study. Community Questionnaire for Market Price data

District: _____

Market Name: _____

Start Time: _____

End Time: _____

Date: _____

crop	CROP NAME	purchased from	UNIT	AVERAGE	AVERAGE
	Q1	Q2	Q3	Q4	Q5
	1. In what units is [...] usually purchased in this community? REFER TO THE QUANTITY CODE BELOW		How much [...] is contained in one [UNIT FROM QUESTION 1]? Use Crop Codes	2. On average, what is the PURCHASE price for one [UNIT FROM Q3] of [....]? **AVERAGE PURCHASE PRICE**	On average, what is the SELLING price for one [UNIT FROM Q31] of [....]? **AVERAGE SELLING PRICE**
1	matooke-food type				
2	matooke-beer type				
3	matooke-sweet type				
4	maize				
5	finger millet				
6	sorghum				
7	rice				
8	beans				
9	field peas				
10	cow peas				
11	pigeon peas				
12	ground nuts				
13	soya beans				
14	sim-sim				
15	cotton				
16	irish potatoes				
17	sweet potatoes				
18	cassava				
19	coffee				
20	tea				
21	tobacco				
22	trees				
23	flowers				
24	oranges				
25	passion fruits				

26	pineapples				
27	mangoes				
28	pawpaw				
29	other fruits				
30	onions				
31	cabbages				
32	dodo				
33	tomatoes				
34	carrots				
35	other vegetables				
36	vanilla				
37	muranga				
38	other crops				