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IFPRI Discussion Paper 00724

October 2007

Assessing the Impact of the National Agricultural Advisory Services (NAADS) in the Uganda Rural Livelihoods

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Development Strategy and Governance Division
and
Environment and Production Technology Division

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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FINANCIAL CONTRIBUTORS AND PARTNERS

IFPRI's research, capacity strengthening, and communications work is made possible by its financial contributors and partners. IFPRI gratefully acknowledges generous unrestricted funding from Australia, Canada, China, Denmark, Finland, France, Germany, India, Ireland, Italy, Japan, the Netherlands, Norway, the Philippines, Sweden, Switzerland, the United Kingdom, the United States, and the World Bank.



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ACKNOWLEDGMENTS

Funding support for this study was provided by the World Bank through the National Agricultural Advisory Services (NAADS) under the contract number NAADS/ARTPII/SRVCS/04-05/00024/07. The support of NAADS Secretariat in managing the fieldwork and data collection is also very much acknowledged. Finally, the authors wish to thank all the farmers who set aside part of their time to participate in the surveys and provided invaluable information for this analysis.

ABSTRACT

The National Agricultural Advisory Services (NAADS) program of Uganda is an innovative public-private extension service delivery approach, with the goal of increasing market oriented agricultural production by empowering farmers to demand and control agricultural advisory services. Although initial evaluations of NAADS have been quite favourable, these evaluations have been primary qualitative in nature. This study quantifies the initial impacts of NAADS in the districts and sub-counties where the program was operating by 2005. It is based on descriptive analyses of results of a survey of 116 farmer groups and 894 farmers in sixteen districts where the program was operating at the time and four districts where NAADS had not yet begun operating to control for factors that may have contributed to differing initial conditions among the communities.

Based on observed differences across the NAADS and non-NAADS sub-counties, it appears that the NAADS program is having substantial positive impacts on the availability and quality of advisory services provided to farmers, promoting adoption of new crop and livestock enterprises as well improving adoption and use of modern agricultural production technologies and practices. NAADS also appears to have promoted greater use of post-harvest technologies and commercial marketing of commodities, consistent with its mission to promote more commercially-oriented agriculture.

Despite positive effects of NAADS on adoption of improved production technologies and practices, no significant differences were found in yield growth between NAADS and non-NAADS sub-counties for most crops, reflecting the still low levels of adoption of these technologies even in NAADS sub-counties, as well as other factors affecting productivity. However, NAADS appears to have helped farmers to avoid the large declines in farm income that affected most farmers between 2000 and 2004, due more to encouraging farmers to diversify into profitable new farming enterprises such as groundnuts, maize and rice than to increases in productivity caused by NAADS.

NAADS appears to be having more success in promoting adoption of improved varieties of crops and some other yield enhancing technologies than in promoting improved soil fertility management. This raises concern about the sustainability of productivity increases that may occur, since such increases may lead to more rapid soil nutrient mining unless comparable success in promoting improved soil fertility management is achieved. Continued emphasis on improving the market environment, promoting adoption of more remunerative crop enterprises, and applied agronomic research identifying more effective ways to profitably combine inorganic and organic soil fertility measures in different crop systems can help to address this problem.

Shortage of capital and credit facilities was often cited by farmers as a critical constraint facing them, in addition to scarcity of agricultural inputs, lack of adequate farmland, unfavorable weather patterns and problems of pests and diseases. These emphasize that the quality of advisory services is not the only important factor influencing technology adoption and productivity, and the need for complementary progress in other areas, especially development of the rural financial system.

Implications are drawn for enterprise targeting and ensuring sustainability of improvements in productivity, as well as for designing and implementing service provision programs in other parts of the Uganda and in other countries.

Keywords: Impact assessment, agricultural extension, Uganda

1. INTRODUCTION

Uganda has been undergoing a major transformation since the late 1980s towards economic growth and poverty reduction. In the 1990s, gross domestic product (GDP) grew steadily by more than 6% per annum from a low rate of 3% in the 1980s, and the proportion of the population living under the poverty line declined from 56% in 1992 to 38% in 2003 (UBOS 2003). This remarkable turnaround from the depression associated with the political turmoil and economic mismanagement of the 1970's until the mid-1980s has been achieved through sound policies linked to investments and economic liberalization undertaken by the Government of Uganda (GOU) with support from the donor community and several other development partners. Despite the substantial progress made, several challenges remain in sustaining the momentum by way of increasing productivity, ensuring sustainable use of natural resources, and reducing poverty. Agricultural productivity has stagnated or declined for most farmers and declining soil fertility is perceived as one of the major causes (Nkonya et al. 2005a, 2005b, 2004; Deininger and Okidi 2001; MAAIF and MFPED 2000).

Recognizing the importance of a multi-sectoral approach to reducing mass poverty, the Government of Uganda has since 2000 been implementing the Plan for Modernization of Agriculture (PMA) as a key policy initiative aimed at reducing poverty to a level below 28% by 2014. The PMA, whose overall objective is to enhance production, competitiveness and incomes, has an ambitious agenda of policy and institutional reform across seven pillars, a key one of which is improving delivery of agricultural extension through the new National Agricultural Advisory Services (NAADS) program (MFPED 2004). NAADS became operational in 2001 and is an innovative public-private extension service delivery approach. NAADS promotes development of farmer organizations and empowers them to procure advisory services, manage linkage with marketing partners and conduct demand-driven monitoring and evaluation (M&E) of the advisory services and their impacts.

Although Uganda began decentralizing government services in 1992 (LGFC (1997) cited in Livingstone and Charlton 2001), provision of agricultural extension and other agricultural support services became the responsibility of local governments in 1997, as per the Local Government (LG) Act. Several challenges remain. For example, the proportion of district budgets allocated to agricultural production and marketing in three districts studied by Francis and James (2003) was 3% or less, while at the sub-county level, the proportions are even smaller. Extension agents surveyed in Tororo district felt that decentralization had negative impacts on their ability to provide extension services (Enyipu et al. 2002). More generally, lack of funds and equipment to facilitate the work of extension agents is a common complaint at the local government level (Sserunkuuma et al. 2001).

The goal of NAADS is increasing the proportion of market oriented production by empowering farmers to demand and control agricultural advisory and information services. The specific objectives are (MAAIF and MFPED 2000):

- Increasing effectiveness, efficiency and sustainability (including financing, private sector participation, farmer responsiveness, deepening decentralization, and gender sensitivity) of the extension delivery service;
- Increasing farmers' access to and sustaining knowledge (education), information and communication to the farmers;
- Increasing access to and sustaining effective and efficient productivity enhancing technologies to farmers;
- Creating and strengthening linkages and co-ordination within the overall extension services; and
- Aligning extension to Government policy, particularly privatization, liberalization, decentralization and democratization.

Empowering farmers, targeting the poor, mainstreaming gender issues and deepening decentralization are some of the key defining principles of NAADS (NAADS Secretariat 2000). The NAADS program targets the economically-active poor —those with limited physical and financial assets, skills and knowledge, rather than destitute or large-scale farmers— through farmers' forums based on specific profitable enterprises. In 2005, a total of 13,202 farmer groups were registered in the NAADS program and engaged in enterprise development and promotion (NAADS Newsletter, 2005). Under the NAADS approach, farmer groups contract private sector service providers (including non-governmental organizations (NGOs)) who are awarded short-term contracts to promote specific enterprises and provide advisory services. There is a coordinator at the district (LC5) level who works with the sub-county (LC3) and the local community (LC1) to identify priorities, manage the allocation of contracts, and monitor and evaluate performance and accountability of service providers and farmer groups.

NAADS was initiated in 2001 in six trailblazing districts (Arua, Kabale, Kibaale, Mukono, Soroti and Tororo), within which the NAADS program began working in 24 sub-counties. NAADS rolled out in 2002/03 into ten new districts (Bushenyi, Busia, Iganga, Kabarole, Kapchorwa, Kitgum, Lira, Luwero, Mbarara and Wakiso), in which it covered 46 sub-counties; it also expanded to 54 additional sub-counties in the trailblazing districts (Ekwamu et al. 2005). In 2003/2004 to 2004/2005, NAADS expanded into 13 new districts (Hoima, Kamuli, Mbale, Nakapiripit, Rakai, Apac, Kanungu, Kumi, Masaka, Moyo,

Rukungiri, Yumbe and Bugiri), bringing NAADS coverage to a total of 29 districts and 280 sub-counties¹ (Ibid). The program is expected to cover the whole country within the next 3 years (NAADS Secretariat 2005).

Initial evaluation of the NAADS program showed a significant impact of the program in sub-counties where the program has been placed (Scanagri 2005). A recent evaluation of the PMA also showed progress in terms of increased use of improved technologies, marketed output, and wealth status of farmers receiving services from NAADS (OPM 2005). However, these studies were primarily qualitative in nature and no quantitative evaluation of the NAADS program has yet been conducted to validate the qualitative impacts observed by Scanagri and OPM.

This study was carried out with the objective of quantifying the initial impact of NAADS and laying a baseline for conducting future impact studies. The findings of this study will be useful for designing policies and strategies for advisory services as they are scaled up over the next several years in Uganda and for drawing potential lessons for other countries in Sub-Saharan Africa (SSA). The findings of this study are expected to be useful to policy makers of the central and local governments, farmer groups, advisory service providers, donors and others seeking to improve agricultural extension services in Uganda and elsewhere.

¹ At the time of the study, there were 56 districts and 975 sub-counties in Uganda. Hence NAADS was involved in roughly 29% of the sub-counties in Uganda.

2. METHODOLOGY

Sample Selection and Data

This study uses data from farmer groups and a household survey. The communities and households were selected using a two-stage stratified random sampling. The strata were based on the NAADS rollout phases: 1) sub-counties where the NAADS program was first established in 2001/02, hereafter referred to as “*trailblazing NAADS sub-counties*”, 2) sub-counties where the NAADS program began in 2002/03, hereafter referred to as “*late NAADS sub-counties*”, and 3) sub-counties where there has not been NAADS program, hereafter referred to as “*non-NAADS sub-counties*”. This study did not cover the sub-counties where NAADS began after 2002/03 since it was felt that NAADS could not yet have had significant impacts in these sub-counties.

Table 1 shows the number of households and farmer groups sampled from each stratum. All the six trailblazing NAADS districts and the 24 corresponding sub-counties were selected for survey. In the case of the late NAADS group, four of the nine districts and 18 of the 72 sub-counties were sampled. The districts and sub-counties from the late NAADS and non-NAADS were purposively sampled such that they have similar agricultural potential² and market access³ as the corresponding trailblazing NAADS districts and sub-counties. For each of the trailblazing NAADS districts, a matching district, i.e., one with similar market access and agricultural potential setting, from the other strata was selected (Table 2). For example, for the case of Mukono district, the corresponding late NAADS and non-NAADS districts selected were Luwero and Mpigi, respectively. This was done to minimize the across group variation in agricultural potential and market access, which are likely to greatly influence agricultural production, income and other variables of interest that will be analyzed in this study. From each selected sub-county, two parishes were randomly selected, and then from each selected parish one village (LC1) was randomly selected. From each of the selected villages in the trailblazing NAADS sub-counties, 8 households were randomly selected. The corresponding number of households selected from the late NAADS and non-NAADS sub-counties averaged about 9 and 6, respectively. For the farmer group survey, one group was randomly selected from each of the selected communities. Table 2 also shows the names of the selected districts and sub-counties.

² Agricultural potential is an abstraction of many factors—including rainfall level and distribution, altitude, soil type and depth, topography, presence of pests and diseases, presence of irrigation, and others—that influence the absolute (as opposed to comparative) advantage of producing agricultural commodities in a particular place.

³ Market access is measured as the potential market integration (estimated as travel time to the nearest five markets, weighted by their population (Wood, et al. 1999)) and distance to an all-weather road.

Table 1. Number of districts, sub-counties, villages, farmer groups and households sampled in each NAADS rollout phases

Sampling frame	Trailblazing NAADS (2001/02)	Late NAADS (2002/03)	Non-NAADS	Total
Districts	6	4	4	14
Sub-counties	24	18	16	58
Villages	48	36	32	116
Farmer groups	48	36	32	116
Households	384	318	192	894

Notes: All sub-counties in the trailblazing and late NAADS districts were selected, while two sub-counties were randomly selected from each of the non-NAADS districts. Then randomly, two parishes selected from each sub county, one village from each parish, and one farmer group from each village. See text on methodology for details. Then 6, about 9, and 6 households were randomly selected from each village in the trailblazing NAADS, late NAADS, and non-NAADS stratum, respectively. The corresponding NAADS districts/sub-counties established in 2004 were excluded from the sampling frame, since it was deemed that the NAADS program could not have significant impact in these districts during the survey in early 2005.

Table 2. Names of districts and sub-counties and number of households and farmer groups selected from each district, by agricultural potential and market access development domain

Stratum/ District	AP	MA	Sub county selected	Number of households	Number of farmer groups
<i>Trailblazing NAADS (2001/02)</i>					
Kabale	H	H	Bubare, Bukinda, Kyanamira, Rubaya	64	8
Mukono	H	H	Kasawo, Kyampisi, Nakisunga, Wakisi	64	8
Arua	L	L	Kijomoro, Lobule, Manibe, Offaka	64	8
Kibaale	L	L	Bwanswa, Bwikara, Mabaale, Mugarama	64	8
Soroti	L	L	Asuret, Budondo, Gweri, Kyere	64	8
Tororo	L	H	Butaleja, Kisoko, Mukujju, Rubongi	64	8
<i>Sub total</i>				384	48
<i>Late NAADS (2002/03)</i>					
Luwero	H	H	Bamunanika, Batuntumula, Kapeeka, Katikamu, Ngoma	80	10
Kabarole	L	L	Bukuuku, Kichwamba, Kisomoro, Mugusu, Mun-West	80	10
Lira	L	L	Adwari, Aputi, Batta, Ogur, Omoro	80	10
Mbarara	L	H	Kabingo, Kinoni, Nyakashashara	78	6
<i>Sub total</i>				318	36
<i>Non-NAADS</i>					
Mpigi	H	H	Mpigi, Kituntu, Kalamba, Budde	48	8
Ntungamo	H	H	Bwongyera, Ruhaama, Nyabihoko, Itojo	48	8
Katakwi	L	L	Obalanga, Usuk, Kuju, Kapelebyong	48	8
Pallisa	L	H	Lyama, Kibuku, Naboia, Kabwangasi	48	8
<i>Sub total</i>				192	32
Grand total				894	116

AP is agricultural potential, which is an abstraction of many factors—including rainfall level and distribution, altitude, soil type and depth, topography, presence of pests and diseases, presence of irrigation, and others—that influence the absolute (as opposed to comparative) advantage of producing agricultural commodities in a particular place. MA is market access, which is measured as the potential market integration (estimated as travel time to the nearest five markets, weighted by their population (Wood, et al. 1999)) and distance to an all-weather road. H and L refer to high and low, respectively.

The data collected from the household survey include the demographic and socio-economic characteristics of the household. To understand the impact of the NAADS program on adoption and productivity of new technologies and enterprises, data on awareness and use of improved production practices and new enterprises adopted after 2000 were collected at household level. The household survey also collected data on participation of households in the market and their access to advisory services and other institutions.

The farmer group survey collected data related mainly to empowerment of farmers to organize, to demand and manage advisory services and how advisory services of different types have influenced livelihoods of female and male farmers. Other data collected in the farmer group survey include access of group members to advisory services, their participation in development of institutions and their perception on the quality and availability of advisory services. For details of the household and farmer group survey instruments, see Appendix A and B.

Data Analysis Methods

In this preliminary report, descriptive statistics are used to analyze the impact of the NAADS program on access to agricultural advisory services; empowerment of farmers to demand those services; farmers' awareness, adoption and intensity of adoption of enterprises and technologies; and impacts on farmers' incomes, assets and food and nutrition security. The analyses use comparative statistics with statistical tests for differences across the three strata. The impact of NAADS is also analyzed by examining the change between 2000 (i.e. before the NAADS program started in Uganda) and 2004 (i.e. after the NAADS started in the selected NAADS sub-counties) for several of the factors. To exclude the influence of inflation and other temporal monetary and fiscal trends, constant prices were used for the household income and value of assets. All statistics are corrected for stratification, clustering, and weighting of sample. The clusters were the villages and sampling weights were calculated using parish level human population data.⁴

Note that several interesting and relevant issues are not analyzed in this preliminary report, including the impacts of households' age, gender and education composition, health, economic activities, ownership of productive assets, access to credit and other services and infrastructure, etc. All of these affect the impact indicators to be examined, either directly or indirectly. Spillover effects of the NAADS program on non-NAADS participants are also anticipated but not analyzed here. These issues will be addressed in a follow up econometric analysis.

⁴ Sample weights are inverse of the probability of a household being selected in the sample, which was calculated as (the number of selected parishes divided by the total number of parishes in the sub-county) multiplied by (the number of selected households divided by the total number of households in the parish). Since population data were only available at the parish (not village) level, random selection of households at the parish level was assumed in the calculation. The statistical results are representative only of the selected sub-counties, since these were purposively selected.

3. PERFORMANCE OF NAADS AND OTHER PROVIDERS

Farmer Empowerment

One of the key principles of NAADS is farmer empowerment. Empowerment is a cognitive state characterized by a sense of perceived control and competence, and internalization of the goals and objectives of the organization or group by their members (Menon 1999, 2001). The perceived control and internalization of the goals and objectives were measured by asking farmer groups (or community members where there was no farmer group) how they perceived their ability to participate in decision making on matters related to the group (or community) activities and how well they participated in developing the bylaws and constitution of the farmer group (or community).

Table 3 shows that over 80% of farmers in the trailblazing NAADS and non-NAADS sub-counties perceived that it was very easy for them to participate in decision making of farmer groups or community matters, suggesting that the level of democratic processes in the sub-counties studied is strong.⁵ The corresponding share of farmers in the late NAADS sub-counties was 63%. Most groups in the NAADS sub-counties report feeling empowered to express their views to the sub-county farmer forum, to local government officials, and to public extension agents; with a somewhat higher proportion of groups in non-NAADS sub-counties reporting feeling empowered to express their views to local government officials and extension agents. However, none of these differences between NAADS and non-NAADS sub-counties are statistically significant. Over 50% of farmer groups also reported that their participation in developing the bylaws and constitution of farmer groups or the community was very good, while 30% perceived that their participation was good.

Table 4 shows that more than half of farmer groups (both in NAADS and non-NAADS sub-counties) feel that their ability to express themselves in decision-making became easier between 2000 and 2004. However, more than 80 percent of groups in all sub-counties reported no change in the performance of their group in developing their bylaws or constitution since 2000.

⁵ Uganda ranks 103th in the democratic ranking of 150 countries in the world, ahead of a score of countries in sub-Saharan Africa (World Audit, 2005). Democracy is defined as equality and freedom from social-economic restraints not self-imposed. It entails the right and the capacity of a people, acting either directly or through representatives, to control their institutions for their own purposes. Democracy also rests on the principle that restraints are placed by legitimate and popularly elected legislative institutions that conform to the principle of equality (Cronin, 1989).

Table 3. Farmer empowerment to express views and participate in democratic processes (percentage of farmer groups or communities reporting)

	NAADS sub counties				Non-NAADS sub counties	
	Trailblazing (n=48)		Late (n=36)		(n=25)	
	Average	Std. Err	Average	Std. Err	Average	Std. Err
Ease of group members to participate in decision making of farmer groups						
Very easy	86.7	48.0	63.1	10.3	84.0	68.0
Somewhat easy	11.6	4.5	35.8	10.4	7.5	5.2
Somewhat difficult	1.6	1.6	0.9	1.0	8.4	4.8
How empowered to express views to sub-county farmer forum						
Very empowered	52.0	9.4	37.6	8.9	n.a.	n.a.
Slightly empowered	27.7	7.1	34.8	10.1	n.a.	n.a.
No change	8.8	6.8	14.3	8.4	n.a.	n.a.
Less empowered	11.4	7.1	13.2	6.5	n.a.	n.a.
How empowered to express views to local government officials since 2000						
Very empowered	37.7	8.8	31.1	8.4	43.8	10.2
Slightly empowered	36.8	8.5	32.8	10.2	42.9	10.5
No change	15.3	7.3	21.4	9.2	6.2	5.9
Less empowered	9.5	7.3	8.5	9.1	7.0	5.9
How empowered to express views to public extension agents						
Very empowered	26.6	9.0	29.8	8.5	31.6	9.9
Slightly empowered	35.9	8.4	30.4	10.9	33.3	10.0
No change	13.4	4.9	28.1	10.5	19.6	7.9
Less empowered	24.1	9.3	11.6	6.3	15.4	8.8
How well members are participating in developing bylaws or constitution						
Very good	61.4	8.9	54.5	10.6	51.3	10.6
Good	29.5	8.3	35.4	10.5	23.4	8.3
Fair	80.5	4.5	66.2	4.7	25.3	9.3
Poor	0.0	0.0	3.5	2.1	0.0	0.0
Very poor	1.1	1.1	0.0	0.0	0.0	0.0

Source: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

These results suggest that the NAADS program may have had limited impact in empowering farmers to participate in decision making, since such participation is as strong or stronger in the non-NAADS sub-counties. This is contrary to expectations and the findings of the study by Scanagri (2005), which reported strong impacts of NAADS on empowerment. However, this could be due in part to comparing different types of farmer groups in NAADS and non-NAADS sub-counties. In the NAADS sub-counties, the farmer groups were formed by different types of producer and marketing organizations and are at different stages of development (Opondo 2002; Scanagri 2005). In the non-NAADS sub-counties, farmer groups also consisted of producer/marketing organizations, but community members as a

whole were also interviewed if there was no strong farmer organization. Furthermore, in some types of empowerment processes, such as participation in enacting community bylaws, the NAADS program does not have a direct mandate to influence them.

The results also do not reflect the better access of farmers in NAADS sub-counties to information and technologies or impacts of NAADS on farmers' productivity and incomes, which are discussed later. Such positive performance may be due more to improvement in the supply of advisory services, which also is discussed later, rather than increased demand for services as a result of empowerment of farmer groups.

Table 4. Changes of empowerment of farmer group members since 2000 (percentage of farmer groups or communities reporting)

	NAADS sub counties				Non-NAADS sub counties	
	Trailblazing (n=49)		Late (n=36)		(n=25)	
	Average	Std. Err	Average	Std. Err	Average	Std. Err
Change of easiness to express selves (general)						
Much easier	45.2	9.1	55.5	9.1	53.4	10.3
Slightly easier	26.7	7.4	19.2	6.9	22.8	8.9
No change	25.0	9.7	25.4	7.9	19.4	7.9
Slightly more difficult	3.1	2.2	0.0	0.0	04.4	4.3
Change of service delivery of farmer forum since 2000						
Faster response	31.2	8.6	28.7	8.2	n.a.	n.a.
Slightly faster	28.7	6.9	19.2	9.4	n.a.	n.a.
No change	30.9	9.7	36.8	9.8	n.a.	n.a.
Slower response	7.8	4.1	5.4	4.3	n.a.	n.a.
Much slower	1.2	1.2	9.8	5.8	n.a.	n.a.
Change of service delivery of local government officials since 2000						
Faster response	9.2	4.5	19.1	7.2	31.6	9.9
Slightly faster	42.8	9.8	13.2	5.1	11.3	5.0
No change	40.0	9.1	35.4	10.4	24.5	8.8
Slower response	3.6	2.1	5.5	4.4	15.2	8.4
Much slower	3.6	3.1	20.5	5.4	11.1	7.4
Change of service delivery of public extension agents since 2000						
Faster response	5.8	3.1	22.1	7.2	31.6	9.9
Slightly faster	42.6	9.3	14.5	5.9	14.1	6.0
No change	29.3	8.4	41.4	10.3	35.6	10.3
Slower response	29.3	8.3	41.4	10.3	35.6	10.3
Much slower	11.4	6.6	0.0	0.0	0.0	0.0
Change in performance of group in developing bylaws or constitution since 2000						
Improved significantly	5.3	3.4	4.4	2.6	0.0	0.0
Improved slightly	10.1	3.7	8.1	5.6	4.7	4.6
no change	84.6	4.8	86.2	6.2	95.2	4.6
Deteriorated	0.0	0.0	12.8	1.3	0.0	0.0

Source: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

Performance of and Constraints Facing Farmer Groups

Studies have shown that farmer groups and collective action in general could help farmers to achieve economies of scale as they could lower transactions costs by pooling resources of poor farmers, increase their negotiation power and skills, facilitate advocacy and provide other services that could be costly if undertaken by individual farmers (Stringfellow and Coulter 1997; Hussein 2001; Coulter et al. 1999). However, the legacy of corruption and inefficiency of cooperatives in the past may have eroded confidence of farmers to organize and work in groups. In this section, participation of members in group activities and how participation has changed since 2000 are first examined. Then the main constraints facing the groups or communities in achieving their goals are examined.

In general, participation of farmers in group or community activities was considered to be very good or good by most of the groups/communities (more than 80% in most cases — Table 5). Besides attending general meetings, other participatory activities include enterprise selection, demonstration and training, management of technology development sites, and development of a constitution and/or by-laws.

Table 5. Participation of members in farmer group/community activities (percentage of farmer groups or communities reporting)

	NAADS sub-counties				Non-NAADS	
	Trailblazing		Late		sub-	counties
	Average	Std. Err	Average	Std. Err	Average	Std. Err
Enterprise selection						
Very good	66.45	49.86	43.55	50.66	63.37	49.61
Good	30.16	6.92	51.80	50.20	24.84	46.15
Fair	2.20	8.35	0.00	10.28	7.53	7.64
Poor	1.20	3.44	4.66	0.00	0.00	0.00
Very poor	0.00	1.07	0.00	3.85	4.25	5.84
Meetings						
Very good	53.50	50.14	43.85	50.54	55.31	49.61
Good	28.73	6.00	37.85	48.71	38.65	47.94
Fair	9.20	8.43	7.22	10.47	6.05	9.79
Poor	8.57	5.00	11.09	4.68	0.00	4.67
Very poor	0.00	6.34	0.00	5.65	0.00	0.00
Demonstrations and training						
Very good	39.15	8.43	32.94	8.74	59.96	9.14
Good	49.37	9.00	50.75	10.30	24.79	7.89
Fair	4.85	3.30	7.59	5.21	15.25	25.49
Poor	4.72	19.80	7.47	23.88	0.00	0.00
Very poor	1.90	1.70	1.25	1.30	0.00	0.00
Management of technical development sites						
Very good	53.83	9.08	28.13	7.53	42.45	10.43
Good	31.48	9.01	62.65	8.98	54.23	10.36
Fair	11.16	4.95	8.03	4.62	3.31	2.60
Poor	0.00	3.11	0.00	1.30	0.00	0.00
Very poor	3.52	16.67	1.19	15.08	0.00	0.00
Development of constitution/bye-laws						
Very good	69.04	8.88	53.16	10.64	37.71	10.57
Good	22.38	8.34	36.96	6.49	29.90	8.25
Fair	7.38	4.45	6.46	4.66	32.39	9.39
Poor	0.00	0.00	3.42	2.10	0.00	0.00
Very poor	1.20	1.08	0.00	0.00	0.00	0.00

Source: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

As Table 6 shows, commitment of members in terms of participation in the various activities has remained high within the last five years. This is not surprising since group formation is an old institution and presence of NGOs and programs has been contributing to strengthening them in Uganda (Nkonya et al. 2005). However, limited capacity in terms of professional and skills competence to guide capacity development of farmer institutions is still a challenge (Barr and Fafchamps 2004), especially in remote and poor communities in many parts of Uganda (Jagger and Pender 2002; Barr and Fafchamps 2004).

Table 6. Change since 2000 in participation of members in farmer group/community activities (percentage of farmer groups or communities reporting)

	NAADS sub counties		Non-NAADS sub counties
	Trailblazing	Late	
Enterprise selection			
Improved a lot	9.17	5.32	0.00
Improved a little	12.03	2.35	0.00
No change	78.80	88.07	100.00
Deteriorated a little	0.00	4.25	0.00
Meetings			
Improved a lot	7.87	5.72	0.00
Improved a little	12.26	7.65	0.00
No change	79.87	83.16	100.00
Deteriorated a little	0.00	3.47	0.00
Demonstrations and training			
Improved a lot	4.63	8.71	0.00
Improved a little	15.63	0.00	0.00
No change	79.74	90.05	100.00
Deteriorated a little	0.00	1.25	0.00
Management of technical development sites			
Improved a lot	4.63	12.56	0.00
Improved a little	15.12	0.00	0.00
No change	78.91	87.44	100.00
Deteriorated a little	1.34	0.00	0.00
Development of constitution/bye-laws			
Improved a lot	5.93	4.30	0.00
Improved a little	11.41	10.40	0.00
No change	82.66	84.05	100.00
Deteriorated a little	0.00	1.25	0.00

Source: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

Examining specific constraints facing farmer groups and communities in achieving their goals and objectives, shortage of capital and lack of credit facilities were cited as the main ones (Table 7). Nearly one-half of all the groups or communities reported these. Due to low levels of resources by individual members, the groups are unable to raise the desired amount of capital from membership contributions to adequately support their activities.

Table 7. Main problems facing farmer groups/communities (percentage reporting)

	NAADS sub counties		Non-NAADS sub counties
	Trailblazing	Late	
Shortage of capital/lack of credit facilities	43.18	45.71	45.00
Lack of markets	2.27	5.71	0.00
Lack of access to information and services	0.00	2.86	0.00
Uncooperative group members	4.55	8.57	0.00
High prices/scarcity of agricultural inputs	15.91	8.57	5.00
Lack of adequate farm land	11.36	2.86	15.00
Unfavorable weather patterns	2.27	0.00	20.00
Pest and diseases	0.00	2.86	10.00
Reduced labor	2.27	2.86	0.00

Source: NAADS-IFPRI Survey data, 2005. Statistics are corrected for stratification, weighting and clustering of sample.

Regarding other problems, there were differences across the three NAADS strata. For example, high prices, shortage of agricultural inputs and shortage of farmland were cited by groups in the trailblazing NAADS sub-counties as the next most constraining factors. In the late NAADS sub-counties, high prices, shortage of agricultural inputs and uncooperative members were cited as the next most constraining factors; while unfavorable weather conditions, shortage of farmland and pests and diseases were cited by groups in the non-NAADS sub-counties. That weather and pests/diseases were not problematic in NAADS sub-counties is consistent with the results showing positive impacts of NAADS in promoting improved crop, soil fertility, and water management practices.

Surprisingly, lack of markets and lack of information and services were not seen as major constraining factors. This may be because production is still primarily for home consumption, although farmers do take advantage of buoyant local market conditions to market surpluses (OPM 2005).

Service Provision

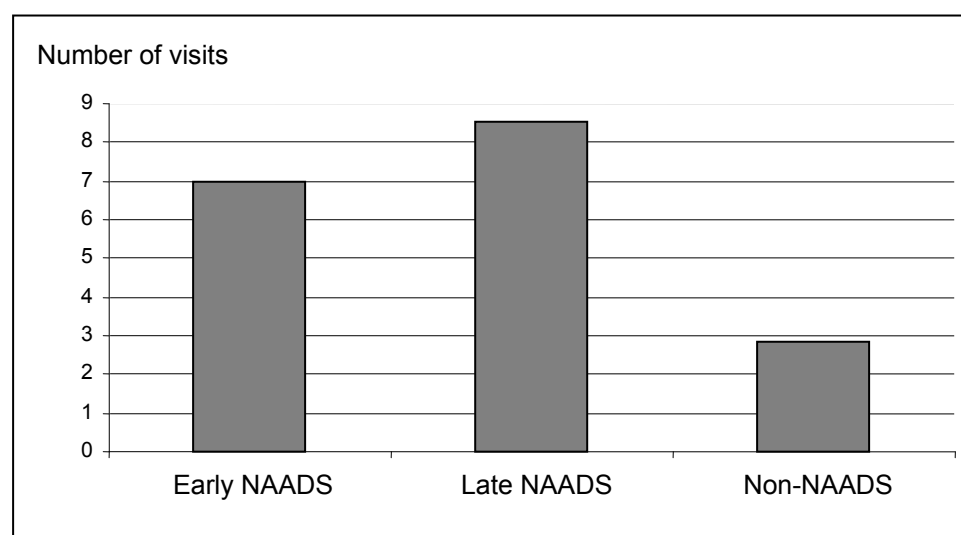
In the household survey, farmers were asked to express their views on methods, usefulness and timeliness of advisory services from different sources within the past five years (2000 to 2004). Table 8 reports the results on these. About 95% of the farmers in NAADS sub-counties perceived that the method used by NAADS providers was very good or good. About 92% of the farmers in NAADS sub-counties also perceived that the advice given by NAADS providers was useful, and more than 80% of households in trailblazing districts felt that the services were provided on time. These perceptions were generally more favorable about NAADS service providers than perceptions of the quality of service by government or NGO providers in the non-NAADS sub-counties, although the perceptions of those providers were also generally favorable. In addition, more than 60% of the NAADS households perceived that the frequency of visits by providers has increased since initiation of the NAADS program. This perception is supported by the large difference in frequency of advisory service agent visits between households in NAADS and non-NAADS sub-counties in 2004 (Figure 1). Farmers in NAADS sub-counties received more than twice as many visits as their counterparts in non-NAADS sub-counties. Among farmers in the NAADS sub-counties, those in the late NAADS sub-counties received more advisory service agent visits than their counterparts in trailblazing NAADS sub-counties, perhaps due to the initial procedures required to establish a NAADS program in a community.

Table 8. Perception of households on the methods used by NAADS, government and NGO advisory service providers in 2004 (percentage of households reporting)

Service provider <i>Methods of delivery</i>	Trailblazing NAADS sub counties (n=227)		Late NAADS sub counties (n=189)		Non-NAADS sub counties			
	NAADS		Government (n=46)		NGO (n=28)			
	Average	Std. Err.	Average	Std. Err.	Average	Std. Err.	Average	Std. Err.
Very good	53.4	3.9	49.4	3.8	28.2	6.5	39.4	12.6
Good	41.5	3.6	45.8	3.1	68.3	6.4	5.3	12.7
Fair	4.4	1.5	4.1	1.8	1.0	1.4	4.7	4.3
Poor	1.0	0.8	1.0	0.8	2.5	1.4	2.7	4.0
<i>Usefulness of advice given</i>								
Very useful	55.8	3.2	52.4	5.1	24.6	7.2	29.4	8.9
Useful	38.1	3.2	39.9	4.1	60.7	7.5	63.2	11.4
Somehow useful	5.0	1.6	5.2	1.7	14.7	4.4	4.7	4.3
Not useful	1.0	0.4	2.5	0.8	0.0	0.0	2.7	2.6
<i>Timeliness of delivery</i>								
Timely	80.7	3.5	64.3	6.0	55.4	8.4	75.1	9.2
Sometimes late	18.0	3.5	35.0	6.0	44.6	8.3	22.9	10.6
Always late	1.3	0.7	0.0	0.0	0.0	0.0	2.0	3.8

Source: NAADS-IFPRI Survey data, 2005.

Figure 1. Average number of extension visits received by households in 2004



Source: NAADS-IFPRI Survey data, 2005.

Availability of Modern Technologies and Information

Households were asked to indicate their perception of the availability (yes or no) of various technologies, practices and information within the community in 2004. They were asked to evaluate how the availability had changed since 2000, according to whether they felt it had increased a lot, increased a little, not changed, decreased a little, or decreased a lot. The source of information, as described earlier, refers to the particular technology, practice or information used by the household. Technology is used to designate the physical object or hardware used in production, e.g. seed, animal breed, or post harvest

equipment like maize huller, while production practice represents the know how for management or utilization of the technology, e.g. plant population and spacing, fertilizer application or disease control. The information is analyzed below.

Availability in 2004

With the exception of fish farming information and technologies, availability of modern technologies and information in 2004 was significantly better in NAADS than in non-NAADS sub-counties (Table 9). The non-NAADS sub-counties reported the smallest share of households with access to crop and livestock technologies and practices.

Table 9. Availability of information/technologies in community in 2004 (percentage of households)

	NAADS Sub-counties				Non-NAADS Sub-counties		Test
	Trailblazing		Late		Average	Std. Err	
	Average	Std. Err	Average	Std. Err			
Information on:							
Improved crop production technologies	79.2	2.3	69.0	3.4	67.1	3.7	bc
Improved crop production practices	80.5	2.3	70.0	3.4	58.9	3.8	abc
Improved livestock production technologies	69.3	2.6	69.7	3.4	53.4	3.9	ab
Improved livestock production practices	68.6	2.7	67.4	3.4	48.6	3.9	ab
Improved fish farming technologies	26.1	2.6	29.3	3.1	26.3	3.5	
Improved fish farming practices	26.8	2.6	22.8	2.7	21.9	3.3	
Improved beekeeping technologies	37.4	2.7	45.0	3.5	21.2	3.3	ab
Improved beekeeping practices	42.0	2.8	46.0	3.5	14.9	2.9	ab
Market information on crops	56.7	2.8	56.3	3.5	36.5	3.8	ab
Market information on livestock	44.0	2.8	48.9	3.5	34.6	3.8	ab
Market information relating to fish farming	18.8	2.2	23.2	2.7	11.9	2.6	ab
market information relating to beekeeping	29.9	2.5	33.6	3.1	14.1	2.8	ab
Technologies available:							
Improved seeds/planting material	72.6	2.6	47.0	3.5	45.9	3.9	bc
Improved livestock breeds	50.1	2.9	47.5	3.6	20.7	3.2	ab
Improved fish farming technologies	16.7	2.2	13.6	2.4	12.3	2.6	
Improved beekeeping technologies	31.1	2.6	29.4	3.2	2.4	1.1	ab
Inorganic fertilizers	33.1	2.8	23.2	3.0	14.2	2.8	abc
Pesticides/herbicides	52.3	2.9	38.3	3.5	46.2	3.9	c
Farm equipment and tools	50.1	2.9	36.2	3.5	54.3	3.9	ac

Source: NAADS-IFPRI Survey data, 2005.

Technology is used to designate the physical object or hardware used in production, e.g. seed, animal breed, or post harvest equipment like maize huller, while production practice represents the know how for management or utilization of the technology, e.g. plant population and spacing, fertilizer application or disease control.

Statistics are corrected for stratification, weighting and clustering of sample.

Tests at 5% level: ^a means significant difference between non-NAADS and late NAADS sub-counties; ^b means significant difference between non-NAADS and trailblazing NAADS sub-counties; and ^c means significant difference between the two NAADS groups.

These results support the findings of past studies showing a deterioration of extension services in Uganda (MAAIF 2000; Rivera 2001; Alonge 2004). In general, technologies and information are more available for crops than for livestock and least available for beekeeping and fish farming. This is not surprising and reflects the relative importance of the various enterprises in the livelihoods of households (this is discussed in further detail below). However, as Table 9 also shows, availability of improved crop varieties was substantially higher than availability of inorganic fertilizers. This finding is troubling and points to the implication of a disproportionately higher use of improved seeds compared to inorganic fertilizers, which will potentially lead to serious soil nutrient mining problems.

Change in Availability

In general, most farmers perceive that there has been improvement since 2000 in availability of most modern technologies and information (Table 10). The pattern of change is consistent with the observations made above on availability in 2004. Improvement in availability was greater in NAADS than in non-NAADS sub-counties. The trailblazing NAADS sub-counties reported the largest share of households who perceived an increase in physical availability of improved planting materials, while more than 50% of households in both the late NAADS and non-NAADS sub-counties reported no change in availability of crop seeds. However, more than 50% of households in all three strata reported no significant change in physical availability of inorganic fertilizer and farm equipment.⁶

Within each group too, there was more improvement in availability of technologies and information related to crops than those related to livestock. Improvements in availability were least for technologies and information related to beekeeping and fish farming. Again troubling, improvement in availability was much greater for improved seeds than inorganic fertilizers. About 71%, 79% and 85% of households reported no change in availability of inorganic fertilizers since 2000 in trailblazing NAADS, late NAADS and non-NAADS sub-counties, respectively. These results are consistent with farmers' perception of increased access to extension services within the past five years as well as better methods, more useful and timely delivery of those services associated with the NAADS program, reported in Table 8 and Figure 1.

⁶ Except for the non-NAADS sub-counties who reported that 40% of the households perceived no change in physical availability of farm equipment.

Table 10. Change in availability of information/technologies since 2000 (percentage of households)

Direction of change [†]	NAADS Sub-counties										Non-NAADS Sub-counties				
	Trailblazing					Late					1	2	3	4	5
	1	2	3	4	5	1	2	3	4	5					
Information															
Improved crop production technologies	34.21	40.74	21.25	3.13	0.67	27.42	35.97	35.68	0.80	0.14	15.33	50.64	31.67	1.12	1.24
Improved crop production practices	34.58	40.13	20.44	3.98	0.87	27.16	36.73	35.18	0.80	0.14	13.62	45.03	38.85	0.34	2.16
Improved livestock production technologies	21.48	40.41	33.22	3.11	1.78	20.23	40.20	38.00	1.43	0.14	10.18	40.03	48.57	0.85	0.37
Improved livestock production practices	23.25	36.02	34.38	4.30	2.04	19.52	38.97	39.40	1.97	0.14	9.22	37.48	50.69	0.39	2.21
Improved fish farming technologies	6.11	17.35	72.26	3.24	1.04	10.57	16.98	71.61	0.62	0.23	5.07	18.21	75.25	1.09	0.39
Improved fish farming practices	6.11	17.71	72.52	2.55	1.12	8.02	17.80	73.06	0.99	0.14	4.81	16.16	77.94	1.09	0.00
Improved beekeeping technologies	14.14	20.35	61.75	1.47	2.29	12.93	27.56	58.61	0.76	0.14	5.57	15.55	77.70	0.79	0.39
Improved beekeeping practices	16.44	22.45	57.59	1.99	1.52	14.26	29.27	55.58	0.76	0.14	4.65	10.98	83.01	0.79	0.57
Market information on crops	22.26	27.55	46.22	2.52	1.45	14.92	34.04	49.69	1.21	0.14	8.27	25.06	62.47	2.52	1.68
Market information on livestock	13.27	29.34	55.74	1.19	0.46	13.33	32.21	53.98	0.48	0.00	8.22	23.03	64.42	2.06	2.27
Market information relating to fish farming	4.06	15.41	77.88	1.55	1.10	9.63	14.34	76.03	0.00	0.00	4.77	7.15	86.84	0.65	0.59
market information relating to beekeeping	10.84	21.48	65.08	1.54	1.06	11.84	21.32	66.44	0.40	0.00	3.10	11.49	83.12	0.79	1.51
Technologies															
Improved seeds/planting material	29.50	39.23	27.59	2.36	1.31	12.58	27.93	58.81	0.54	0.14	8.20	36.26	53.81	0.78	0.96
Improved livestock breeds	18.84	29.80	48.30	1.68	1.38	8.47	31.78	59.06	0.54	0.14	4.20	15.11	77.41	0.92	2.36
Improved fish farming technologies	3.97	11.69	82.38	1.73	0.24	2.73	11.26	85.44	0.28	0.29	1.72	7.15	89.38	0.50	1.26
Improved beekeeping technologies	12.21	18.46	68.14	1.19	0.00	4.19	19.76	75.75	0.15	0.14	0.00	2.85	96.19	0.00	0.96
Inorganic fertilizers	6.29	21.58	70.92	0.81	0.40	1.97	19.30	78.59	0.00	0.14	4.57	10.38	84.48	0.57	0.00
Pesticides/herbicides	14.75	36.37	45.73	2.53	0.62	4.52	27.88	66.71	0.75	0.14	12.74	31.74	48.98	2.14	4.41
Farm equipment and tools	11.80	33.44	51.25	1.88	1.63	4.86	28.07	66.50	0.00	0.57	8.77	43.24	40.44	2.33	5.22

Source: NAADS-IFPRI Survey data, 2005.

[†] 1=increased a lot; 2=increased a little; 3=no change; 4=decreased a little; 5=decreased a lot.

Statistics are corrected for stratification, weighting and clustering of sample.

Sources of Technologies and Information

Table 11 shows the sources of agricultural services (technologies and information) utilized by farmers. As expected, farmers in NAADS sub-counties relied more on NAADS service providers than other traditional sources, while farmers in non-NAADS sub-counties relied more on NGOs and government service providers. It is interesting to note that in non-NAADS sub-counties, a larger share of farmers reported NGOs than government extension as their source of agricultural services. The results emphasize the large impact of NGOs in advisory service provision and the weakness of service delivery through the old government extension service.

Table 11. Sources of information/technologies (percentage of households)

	NAADS Sub-counties		Non-NAADS Sub-counties
	Trailblazing	Late	
Crop varieties			
NAADS service providers	51.15	69.50	0.00
Government extension workers	8.12	4.95	16.61
NGO, not affiliated with NAADS	8.36	3.15	18.15
NGO, unknown affiliation	15.23	12.39	43.55
Other sources	17.14	10.01	21.69
Crop production and NRM practices			
NAADS service providers	48.10	74.94	0.00
Government extension workers	4.89	2.18	22.40
NGO, not affiliated with NAADS	13.39	7.54	10.60
NGO, unknown affiliation	19.90	10.07	53.28
Other sources	13.72	5.27	13.72
Livestock breeds			
NAADS service providers	32.10	66.24	0.00
Government extension workers	2.77	0.00	13.70
NGO, not affiliated with NAADS	4.11	2.07	9.85
NGO, unknown affiliation	41.41	23.24	55.03
Other sources	19.61	8.45	21.42
Livestock management practices			
NAADS service providers	44.23	63.83	0.00
Government extension workers	11.73	4.29	18.47
NGO, not affiliated with NAADS	4.27	4.76	5.30
NGO, unknown affiliation	23.46	11.18	50.80
Other sources	16.31	15.94	25.43
Post-harvest handling and marketing			
NAADS service providers	40.69	79.58	0.00
Government extension workers	2.66	2.03	7.82
NGO, not affiliated with NAADS	25.61	3.51	3.42
NGO, unknown affiliation	19.63	12.59	85.88
Other sources	11.41	2.29	2.88

Source: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

An interesting observation, however, lies in comparing the trailblazing and late NAADS sub-counties. Reliance on NAADS service providers was higher in late than trailblazing NAADS sub-counties, while use of NGOs and other sources was higher in trailblazing than late NAADS sub-counties. This may suggest a switch-back by some farmers in trailblazing NAADS sub-counties to previous service providers and other traditional providers, likely to fill gaps where they feel the NAADS service providers are lacking.

It is odd that some farmers in NAADS sub-counties reported using government extension agents, as the traditional government extension system is no longer operating in NAADS sub-counties. This is probably due to farmers recognizing former government extension workers who have left the public service and are now providing services through the private or NGO sector under NAADS. Hiring of former government extension service providers to provide services through other providers is reportedly common in Uganda, and has been observed elsewhere in Africa (Anderson and Van Crowder 2000).

4. IMPACTS OF NAADS

Awareness and Adoption of New Enterprises, Technologies and Practices After 2000

In this section, households' awareness and use of information on crop and livestock enterprises and production practices as well as post-harvest handling practices and marketing information are examined. The focus is on what households have done differently after 2000, though what enterprises households were pursuing in 2004 are first considered. Respondents (farm households) were asked what enterprises they were pursuing in 2004 and if they had adopted a new (i.e. after 2000) enterprise or practice or utilized new information. If they had, they were then asked for the source of the information, the year they first adopted or used it, the reason for doing so, number of seasons used, whether or not they were still using it at the time of interview, and the intensity of use at that time. If they had stopped using it, the reason for doing so was also obtained. To enrich the analysis, part of the 2004 NSDS data (UBOS 2005) on use of modern agricultural inputs in 2003/04 is also analyzed.

New Enterprises Adopted After 2000

Crops

As Table 12 shows, crop enterprises pursued by households differed significantly across the three sub groups of sub-counties, either in terms of proportion of households engaged or average amount of cropland allocated. Furthermore, the importance of crops within a particular sub group is different according to whether the ranking is by proportion of households engaged or average amount of cropland allocated. These have different implications for targeting interventions. For example, within non-NAADS sub-counties, cassava, beans, and maize are the top three crop enterprises by proportion of households engaged in a particular crop, while banana, cassava and sorghum are the top three enterprises by average area allocated to a particular crop. Only cassava is common in the top three by both criteria. In the late NAADS sub-counties, however, beans, banana and maize are the top three by either criterion, although the ordering is different. In the trailblazing sub-counties, cassava and maize are in top three crop enterprises by either criterion. However, vanilla, which is top ranked by average acreage allocated is ranked 8th by the proportion of households engaged in it, suggesting its impact in terms of the proportion of households affected may be limited.

Table 12. Crop enterprise engaged in 2004

	NAADS Sub-counties				Non-NAADS Sub-counties		Test
	Trailblazing		Late		Average	Rank	
	Average	Rank	Average	Rank			
Percentage of households planting							
Groundnut	39.2	5	21.8	6	52.8	4	abc
Maize	60.2	3	65.7	3	55.1	3	a
Upland rice	8.6	15	4.5	17	14.7	10	ac
Banana	39.2	5	70.0	2	41.9	7	ac
Vanilla	23.2	8	11.5	13	8.6	15	bc
Cassava	67.3	1	58.3	4	70.2	1	ac
Beans	64.4	2	82.6	1	57.2	2	ac
Sorghum	31.8	7	7.3	15	43.8	6	abc
Millet	22.7	9	17.9	9	39.8	8	ab
Sweet potatoes	54.8	4	39.8	5	52.0	5	ac
Oil crop	06.9	16	11.5	13	5.4	17	ac
Legumes	17.9	11	12.1	12	27.6	9	ab
Vegetables	16.6	13	20.5	7	11.9	12	a
Horticultural crops	6.6	17	6.7	16	2.8	18	
Fruits	10.9	14	16.8	10	9.3	14	a
Trees	1.4	19	1.0	19	1.1	19	
Fiber crops	4.1	18	4.5	17	11.5	13	ab
Beverage crops	17.4	12	19.9	8	13.1	11	
Other root crops	19.4	10	13.1	11	6.2	16	abc
Average area planted (acres)							
Groundnuts	0.229	6	0.114	13	0.302	6	ac
Maize	0.369	3	0.620	3	0.315	4	ac
Upland rice	0.061	15	0.053	18	0.098	11	
Banana	0.207	8	1.750	1	0.421	1	ac
Vanilla	0.469	1	0.132	11	0.018	17	
Cassava	0.431	2	0.314	6	0.419	2	c
Beans	0.248	4	0.858	2	0.310	5	b
Sorghum	0.240	5	0.043	19	0.336	3	
Millet	0.191	9	0.155	9	0.233	7	
Sweet potatoes	0.218	7	0.416	5	0.228	8	
Oil crops	0.064	13	0.100	14	0.019	16	
Legumes	0.092	10	0.129	12	0.183	9	
Vegetables	0.063	14	0.153	10	0.057	13	
Horticultural crops	0.025	18	0.088	15	0.004	19	
Fruits	0.046	17	0.559	4	0.042	14	
Trees	0.003	19	0.079	16	0.008	18	
Fiber crops	0.060	16	0.063	17	0.131	10	
Beverage crops	0.067	12	0.272	8	0.068	12	
Other root crops	0.091	11	0.301	7	0.026	15	

Source: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

Tests at 5% level: ^a means significant difference between non-NAADS and late NAADS sub-counties; ^b means significant difference between non-NAADS and trailblazing NAADS sub-counties; and ^c means significant difference between the two NAADS groups.

More than 50% of households in NAADS sub-counties had adopted at least one new crop enterprise after 2000, compared to only 32% in of households in non-NAADS sub-counties (Table 13). The average number of new crop enterprises adopted was also significantly higher in the NAADS sub-counties (an average of one per household) than in non-NAADS sub-counties (about one per every two households). The enterprises adopted are still being cultivated in almost all cases, without any significant differences between households in NAADS and non-NAADS sub-counties. However, total area cultivated to the new crop enterprises was significantly higher among households in the late NAADS sub-counties (average of two acres) than in the trailblazing NAADS sub-counties (average of one acre), followed by those in the non-NAADS sub-counties (average of 0.7 acres). This could be due to the influence of large farms in Mbarara, which is in the late NAADS group.

Table 13. New crop enterprises adopted after 2000

	NAADS Sub-counties				Non-NAADS Sub-counties		Test
	Trailblazing		Late		Average	Std. Err	
	Average	Std. Err	Average	Std. Err			
Adopted any crop enterprise (yes=1, no=0)	0.557	0.029	0.517	0.035	0.320	0.037	ab
Average number of enterprises adopted	1.041	0.071	1.058	0.089	0.536	0.079	ab
Average number of seasons used	2.512	0.152	2.303	0.132	2.227	0.177	
Still used (yes=1, no=0)	0.975	0.017	0.988	0.012	0.975	0.017	
Area planted (acres)	1.017	0.183	1.982	0.246	0.738	0.117	ac
Adoption of selected crop (yes=1, no=0)							
Groundnut	0.104	0.018	0.058	0.015	0.037	0.016	b
Maize	0.094	0.019	0.113	0.020	0.035	0.013	ab
Upland rice	0.067	0.015	0.043	0.012	0.026	0.013	b
Banana	0.024	0.008	0.078	0.020	0.010	0.006	ac
Vanilla	0.189	0.024	0.112	0.019	0.067	0.020	bc
Cassava	0.068	0.015	0.053	0.013	0.070	0.020	
Beans	0.033	0.010	0.062	0.017	0.017	0.009	a
Sorghum	0.022	0.006	0.023	0.009	0.024	0.011	
Millet	0.007	0.004	0.006	0.004	0.013	0.007	
Sweet potatoes	0.004	0.002	0.024	0.011	0.007	0.005	

Source: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

Tests at 5% level: ^a means significant difference between non-NAADS and late NAADS sub-counties; ^b means significant difference between non-NAADS and trailblazing NAADS sub-counties; and ^c means significant difference between the two NAADS groups.

Adoption of new enterprises of groundnuts, maize, upland rice, banana, beans and vanilla was significantly more common in NAADS sub-counties than in non-NAADS sub-counties. Households in the trailblazing NAADS sub-counties favored (in terms of proportion adopting) vanilla, followed by groundnuts and then maize, while those in the late NAADS sub-counties equally favored vanilla and maize, followed by banana and then beans. In the non-NAADS sub-counties, vanilla and cassava were the favorite crop enterprises.

Income generation/diversification and increased food availability were the two main reasons cited by households for adopting a new enterprise. The proportion of households that cited these respective reasons were 42% and 16% in trailblazing NAADS sub-counties, 48% and 12% in late NAADS sub-counties, and 41% and 26% in non-NAADS sub-counties. In the NAADS sub-counties, a substantial proportion (about 14%) also said it was because the enterprise was either high yielding or a marketable item. These results suggest a more market-oriented production in NAADS sub-counties and more subsistence production in non-NAADS sub-counties. However, it is not known whether this was a result of the NAADS program or that the NAADS sub-counties were already more market oriented before the NAADS program came into effect.

Livestock

Adoption of new livestock enterprises was lower than adoption of new crops, in terms of the proportion of households adopting. Between 23% and 36% adopted a new livestock enterprise after 2000, with a greater share of the households adopting in the trailblazing NAADS sub-counties than in the late NAADS sub-counties (Table 14). Adopted enterprises, averaging about one tropical livestock unit (TLU) for all adopting households, were still being used at the time of the survey in almost all cases. Beef cattle, pigs, goats and poultry accounted for significant differences between NAADS and non-NAADS sub-counties. Households in the trailblazing NAADS sub-counties favored goats followed by pigs and then poultry, while those in the late NAADS as well as in non-NAADS sub-counties favored goats. None of the households in the non-NAADS sub-counties adopted beef cattle as a new enterprise.

Table 14. New livestock and beekeeping enterprises adopted after 2000

	NAADS Sub-counties				Non-NAADS		Test
	Trailblazing		Late		Sub-counties		
	Average	Std. Err	Average	Std. Err	Average	Std. Err	
Adopted any livestock enterprise (yes=1, no=0)	0.364	0.028	0.230	0.030	0.290	0.036	^c
Average number of enterprises adopted	0.502	0.045	0.295	0.038	0.406	0.057	^c
Average number of years since adoption	1.802	0.113	1.775	0.150	1.486	0.165	
Average number of seasons used	2.580	0.170	2.813	0.253	2.245	0.213	
Still used (yes=1, no=0)	1.000	0.000	1.000	0.000	0.990	0.010	
Number adopted (tropical livestock units)	1.004	0.213	0.871	0.158	0.939	0.242	
Adoption of livestock enterprise (yes=1, no=0)							
Dairy cattle	0.060	0.014	0.058	0.014	0.098	0.023	
Beef cattle	0.036	0.011	0.019	0.008	0.000	0.000	^{ab}
Pigs	0.107	0.019	0.063	0.018	0.055	0.019	^b
Sheep	0.036	0.012	0.011	0.007	0.032	0.013	
Goats	0.177	0.022	0.107	0.022	0.140	0.028	^c
Poultry	0.086	0.016	0.038	0.011	0.080	0.022	^c
Adopted any beekeeping (yes=1, no=0)	0.022	0.007	0.068	0.018	0.035	0.014	^c
Average number of seasons used	1.378	0.171	2.464	0.335	3.067	0.891	^c
Still used (yes=1, no=0)	1.000	0.000	1.000	0.000	1.000	0.000	
Number of beehives adopted	3.497	0.716	6.829	2.881	4.300	1.553	

Source: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

Tests at 5% level: ^a means significant difference between non-NAADS and late NAADS sub-counties; ^b means significant difference between non-NAADS and trailblazing NAADS sub-counties; and ^c means significant difference between the two NAADS groups.

Here too, income generation was cited as the main reason for adopting a new livestock enterprise, with about 53%, 66% and 51% of the households citing this reason in trailblazing NAADS, late NAADS and non-NAADS sub-counties, respectively. About 17% and 13% of the households also cited new livestock enterprises as a form of investment in trailblazing NAADS and non-NAADS sub-counties, respectively.

Beekeeping

Very few households adopted beekeeping as a new enterprise: less than 7% of households across all categories. The proportion adopting and number of seasons managed were significantly higher in the late NAADS sub-counties. Almost all the adopting households in late NAADS sub-counties cited income generation as the reason for adopting. In the other areas the reasons for adopting were not as clear, but income generation, home consumption (honey considered to be highly nutritious), and as a form of investment were some of the reasons cited.

Fish-farming

Only three of the surveyed households adopted a fish-farming enterprise after 2000. One of them was in a non-NAADS sub county; the other two were in a trailblazing NAADS sub county. Two of the adopting households (one each in the trailblazing and non-NAADS sub county) cited income generation as the

reason for adopting, while the other household in the trailblazing NAADS sub county said it was because he received advice on how to do it.

New Technologies/Practices Adopted and Information Used After 2000

Improved seeds/planting material

A significantly greater proportion of households in NAADS trailblazing sub-counties and non-NAADS sub-counties reported becoming aware of improved seeds after 2000 than their counterparts in late NAADS sub-counties (Table 15).⁷ However, the proportion of those who recently became aware and actually adopted improved seeds was significantly greater in NAADS (about 85%) than in non-NAADS (58%) sub-counties. Crops for which improved seeds or planting material were commonly adopted included cotton, maize, rice, groundnuts, beans, banana, and cassava. The average number of seasons of use since 2000 of any of the adopted improved seed as well as the intensity of adoption (i.e. total acreage planted to all the improved seeds) for households adopting was not significantly different between NAADS and non-NAADS sub-counties.

Reduction in farm size and improvement in productivity were the main reasons cited by households for adopting improved seeds, suggesting intensification of crop production in response to increase in pressure on farmland. For those not adopting or abandoning improved seeds after some time (especially in non-NAADS sub-counties), lack of capital, reduced supply of improved seeds, lack of technical knowledge, and reduced security were reasons cited.

Crop management practices

In general, the proportion of households that recently became aware of various crop production practices—including methods of disease/pest control, row planting, plant spacing, and weeding techniques—was low, ranging from 10% to 40% of households (Table 15). Surprisingly, a significantly greater proportion of households in non-NAADS sub-counties became aware of various crop production practices than their counterparts in NAADS sub-counties. However, and as is the case with use of improved seeds, the proportion of those becoming aware that actually adopted the practices was significantly greater in NAADS than in non-NAADS sub-counties. The number of seasons of use of practices since 2000 tended to be significantly higher among households in non-NAADS sub-counties, especially regarding practice of row planting and weeding. The intensity of adoption (i.e. acreage under practice) for households

⁷ In Tables 15–18, whether farmers became aware of a particular technology or practice after 2000 is reported. A “no” response could mean either that the farmer was not aware of the technology or practice at the time of the survey, or was already aware in 2000. The reason for this is that the focus is on changes in technology adoption since 2000, hence focus on changes in awareness since 2000. The figures in these tables on the proportion of households that used the technology or practice are only for those households who have become aware of the technology or practice since 2000.

adopting was significantly higher in late NAADS sub-counties (1.6–3 acres) than in trailblazing NAADS sub-counties (1.2–1.5 acres). As mentioned earlier, this could be due to larger farms in some of the late NAADS sub-counties, especially in Mbarara district. With the exception of weeding, the intensity of adoption was not significantly different between non-NAADS and trailblazing NAADS sub-counties.

Across the board, reduction in farm size was cited as the main reason for adopting improved crop production practices, with more than 70% of the households citing it across the three groups. Again, this suggests intensification of production in response to the increasing pressure on farmland due primarily to increasing rural population densities. Regarding row planting and using recommended plant spacing, households adopting these practices (especially in NAADS sub-counties) also felt it was low cost way of controlling pests. A few households had also abandoned disease/pest control measures due to lack of capital.

Soil fertility management

The proportion of households recently becoming aware of various soil fertility management practices, including application of chemical fertilizers, animal manure, composting, and organic residue management was low, ranging from 7% to 32% of households (Table 15). As for crop management practices, a significantly greater proportion of households in non-NAADS sub-counties became aware of those crop management practices than their counterparts in the late NAADS sub-counties. However, also as for improved seeds and crop management practices, the proportion of those becoming aware that actually adopted the practices were significantly greater in NAADS sub-counties (more than 70%) than in non-NAADS (14–50%) sub-counties. The number of seasons of use of the practices since 2000 also tended to be significantly higher among households in non-NAADS sub-counties, especially regarding use of animal manure, composting and other organic residues. Intensity of adoption was not significantly different among households in the three sub groups. Given the low level of awareness and adoption since 2000 of soil fertility management practices in NAADS sub-counties, these results support the findings by Nkonya, et al. (2005a) that promotion of soil fertility management practices by NAADS is not yet having significant impact. As for other technologies and practices, reduction in farm size was a major reason cited for adopting improved soil fertility management practices. However, households in NAADS sub-counties also cited obtaining higher yields and, consequently, higher incomes as another major reason for adopting improved soil fertility management practices. Lack of capital and lack of labor were reasons for abandoning use of inorganic fertilizers and composting, respectively.

Table 15. Improved crop and soil fertility management practices adopted after 2000

	NAADS Sub-counties				Non-NAADS Sub-counties		Test
	Trailblazing		Late		Average	Std. Err	
	Average	Std. Err	Average	Std. Err			
Improved seeds ¹							
Aware (yes=1, no=0)	0.556	0.029	0.352	0.031	0.525	0.038	ac
Use practice (yes=1, no=0)	0.856	0.025	0.848	0.036	0.578	0.056	ab
Number of seasons used	2.837	0.160	2.722	0.189	2.582	0.272	
Area under improved seeds (acres)	0.639	0.109	0.568	0.081	0.416	0.087	
Crop management ¹							
Disease and pest control							
Aware (yes=1, no=0)	0.149	0.020	0.098	0.022	0.269	0.035	ab
Use practice (yes=1, no=0)	0.711	0.063	0.889	0.050	0.457	0.077	abc
Number of seasons used	3.562	0.432	3.578	0.513	4.530	0.659	
Area under management (acres)	1.379	0.325	3.008	0.678	2.175	0.439	c
Row planting							
Aware (yes=1, no=0)	0.325	0.026	0.234	0.028	0.387	0.037	ac
Use practice (yes=1, no=0)	0.919	0.023	0.829	0.053	0.749	0.053	b
Number of seasons used	2.807	0.186	3.371	0.307	3.624	0.378	b
Area under row planting (acres)	1.244	0.137	2.100	0.386	1.331	0.179	c
Spacing							
Aware (yes=1, no=0)	0.388	0.028	0.303	0.030	0.346	0.037	c
Use practice (yes=1, no=0)	0.914	0.025	0.875	0.034	0.829	0.049	
Number of seasons used	3.521	0.269	3.489	0.284	3.745	0.403	
Area under spacing (acres)	1.244	0.126	1.614	0.281	1.426	0.221	
Weeding							
Aware (yes=1, no=0)	0.320	0.027	0.168	0.026	0.293	0.035	ac
Use practice (yes=1, no=0)	0.948	0.022	0.863	0.044	0.838	0.050	b
Number of seasons used	3.652	0.259	4.104	0.588	4.869	0.344	b
Area weeded (acres)	1.497	0.157	2.605	0.795	2.237	0.295	b
Soil fertility management ¹							
Chemical fertilizers							
Aware (yes=1, no=0)	0.155	0.021	0.070	0.015	0.168	0.030	ac
Use practice (yes=1, no=0)	0.710	0.064	0.305	0.103	0.144	0.071	bc
Number of seasons used	2.656	0.307	2.495	0.708	3.002	1.378	
Area under management (acres)	4.541	2.345	0.739	0.116	0.980	0.418	
Animal manure							
Aware (yes=1, no=0)	0.326	0.028	0.142	0.023	0.279	0.036	ac
Use practice (yes=1, no=0)	0.890	0.029	0.791	0.067	0.493	0.076	ab
Number of seasons used	2.932	0.206	2.864	0.422	4.260	0.533	ab
Area applied (acres)	1.804	0.882	4.454	2.527	1.452	0.345	
Compost and organic residue management							
Aware (yes=1, no=0)	0.129	0.019	0.127	0.024	0.201	0.031	b
Use practice (yes=1, no=0)	0.798	0.060	0.892	0.056	0.366	0.082	ab
Number of seasons used	3.784	0.361	2.868	0.258	5.181	0.700	ac
Area under management (acres)	1.240	0.338	1.545	0.391	1.345	0.230	
Use of practices in 2003/04 ²							
Improved seeds	0.250	0.015	0.193	0.016	0.239	0.013	ac
Hybrid seeds	0.178	0.014	0.092	0.012	0.153	0.011	ac
Herbicides	0.124	0.012	0.071	0.011	0.046	0.007	abc
Fungicides	0.138	0.012	0.050	0.009	0.088	0.009	abc
Pesticides	0.341	0.017	0.121	0.014	0.160	0.011	abc

Sources: 1) NAADS-IFPRI Survey data, 2005, 2) National Service Delivery Survey (NSDS) data, 2004. Statistics are corrected for stratification, weighting and clustering of sample.

Some of these and the earlier results appear to contradict those obtained from using data from the 2004 NSDS (also see Table 15), which show that the proportion of households in NAADS districts using improved/hybrid seeds and pest control technologies is lower in late NAADS districts than in non-NAADS districts. However, the figures from the 2004 NSDS report the proportion of all households using specific technologies, whereas the figures discussed earlier report the proportion of households that recently became aware of the technologies and who have adopted them. Thus, there is not necessarily any contradiction between these results.

Soil and water management

The proportion of households who recently became aware of the soil and water management practices considered--including trenches, terraces, mulching and grass strips--was also low, ranging from 5% to 27% of households (Table 16). Unlike the crop and soil fertility management practices, there is no clear pattern of differences in awareness among households in the three sub groups. For example, there was no statistically significant difference among sub groups in their recent awareness of use of trenches and terraces. Regarding use of mulching, recent awareness was significantly higher among households in trailblazing than in late NAADS sub-counties, while recent awareness of use of grass strips was significantly higher among households in late than in trailblazing NAADS sub-counties. However, consistent with the findings for other practices, the proportion of households recently becoming aware that actually adopted any of the practices was significantly greater in NAADS (more than 70%) than in non-NAADS (14–50%) sub-counties. With exception of use of trenches and terraces, intensity of adoption was not significantly different among households in the three sub groups. Intensity of adoption of trenches and terraces was much higher in the trailblazing NAADS sub-counties than in the other groups.

Farmers reported adopting the above soil and water management practices primarily because they are enforced through community bylaws. These results support the findings by Nkonya, et al. (2005b) that community bylaws have important impacts on natural resource management in Uganda. Regarding use of mulching, reduction in farm size was also cited as a reason for adoption by households in all three groups.

Table 16. Soil and water management and agroforestry practices adopted after 2000

	NAADS Sub-counties				Non-NAADS Sub-counties		Test
	Trailblazing		Late		Average	Std. Err	
	Average	Std. Err	Average	Std. Err			
Soil and water management							
Trenches and terraces							
Aware (yes=1, no=0)	0.265	0.026	0.214	0.030	0.200	0.032	ab
Use practice (yes=1, no=0)	0.890	0.035	0.940	0.027	0.522	0.093	abc
Number of seasons used	3.345	0.279	2.311	0.236	4.870	0.620	bc
Area under management (acres)	13.573	5.880	1.708	0.328	1.561	0.546	
Mulching							
Aware (yes=1, no=0)	0.238	0.025	0.153	0.026	0.230	0.034	c
Use practice (yes=1, no=0)	0.881	0.037	0.920	0.042	0.631	0.083	ab
Number of seasons used	4.319	0.377	2.736	0.274	4.417	0.503	ac
Area under mulching (acres)	1.253	0.185	1.507	0.284	1.197	0.289	
Grass strips							
Aware (yes=1, no=0)	0.048	0.011	0.091	0.017	0.115	0.026	bc
Use practice (yes=1, no=0)	0.948	0.051	0.819	0.079	0.670	0.110	b
Number of seasons used	5.211	0.783	4.612	0.707	4.958	0.623	
Area under grass strips (acres)	1.842	0.457	2.573	0.840	3.108	0.852	
Agro-forestry							
Planting fruit trees							
Aware (yes=1, no=0)	0.130	0.020	0.110	0.023	0.155	0.029	
Use practice (yes=1, no=0)	0.802	0.054	0.867	0.057	0.374	0.101	ab
Number of seasons used	4.121	0.534	2.031	0.315	3.861	0.590	ac
Number of trees planted	0.659	0.165	0.502	0.191	0.626	0.353	
Planting wood trees							
Aware (yes=1, no=0)	0.101	0.019	0.076	0.020	0.173	0.031	ab
Use practice (yes=1, no=0)	0.800	0.075	0.841	0.127	0.168	0.075	ab
Number of seasons used	2.297	0.395	1.938	0.256	1.777	0.666	
Number of trees planted	0.551	0.143	0.904	0.089	1.271	0.683	c

Source: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

Tests at 5% level: ^a means significant difference between non-NAADS and late NAADS sub-counties; ^b means significant difference between non-NAADS and trailblazing NAADS sub-counties; and ^c means significant difference between the two NAADS groups.

Agro forestry

The proportion of households recently becoming aware of various agro forestry practices (including planting of fruit or wood trees) was low, ranging from 2% to 17% of households (Table 16). A significantly greater proportion of households in non-NAADS sub-counties recently became aware of planting wood trees than their counterparts in NAADS sub-counties, although the proportion of those aware that actually planted trees was significantly greater in NAADS (80–95%) than in non-NAADS (52–67%) sub-counties. Intensity of adoption of planting fruit trees was not significantly different among households in the three sub groups, while the area planted to wood trees was significantly larger in the late than in the trailblazing NAADS sub-counties (again, possibly because of larger farms in late NAADS sub-counties).

Improving diet and health were the main reasons given by households for planting fruit trees, especially by households in NAADS sub-counties. Some households in trailblazing NAADS sub-counties also thought it was a low cost method of achieving better diet and health and other benefits. The reason for planting wood trees was not quite as unanimous. Income generation and community bye-laws were cited as some of the reasons, especially in NAADS sub-counties.

Animal husbandry practices

Use of improved livestock breeds and deworming practices are considered here. The proportion of households recently becoming aware of these was low, ranging from 2% to 20% of households, with significantly higher recent awareness in non-NAADS than in NAADS sub-counties (Table 17). However, the proportion of those recently becoming aware that actually adopted these practices was significantly greater in NAADS (40–94%) than in non-NAADS (11–46%) sub-counties. The number of seasons of adoption since 2000 was not significantly different among households in the three sub groups. Intensity of adoption (i.e. number of improved livestock adopted) was significantly higher in the late NAADS sub-counties than in the non-NAADS sub-counties.

Table 17. Animal husbandry practices adopted after 2000

	NAADS Sub-counties				Non-NAADS Sub-counties		Test
	Trailblazing		Late		Average	Std. Err	
	Average	Std. Err	Average	Std. Err			
Improved livestock breeds ¹							
Aware (yes=1, no=0)	0.084	0.016	0.016	0.006	0.169	0.030	abc
Use practice (yes=1, no=0)	0.637	0.090	0.860	0.131	0.113	0.066	ab
Number of seasons used	3.105	0.531	3.730	1.931	3.182	0.841	
Number of improved breeds	5.974	2.528	11.345	2.436	2.318	0.437	a
Deworming ¹							
Aware (yes=1, no=0)	0.163	0.022	0.091	0.018	0.203	0.032	ac
Use practice (yes=1, no=0)	0.803	0.056	0.937	0.030	0.465	0.083	abc
Number of seasons used	2.675	0.440	2.353	1.292	3.370	0.762	
Number of animals dewormed	8.788	2.326	6.356	2.666	5.280	1.950	
Technologies in 2003/04 (proportion of households) ²							
Animal feeds	0.084	0.011	0.080	0.016	0.086	0.014	
Veterinary drugs	0.403	0.020	0.504	0.033	0.626	0.024	abc
Artificial insemination	0.015	0.005	0.064	0.015	0.030	0.009	c

Sources: 1 NAADS-IFPRI Survey data, 2005; 2 National Service Delivery Survey (NSDS) data, 2004.

Statistics are corrected for stratification, weighting and clustering of sample. Tests at 5% level: ^a means significant difference between non-NAADS and late NAADS sub-counties; ^b means significant difference between non-NAADS and trailblazing NAADS sub-counties; and ^c means significant difference between the two NAADS groups.

Similar to other technologies and practices, reduction in farm size and improvement in productivity were the main reasons cited by households in all three groups for adopting improved livestock breeds. For those not adopting or abandoning improved breeds (especially in non-NAADS sub-counties), lack of capital and lack of technical knowledge in maintaining the animals were the reasons

cited. Regarding deworming, adopting households revealed that it helped the animals mature at a faster rate, which improved productivity gains. Here too, lack of capital and lack of technical knowledge in using the practice were reasons cited by non-adopting households, especially those in non-NAADS sub-counties.

Analysis of data from the 2004 NSDS also sheds light on the use of some improved livestock technologies, including animal feed, veterinary drugs and artificial insemination (also see Table 17). Those results show that use of veterinary drugs was quite high, with 62%, 50% and 40% of households raising livestock in non-NAADS, late NAADS and trailblazing NAADS districts, respectively, using them. The differences are statistically significant. However, use of animal feeds was low and only about 8-9% of households raising livestock used them, without significant differences between NAADS and non-NAADS districts. Use of artificial insemination was even lower; 2%, 3% and 6% in trailblazing NAADS, non-NAADS and late NAADS districts, respectively.

Post-harvest handling practices and marketing information

The story is quite different here, with households in trailblazing NAADS sub-counties ahead of others (Table 18). The proportion of households recently becoming aware of drying technologies, storage facilities, grading practices, information on prices and markets, and collective marketing practices was significantly higher in trailblazing NAADS sub-counties, ranging from 8% to 22% of households. In late NAADS and non-NAADS sub-counties, the respective ranges were 0–12% and 0–15%. The proportion of those aware that actually adopted post-harvest handling practices was also significantly greater in trailblazing NAADS than in late NAADS or non-NAADS sub-counties. As Table 19 shows, the share of marketed output was slightly higher among households in NAADS sub-counties (28–33%) compared to their counterparts in non-NAADS sub-counties (24%). Table 19 also shows that the percentage of households reporting an increase since 2000 in the share of marketed output was about two times greater in NAADS (about 25%) than in non-NAADS sub-counties (14%). These results suggest the market orientation of the NAADS program is having the desired impact.

Regarding post-harvest handling practices, the main reason cited for adoption was prevention of disease/pests, but respondents also mentioned that they were low cost techniques that did not require a large space, especially with respect to drying and storage. Regarding use of marketing information or collective marketing, on the other hand, the reasons were not as direct since improving diet and health were commonly cited. It seems that households were looking beyond the direct impacts to the better farm gate prices and, consequently, increased incomes associated with improvement in marketing.

Table 18. Post-harvest handling and marketing practices/information after 2000

	NAADS Sub-counties				Non-NAADS Sub-counties		Test
	Trailblazing		Late		Average	Std. Err	
	Average	Std. Err	Average	Std. Err			
Post-harvest handling							
Drying							
Aware (yes=1, no=0)	0.217	0.024	0.122	0.023	0.031	0.014	abc
Use practice (yes=1, no=0)	0.994	0.006	0.746	0.097	0.138	0.133	abc
Storage facilities							
Aware (yes=1, no=0)	0.173	0.023	0.086	0.018	0.150	0.029	c
Use practice (yes=1, no=0)	0.973	0.016	0.643	0.104	0.558	0.101	bc
Grading							
Aware (yes=1, no=0)	0.081	0.017	0.005	0.003	0.005	0.005	bc
Use practice (yes=1, no=0)	0.969	0.031	1.000	0.000	1.000	0.000	
Marketing							
Information on market prices							
Aware (yes=1, no=0)	0.125	0.019	0.025	0.010	0.045	0.017	bc
Use information (yes=1, no=0)	0.944	0.029	0.918	0.082	0.284	0.178	ab
Information on where to sell							
Aware (yes=1, no=0)	0.084	0.017	0.018	0.008	0.045	0.016	c
Use information (yes=1, no=0)	0.970	0.022	0.426	0.229	0.554	0.172	bc
Collective marketing							
Aware (yes=1, no=0)	0.083	0.018	0.004	0.003	0.000	0.000	bc
Use practice (yes=1, no=0)	0.984	0.017	0.500	0.356	0.000	0.000	

Source: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

Tests at 5% level: ^a means significant difference between non-NAADS and late NAADS sub-counties; ^b means significant difference between non-NAADS and trailblazing NAADS sub-counties; and ^c means significant difference between the two NAADS groups.

Table 19. Share of crop harvest marketed in 2004 (%) and change since 2000 (percent of households reporting)

	NAADS sub-counties		Non-NAADS sub-counties	Test
	Early (n=363)	Late (n=306)	(n=195)	
% marketed in 2004	28.05	32.46	23.79	ac
Change in % marketed since 2000				
Increased significantly	7.59	7.20	2.69	n.a.
Increased modestly	16.45	17.88	11.87	n.a.
No change	48.21	47.78	49.36	n.a.
Decreased modestly	14.09	14.09	16.21	n.a.
Decreased significantly	13.66	13.05	19.86	n.a.

Source: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

Tests at 5% level: ^a means significant difference between non-NAADS and late NAADS sub-counties; ^b means significant difference between non-NAADS and trailblazing NAADS sub-counties; and ^c means significant difference between the two NAADS groups.

In general, the results in this section suggest that NAADS' impacts are not so much via increasing awareness of technologies, but by increasing adoption among households who are aware of the technologies. Although increasing awareness may be necessary in some cases, it is clearly not sufficient to achieve adoption, and NAADS appears to address some of the sufficiency conditions, such as technical knowledge of how to use the technologies.

Changes in Intensity of Adoption of Modern Technologies and Practices

In this section, changes between 2000 and 2004 in households' use of modern crop and livestock production technologies and practices are examined. In the relevant sections of the survey and following up from the previous section, households were asked to first provide information on all the various crop and livestock enterprises they were engaged in during 2004. Then they were asked if they had any improved varieties or breeds and the amount if so. The procedure was repeated to obtain similar information for 2000. The analysis below focuses on changes between 2000 and 2004, which are less likely than the level of adoption in any particular year to be influenced by fixed or slowly changing factors that may differ across the different groups and be confounded with the impacts of NAADS.

Change in use of improved crop technologies and practices

Looking at the change between 2000 and 2004 shows that the area under improved varieties of crops has more than doubled in trailblazing NAADS sub-counties and quadrupled in late NAADS sub-counties. In non-NAADS sub-counties, the increase was only about 60% (Table 20). While these results are encouraging, some of the earlier results suggest a disproportionate higher use and increase in use of improved seeds compared to fertilizers (especially inorganic fertilizers), which will potentially lead to serious soil nutrient mining problems.

Table 20 also shows changes between 2000 and 2004 in area under improved varieties of particular crops. Regarding groundnuts, the area under improved varieties was significantly different across the three groups, representing 13%, 9% and 7% of the total area under groundnuts in trailblazing NAADS, late NAADS and non-NAADS sub-counties in 2004, respectively. Change in area under improved groundnuts seed was more than 10 times the area in 2000. The absolute increase was significantly greater in trailblazing NAADS than in non-NAADS sub-counties. Note that none of the households in the late NAADS sub-counties used any improved groundnuts seed in 2000.

The area under improved maize varieties was not significantly different across the three groups in 2004. However, the change between 2000 and 2004 was about 250–350% of the area in 2000 in NAADS sub-counties, compared to only 87% in non-NAADS sub-counties.

Table 20. Acreage and change in acreage under improved varieties for selected crops

	NAADS Sub-counties				Non-NAADS Sub-counties		Test
	Trailblazing		Late		Average	Std. Err	
	Average	Std. Err	Average	Std. Err			
All crops							
Acreage in 2000	0.203	0.043	0.094	0.021	0.219	0.070	c
Acreage in 2004	0.670	0.081	0.507	0.070	0.358	0.072	b
Change from 2000 to 2004 (acres)	0.466	0.073	0.413	0.064	0.139	0.047	ab
Groundnuts							
Acreage in 2000	0.009	0.004	0.000	0.000	0.003	0.002	c
Acreage in 2004	0.098	0.019	0.007	0.004	0.043	0.013	abc
Change from 2000 to 2004 (acres)	0.089	0.018	0.007	0.004	0.040	0.013	abc
Maize							
Acreage in 2000	0.037	0.010	0.051	0.016	0.060	0.038	
Acreage in 2004	0.164	0.028	0.184	0.032	0.112	0.039	
Change from 2000 to 2004 (acres)	0.128	0.027	0.133	0.028	0.052	0.024	ab
Upland rice							
Acreage in 2000	0.000	0.000	0.000	0.000	0.000	0.000	
Acreage in 2004	0.031	0.012	0.025	0.011	0.006	0.005	c
Change from 2000 to 2004 (acres)	0.031	0.012	0.025	0.011	0.006	0.005	
Banana							
Acreage in 2000	0.001	0.001	0.021	0.009	0.002	0.002	ac
Acreage in 2004	0.019	0.006	0.063	0.018	0.005	0.004	ac
Change from 2000 to 2004 (acres)	0.018	0.006	0.042	0.015	0.004	0.003	ab
Vanilla							
Acreage in 2000	0.001	0.001	0.000	0.000	0.000	0.000	
Acreage in 2004	0.001	0.001	0.000	0.000	0.000	0.000	
Change from 2000 to 2004 (acres)	0.000	0.000	0.000	0.000	0.000	0.000	
Cassava							
Acreage in 2000	0.058	0.018	0.003	0.002	0.125	0.042	ac
Acreage in 2004	0.102	0.018	0.023	0.009	0.115	0.031	ac
Change from 2000 to 2004 (acres)	0.044	0.016	0.020	0.009	-0.010	0.030	
Beans							
Acreage in 2000	0.019	0.010	0.000	0.000	0.009	0.005	ac
Acreage in 2004	0.039	0.012	0.037	0.013	0.015	0.008	c
Change from 2000 to 2004 (acres)	0.019	0.006	0.037	0.013	0.006	0.005	a
Sorghum							
Acreage in 2000	0.000	0.000	0.000	0.000	0.013	0.010	
Acreage in 2004	0.047	0.019	0.015	0.007	0.047	0.024	
Change from 2000 to 2004 (acres)	0.047	0.019	0.015	0.007	0.034	0.025	
Millet							
Acreage in 2000	0.002	0.002	0.000	0.000	0.000	0.000	
Acreage in 2004	0.008	0.005	0.000	0.000	0.000	0.000	
Change from 2000 to 2004 (acres)	0.006	0.005	0.000	0.000	0.000	0.000	
Sweet potatoes							
Acreage in 2000	0.000	0.000	0.002	0.002	0.002	0.002	
Acreage in 2004	0.001	0.001	0.005	0.003	0.002	0.002	
Change from 2000 to 2004 (acres)	0.001	0.001	0.002	0.002	0.000	0.000	

Source: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

Tests at 5% level: ^a means significant difference between non-NAADS and late NAADS sub-counties; ^b means significant difference between non-NAADS and trailblazing NAADS sub-counties; and ^c means significant difference between the two NAADS groups.

The area under improved banana varieties in 2004 was significantly higher in NAADS than non-NAADS sub-counties, representing about 5%, 4% and 1% of the total area under banana in late NAADS, trailblazing NAADS, and non-NAADS sub-counties, respectively. The change between 2000 and 2004 in area under improved banana varieties was about 18 times the area in 2000 in trailblazing NAADS sub-counties, compared to only 2 times in late NAADS and non-NAADS sub-counties.

Regarding cassava, the area under improved varieties was significantly lower in the late NAADS sub-counties in 2004 than in the other sub-counties. Compared to the situation in 2000, however, the 2004 figures represent about 650% and 75% of the area in 2000 in late and trailblazing NAADS sub-counties, respectively, while the area under improved cassava varieties in non-NAADS sub-counties declined.

Regarding beans, the change between 2000 and 2004 in area under improved varieties was about 100% of the area in 2000 in trailblazing NAADS sub-counties, compared to 67% in non-NAADS sub-counties. Similar to the case of groundnuts, none of the households in the late NAADS sub-counties used any improved beans seed in 2000.

Regarding cultivation of other crops, including upland rice, vanilla, sorghum, millet and sweet potatoes, there were no significant differences across the three groups in area under improved varieties in both 2000 and 2004, or in the changes between the two years (see Table 20 for details). For several of these crops, no improved seeds or varieties were cultivated in 2000.

Change in improved livestock technologies

As Table 21 shows, the number of improved livestock breeds owned in 2004 represented less than 5% of the total stock. Only in the case of cattle and poultry were there any significant differences in the share of improved breeds in the total stock owned, the share of improved breeds being higher in NAADS than in non-NAADS sub-counties. Compared to 2000, however, ownership of improved breeds of several types of livestock has increased in NAADS sub-counties, while in non-NAADS sub-counties use of improved breeds declined for some types of animals (e.g., the number of improved goats and poultry owned declined by 58% and 4%, respectively), though the differences are not statistically significant.

Use of improved beehives was restricted to NAADS sub-counties, with households in the late NAADS sub-counties being ahead of others.

Table 21. Ownership of improved livestock breeds and beehives

	NAADS Sub-counties				Non-NAADS Sub-counties		Test
	Trailblazing		Late		Average	Std. Err	
	Average	Std. Err	Average	Std. Err			
Enterprises							
Cattle							
Number in 2000	0.055	0.024	0.876	0.334	0.082	0.054	ac
Number in 2004	0.140	0.042	1.008	0.291	0.158	0.092	ac
Share of total in 2004 (%)	4.861	1.437	4.589	1.247	1.432	0.745	ab
Change from 2000 to 2004 (number)	0.085	0.039	0.132	0.149	0.076	0.051	
Pigs							
Number in 2000	0.000	0.000	0.005	0.005	0.060	0.037	
Number in 2004	0.171	0.061	0.062	0.052	0.145	0.118	
Share of total in 2004 (%)	4.313	1.193	1.611	1.201	2.480	1.345	
Change from 2000 to 2004 (number)	0.171	0.061	0.057	0.047	0.084	0.090	
Goats							
Number in 2000	0.067	0.035	0.050	0.039	0.148	0.135	
Number in 2004	0.116	0.032	0.182	0.053	0.062	0.041	
Share of total in 2004 (%)	3.637	1.015	3.122	1.277	1.520	1.066	
Change from 2000 to 2004 (number)	0.049	0.039	0.132	0.064	-0.086	0.108	
Sheep							
Number in 2000	0.042	0.037	0.000	0.000	0.000	0.000	
Number in 2004	0.013	0.008	0.000	0.000	0.000	0.000	
Share of total in 2004 (%)	0.534	0.312	0.000	0.000	0.000	0.000	
Change from 2000 to 2004 (number)	-0.029	0.030	0.000	0.000	0.000	0.000	
Poultry							
Number in 2000	2.801	1.150	0.136	0.094	0.576	0.541	c
Number in 2004	6.486	3.152	0.430	0.359	0.556	0.509	
Share of total in 2004 (%)	5.320	1.450	1.163	0.452	1.026	0.622	bc
Change from 2000 to 2004 (number)	3.685	2.556	0.293	0.271	-0.020	0.037	
Beekeeping							
Number of hives in 2000	0.000	0.000	0.052	0.044	0.000	0.000	
Number of hives in 2004	0.008	0.006	0.175	0.107	0.000	0.000	
Share of total in 2004 (%)	0.316	0.291	2.000	0.843	0.000	0.000	a
Change from 2000 to 2004 (number)	0.008	0.006	0.122	0.104	0.000	0.000	

Sources: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

Tests at 5% level: ^a means significant difference between non-NAADS and late NAADS sub-counties; ^b means significant difference between non-NAADS and trailblazing NAADS sub-counties; and ^c means significant difference between the two NAADS groups.

Change in Crop Yields

Table 22 shows reported yields of major crops and the change between 2000 and 2004. In most cases there were no significant differences in the yields or changes of yields of crops among the three groups. The exceptions were yields of sorghum, which were significantly higher in the late-NAADS than non-NAADS sub-counties in 2004, and the change in yields of Irish potatoes, which were significantly greater in the trailblazing NAADS and non-NAADS sub-counties than in the late NAADS sub-counties. Yields of most crops reported increased in 2004 from their levels in 2000 (though this increase was not statistically significant in many cases), confirming the effect of intensification reported earlier. The

exception is coffee whose yield dropped in the NAADS sub-counties but increased in the non-NAADS sub-counties. The drop in coffee yield is likely due in part to the sharp decline in its international and domestic price, which reduced farmers' incentive to invest labor and inputs in coffee production.

Table 22. Crop yield (kg/acre) in 2000 and percentage change between 2000 and 2004

	NAADS sub-counties		Non-NAADS sub-counties	Test
	Trailblazing	Late		
Groundnuts (n=288)				
Yield in 2004	425.77	402.16	433.11	
% Change between 2000 and 2004	57.00	7.90	-5.70	
Test of change				n.a.
Maize (n=478)				
Yield in 2004	669.18	551.87	835.17	
% Change between 2000 and 2004	63.80	24.30	27.30	
Test of change		**		n.a.
Banana (n=424)				
Yield in 2004	5942.19	3689.34	3323.06	
% Change between 2000 and 2004	-4.70	500.30	55.30	
Test of change	*	*	**	n.a.
Sorghum (n=212)				
Yield in 2004	448.77	442.53	388.92	a
% Change between 2000 and 2004	76.80	5.20	34.80	
Test of change				n.a.
Sweet Potato (n=409)				
Yield in 2004	1760.86	1609.04	1391.88	
% Change between 2000 and 2004	18.00	-4.90	7.30	
Test of change		***	***	n.a.
Cassava (n=525)				
Yield in 2004	1243.61	1505.68	4340.43	
% Change between 2000 and 2004	45.90	1.00	-9.40	
Test of change				n.a.
Beans (n=562)				
Yield in 2004	572.22	386.71	721.01	
% Change between 2000 and 2004	62.10	12.90	17.20	
Test of change			*	n.a.
Coffee (n=121)				
Yield in 2004	515.45	1357.23	2090.45	
% Change between 2000 and 2004	-27.80	-28.60	81.30	
Test of change		**		n.a.
Irish potato (n=112)				
Yield in 2004	1003.28	606.57	1368.51	ab
% Change between 2000 and 2004	260.00	29.40	285.40	ab
Test of change				n.a.

Source: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

Test (at 5% level): ^a means significant difference between non-NAADS and late NAADS sub-counties; ^b means significant difference between non-NAADS and trailblazing NAADS sub-counties; and ^c means significant difference between the two NAADS groups. Test of change: *, ** and *** means Change between 2000 and 2004 is significantly different from zero at the 10%, 5% and 1% level, respectively.

Crop Yield, Household Income, Wealth and Food and Nutrition Security

In this section, changes in crop yield, household income, assets, and food and nutrition security are examined. With respect to crop yield, income and assets, households were asked to provide information for 2000 and 2004, and then the change between the two periods is calculated. Households were also asked to evaluate how their incomes and food and nutrition security had changed since 2000, according to whether they felt it had increased a lot, increased a little, not changed, decreased a little, or decreased a lot. However, the negative impact of the drop in coffee prices would have been similar throughout Uganda -- hence does not explain the differences between NAADS and non-NAADS sub-counties. The coffee wilt disease was also likely an important cause of declining yields and its impacts may have been more location-specific.

Change in Incomes

Roughly one fourth to one third of the households perceived that their farm income had increased between 2000 and 2004 (either moderately or significantly) (Table 23), a quarter of the farmers perceived that their farm incomes decreased, while the remaining felt no significant change in their income. The non-NAADS sub-counties reported the largest share of households that felt their farm income either did not change or decreased, while the trailblazing NAADS sub-counties reported the largest share of households that felt their farm income increased. These perceptions are consistent with the high rate of adoption of technologies and new enterprises among NAADS farmers, which are expected to cause higher farm income if other factors are held constant. Non-farm income was perceived to have increased for about one-third of the households, while about half of the households reported no significant change and about 12% reported slight to significant reduction. There was little difference in these changes in non-farm income across the three sub groups.

Table 23. Perception on change in crop, livestock and non-farm income and wealth since 2000 (percentage of households reporting)

Income	NAADS sub-counties		Non-NAADS sub-counties
	Trailblazing	Late	
Crop income			
Increased significantly	13.6	9.6	13.1
Increased moderately	17.2	19.0	9.0
No change	44.1	46.3	48.9
Decreased moderately	6.3	14.2	17.2
Decreased significantly	18.8	10.9	11.8
Livestock income			
Increased significantly	6.4	4.0	9.2
Increased moderately	21.7	21.1	15.1
No change	59.8	58.2	63.1
Decreased moderately	2.8	8.1	7.7
Decreased significantly	9.3	8.7	5.0
Non-farm income			
Increased significantly	11.2	15.0	15.0
Increased moderately	25.4	22.6	24.2
No change	46.0	51.4	53.9
Decreased moderately	6.3	1.6	1.0
Decreased significantly	11.2	9.3	6.2
Wealth			
Increased significantly	7.9	9.9	4.8
Increased moderately	36.6	3.6	27.7
No change	17.4	12.0	12.1
Decreased moderately	12.1	17.5	25.3
Decreased significantly	26.0	25.1	30.1

Source: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

The perceptions on farm income were verified by estimating the actual household farm income, which accounts for the largest share of household income (Nkonya et al. 2004; UBOS 2003). There was a significant decrease in estimated farm income between 2000 and 2004 in the non-NAADS and late NAADS sub-counties, with the declines averaging 32% in the non-NAADS sub-counties and 28% in the late-NAADS sub-counties (Table 24 and Figure 2). The average decline in the trailblazing NAADS sub-counties was 15%, but was not statistically significant. Statistical tests show that the decline in farm income was greatest in the non-NAADS sub-counties, followed by the late-NAADS sub-counties. The trailblazing NAADS sub-counties performed best in terms of changes in both crop and livestock income. The presence of NAADS (especially in the trailblazing districts) and adoption of the new enterprises and technologies that it promoted apparently helped farm households in NAADS sub-counties to avoid the severe income decline that affected most rural areas after 2000.

Table 24. Farm income and wealth in 2000 and 2004 and change (in 1998 '000 US\$)

Source of income	NAADS sub-counties				Non-NAADS sub-counties		Test
	Trailblazing		Late		Average	Std. Err	
	Average	Std. Err	Average	Std. Err			
Gross livestock income							
2000	375.40	63.38	3501.80	1248.68	551.60	49.27	ac
2004	385.40	56.47	2645.10	73.24	413.90	52.57	ac
% change	2.70	11.92	-24.00	9.20	-25.00	47.60	bc
Test of change			***				n.a.
Gross crop income							
Crops 2000	1235.60	236.89	1554.30	174.54	1746.70	167.25	bc
Crops 2004	1069.40	138.28	1185.30	135.31	1155.70	137.33	
% change	-13.40	27.40	-23.70	11.40	-51.20	19.10	abc
Test of change			***		***		n.a.
Gross farm income							
2000	1612.70	210.72	3775.60	676.88	2481.40	186.08	ac
2004	1374.50	146.04	2726.40	496.23	1692.70	145.92	c
% change	-14.80	29.30	-27.80	10.20	-31.60	22.30	abc
Test of change			***		***		n.a.
Assets							
2000	1597.60	266.48	1829.40	242.51	1107.50	102.97	a
2004	2107.70	325.39	2218.80	210.39	1450.80	174.19	a
% change	31.90	11.90	21.30	9.20	30.90	47.60	
Test of change	***		***		***		n.a.

Source: NAADS-IFPRI Survey data, 2005.

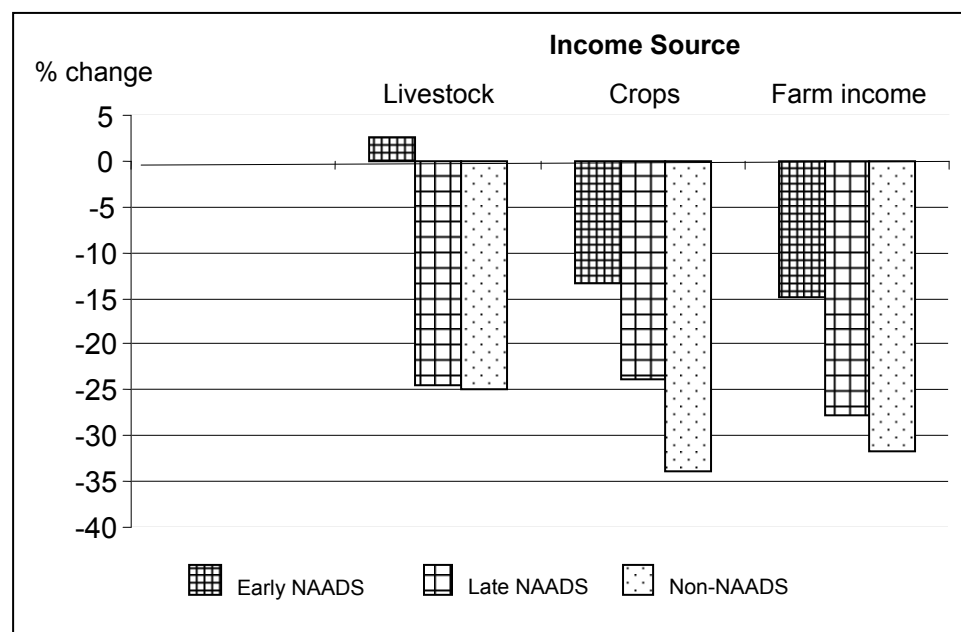
Assets include value of land, household items, equipment and other non-livestock assets.

Statistics are corrected for stratification, weighting and clustering of sample.

Test (at 5% level): ^a means significant difference between non-NAADS and late NAADS sub-counties; ^b means significant difference between non-NAADS and trailblazing NAADS sub-counties; and ^c means significant difference between the two NAADS groups.

Test of change: *, ** and *** means change between 2000 and 2004 is significantly different from zero at the 10%, 5% and 1% level, respectively.

Figure 2. Percentage change between 2000 and 2004 in household farm income



The finding of declining farm incomes in most areas between 2000 and 2004 is consistent with the findings of UBOS (2003) and Ssewanyana et al. (2004). One reason for declining farm incomes could be the low intensity of technology adoption. For instance, Table 20 shows that area planted with improved crop varieties and/or receiving fertilizer was less than one acre for all strata (except the application of inorganic fertilizer among the farmers in the trailblazing sub-counties). Intensity of adoption of most other technologies (Tables 13, 15 and 16) is also less than one acre. Such low intensity of adoption implies a limited impact on average crop yields. Consistent with this, crop yields did not significantly increase for many crops, despite adoption of new technologies, and the changes in crop yields were not significantly different between NAADS and non-NAADS districts, as noted earlier. The decline in yields of coffee may have also been affected by declining international prices and coffee wilt disease, also as noted above.

Irrespective of changes in yield (which are not definitive), changes in prices may have been a major reason for declining farm incomes. The decline in coffee prices and yields, which were undoubtedly of major importance to farm income in coffee producing areas, has already been noted. Price trends of non-coffee crops between 2000 and 2004 are less conclusive as an explanation of the decline in farm income. Another contributing factor to declining incomes was the doubling of petroleum prices, which contributed to higher transportation costs and hence lower farm level prices of outputs and higher prices of inputs (though purchased inputs are used to a very limited extent in Uganda).

Change in Assets

Despite declining farm incomes, households in all groups increased their ownership of assets on average between 2000 and 2004, and the differences across sub groups in asset accumulation were not statistically significant (Table 24). The quantitative increase in assets is also reflected in the perceptions on changes in assets. Over 42% of households reported that their wealth increased and only 15% reported no change in wealth since 2000 (Table 23). The group that reported the greatest share of households perceiving increase in wealth is the late NAADS sub-counties. The non-NAADS sub-counties reported the smallest share of households who perceived that the value of their assets increased.

Given that farm incomes reportedly declined among most groups between 2000 and 2004, it is surprising that households in all groups were able to increase their ownership of assets. Perhaps improving non-farm incomes among many households helped to offset declining farm incomes and allowed them to invest in asset accumulation. Whether and how households were able to invest in assets if their farm incomes were declining cannot definitively be explained, since information on levels of non-farm income was not collected; this would require further study using other data.

Change in Food and Nutrition Security

The pattern of perceptions of change in food security (access to food) and nutrition (quantity and quality of food) are similar to those discussed above (Table 25). About 38% of all households felt that their food security and nutrition in 2004 has improved from their level in 2000, but about a quarter did not perceive any change in food security. As is the case with perception of change in income and perhaps for the same reasons, the non-NAADS households reported the lowest share of households perceiving an improvement in food security and nutrition.

Table 25. Perception on change in food and nutrition security and nutrition since 2000 (percentage of households reporting)

	NAADS sub-counties		Non-NAADS sub-counties
	Trailblazing (n=345)	Late (n=307)	(n=188)
Food security			
Improved significantly	7.7	12.4	4.6
Improved Moderately	30.5	32.8	20.4
No change	15.1	8.8	9.3
Worsened moderately	10.7	17.6	23.9
Worsened significantly	36.0	28.4	41.8
Human nutrition			
Improved significantly	6.6	8.2	4.8
Improved Moderately	33.0	32.9	25.3
No change	24.4	24.3	22.8
Worsened moderately	9.4	16.4	23.1
Worsened significantly	26.6	18.2	24.1

Source: NAADS-IFPRI Survey data, 2005.

Statistics are corrected for stratification, weighting and clustering of sample.

5. CONCLUSIONS AND IMPLICATIONS

Key findings

Based on observed differences across selected NAADS and non-NAADS sub-counties, it appears that the NAADS program is having substantial positive impacts on the availability and quality of advisory services provided to farmers, promoting adoption of new crop (e.g. vanilla, groundnuts, maize, and beans) and livestock (e.g. goats and pigs) enterprises as well improving adoption and use of modern agricultural production technologies and practices, including use of improved crop and livestock varieties, fertilizers, and disease and pest control measures. Although current rates of adoption and intensity of use among households are still low, the increase in rates of adoption between 2000 and 2004 in NAADS sub-counties was very dramatic in many cases. NAADS also appears to have promoted greater use of post-harvest technologies and commercial marketing of commodities, consistent with its mission to promote more commercially oriented agriculture. Although it was not found that NAADS had more impact than other service providers in increasing awareness of new technologies and practices, it did have more impact on adoption among those households whose awareness of such technologies and practices improved.

Despite positive effects of NAADS on adoption of improved production technologies and practices, no significant differences were found in yield growth between NAADS and non-NAADS sub-counties for most crops, reflecting the still low levels of adoption of these technologies even in NAADS sub-counties, as well as other factors affecting productivity. However, NAADS appears to have helped farmers to avoid the large declines in farm income that affected most farmers between 2000 and 2004, especially in the trailblazing NAADS districts. Given the generally limited and mixed impacts observed of NAADS on yields of different crops, this beneficial impact (i.e. avoiding large declines in farm income) probably was due more to encouraging farmers to diversify into profitable new farming enterprises such as groundnuts, maize and rice than to increases in productivity caused by NAADS. Further research on this issue is needed.

NAADS appears to be having more success in promoting adoption of improved varieties of crops and some other yield enhancing technologies than in promoting improved soil fertility management. This raises concern about the sustainability of productivity increases that may occur, since such increases may lead to more rapid soil nutrient mining unless comparable success in promoting improved soil fertility management is achieved. It may be difficult to achieve widespread adoption of soil fertility management measures, however, unless more profitable options are identified. Continued emphasis on improving the market environment through the PMA (e.g., through investments in infrastructure, reduction of commodity taxes and license fees, trade liberalization), promoting adoption of more remunerative crop

enterprises, and applied agronomic research identifying more effective ways to profitably combine inorganic and organic soil fertility measures in different crop systems can help to address this problem.

Contrary to another recent study, the impact of NAADS on farmers' sense of empowerment was found to be weak; farmers' sense of empowerment seems to be fairly strong in general. Partly, this finding may have resulted from problems in the way empowerment was measured, which may not have been fully comparable between NAADS and non-NAADS sub-counties. Still, it may be that empowerment of farmers is less of a constraint to modern technology adoption than the supply of effective advisory services.

Although NAADS providers generally received favorable ratings from farmers for the availability, quality and timeliness of their services, and farmer participation in NAADS farmer group activities was generally high, there were some important constraints facing farmer groups. Shortage of capital and credit facilities was often cited as a critical constraint. Other constraints commonly cited include the scarcity of agricultural inputs, lack of adequate farmland, unfavorable weather patterns and problems of pests and diseases. These responses emphasize that the quality of advisory services is not the only important factor influencing technology adoption and productivity, and the need for complementary progress with respect to the other pillars of the PMA that address many of these constraints, especially development of the rural financial system.

The reasons reported by survey respondents for adopting particular technologies also demonstrated the importance of factors other than access to advisory services. For example, declining farm size was a commonly cited reason for adopting productivity enhancing technologies, which is consistent with Ester Boserup's (1965) theory of population-induced intensification. Community by-laws also were key factors in the adoption of some of the soil and water conservation and agro-forestry practices. Lack of capital and insecurity were reasons cited for not adopting or abandoning adoption of several improved technologies and practices. These and other confounding factors will be controlled for in a follow-up study using multiple regression econometric analysis.

The results presented in this paper should be regarded as preliminary because they reflect only differences across groups of sub-counties that may have been due to differences in other factors (such as agricultural potential, access to markets, farmers' education levels, etc.); although many such confounding influences have been controlled for by selecting sample districts and sub-counties in different groups that were similar in terms of agricultural potential and market access, and by focusing on changes in responses and outcomes (rather than levels in a particular year), which reduces the influence of many confounding factors (Ravallion 2001). The follow-up study will produce more definitive conclusions.

Implications

Since the findings are regarded as preliminary, it is somewhat risky to offer policy implications at this point. However, the following suggestions are offered as tentative recommendations on implementation approaches, subject to further verification based on the follow-up study.

Enterprise targeting

It is important to identify and promote enterprises that can be both profitable and adopted by large numbers of farmers. For example, vanilla has been actively promoted in the trailblazing NAADS sub-counties and, not surprisingly, has become the top ranked new crop enterprise in terms of acreage allocated. However, it is ranked 8th in terms of the proportion of households engaged in its production. Therefore, its potential impact of raising overall agricultural productivity and incomes is likely limited to a relatively small proportion of households. Other IFPRI analysis (e.g. Diao et al. 2003) shows that non-traditional exports in general (e.g., cut flowers, vanilla, and fish) have a small base and so cannot produce huge positive impacts on overall productivity and incomes. In rolling out the NAADS program to other districts and sub-counties, priority should be given to promoting profitable enterprises that can be adopted by large numbers of farmers (whether or not most households are already engaged in them); and if profitable enterprises are not adopted, priority should be given to identifying and addressing the constraints that are preventing widespread adoption of such enterprises.

Balance between use of improved seed and inorganic fertilizers

The findings suggest disproportionately higher use and increase in use of improved seeds compared to fertilizers in general and inorganic fertilizers in particular. This is troubling as it has serious soil nutrient mining implications in the sense that the potential yield improvements associated with the increase in use of improved seeds cannot be sustained. This is consistent with another IFPRI-led study (Nkonya et al. 2005a), which shows that while the NAADS program has had substantial positive impact on the value of agricultural production, it may have contributed to greater soil nutrient depletion. The findings also suggest that emphasis is given to organic sources of nutrients (e.g., manure, compost, crop residues). This also is troubling, as organic methods are mostly recycling nutrients and can at best act as a buffer to the system but not redress the problem of nutrient depletion. In addition, they can be very costly when used alone due to the low concentration of nutrients, especially phosphorus (Palm et al. 1997; Larson and Frisvold 1996). Although planting legumes has the potential of restoring soil fertility through nitrogen fixation, it is in most cases not effective because of short rotation cycles or planting species that concentrate the nitrogen in the pods (which are harvested for consumption) and add little to the soil (Giller and Cadisch 1995). The data shows that low use of inorganic fertilizers by farmers is attributed to

its high cost relative to output prices and, in turn, low returns. Low economic returns to both inorganic and organic fertilizers have also been found in several other studies in Uganda (Woelcke et al. 2004; Pender et al. 2004; Nkonya et al. 2005a). Lack of capital and unavailability of inorganic fertilizers were also cited as common problems. Thus, interventions that address access to credit and affordable chemical fertilizers may help to address the soil nutrient depletion problem. But the more fundamental need is to identify profitable soil fertility management options for farmers in Uganda and to improve the market environment.

Post-harvest handling and marketing

The findings show a production-focused impact of the NAADS and other programs, with improvement in post-harvest handling technologies and practices as well as use of marketing information lagging behind. For example, in the trailblazing NAADS sub-counties, the proportion of all households that adopted a new enterprise after 2000 was very high, but much fewer of the households adopted a new post-harvest handling practice or used marketing information. This situation has to be improved quickly else the potential gains in productivity and output, derivable from the observed increase in adoption and use of modern production technologies and practices, will cause prices to fall, which will in turn reduce the returns to the modern production technologies and practices. There are some well-intended strategies to help improve the situation. The PMA marketing and agro-processing strategy (MAPS, MTTI 2005) is a key one that sets out to address issues relating to collective action (support to farmers' organizations, cooperatives and out-grower schemes); physical infrastructure (roads, energy, telecommunications, markets and agro-processing units, post-harvest storage); policies and legislation (commodity exchange and warehouse receipts, grades and standards, taxation); and market information. These are critical for creating the incentives--i.e. higher farm gate prices and/or lower input prices--for farm households to sustain higher levels of adoption of improved technologies and practices. Speeding up implementation of the MAPS should be given priority.

Designing and implementing service provision programs

The results obtained here also imply that there are certain key factors that cannot be ignored in the design and implementation of service provision programs. For example, it is seen that reduction in farm size (due to increasing population pressure) was one of the main factors driving farm households to adopt improved seeds/breeds and many of the improved agricultural management practices in order to raise productivity. Community bye-laws also were important factors in the adoption of some of the soil and water conservation and agro-forestry practices. Also, lack of capital and insecurity were reasons cited for not adopting or abandoning adoption of several improved technologies and practices. Therefore, the success

(or failure) of agricultural service provision in raising productivity and incomes in a sustainable fashion will to a large extent depend on how these factors (or information on them) are utilized or incorporated in design and implementation of programs. Addressing many of these issues will require that more rapid progress occurs on other pillars of the PMA, at the same time as NAADS is being rolled out to the entire country.

APPENDIX A: HOUSEHOLD SURVEY QUESTIONNAIRE

**National Agricultural Advisory Services (NAADS)
Impact Assessment
Household Questionnaire**

Enumerator and Supervisor Details:

Enumerator name..... Code.....

Supervisor:

Name..... Signature Date.....

Supervisor's comments
.....

Sub-county NAADS Coordinator/Sub-county Chief:

Name..... Signature Date.....

Comments
.....

District NAADS Coordinator/District Agricultural Officer:

Name..... Signature Date.....

Comments
.....

Household Code No: Date:

Latitude:

Longitude:

Altitude:

A. GENERAL INFORMATION

A.1. Household Identification (Establish the following information)

Variable	Codes
A.1.1a Roofing material of household's residence	1=thatch/straw, 2=mud, 3=wood/planks, 4=iron sheets, 5=asbestos, 6=tiles, 7=tin, 8=cement, 9=other
A.1.1b Wall material of household's residence	1=thatch/straw, 2=mud/poles, 3=tiles, 4=unburnt bricks, 5=burnt bricks and mud, 6=burnt bricks and cement, 7=tin, 8=cement blocks, 9=other
A.1.1c Floor material of household's residence	1=earth, 2=earth and dung, 3=wood, 4=bricks, 5=stone, 6=tiles, 7=cement, 9=other
A.1.2 Name of Household head	
A.1.3 Sex of Household head	1=Female, 2=Male
A.1.4 Education level of household head	1=no formal education, 2=some primary education, 3=completed primary education, 4=some secondary education, 5=completed secondary education, 6=post-secondary education
A.1.5a Primary source of income of household head	See codebook
A.1.5b Primary source of income for the household	See codebook
A.1.6 Age of Household head	
A.1.7 Name of respondent	
A.1.8 Sex of the respondent	1=Female, 2=Male
A.1.9 Relationship to household head	1=head; 2=spouse, 3=father, 4=mother, 5=son, 6=daughter, 7=other (specify)
A.1.10 Household size	see codebook for definition of household
A.1.11 Number of household members <16 years old	

Household composition, level of education and primary activities of members older than 15 years

Name of household member above 15 years	PID	A.1.12 Age	A.1.13 Sex (female =1, male=2)	A.1.14 Level of education (codes as A.1.4)	A.1.15 Primary activity ¹

¹ **Primary activity codes:** 1=agricultural production, 2=non-farm activities, 3=School (any type), 4=Retired/sick/unemployed, 9=Other (specify)

Household Location

A.1.16 Village (LC1)	A.1.19 District	See codebook
A.1.17 Parish	A.1.20 Region	1=central, 2=eastern, 3=northern, 4=western
A.1.18 Sub-county		

B. LAND AND OTHER HOUSEHOLD ASSETS (excluding livestock)

B.1. Land Holding (acres)

	Currently	2000
B.1.1 Total land owned		
B.1.2 Total land rented in, sharecropped in, or borrowed		
B.1.3 Total land rented out, sharecropped out, or lent out		
B.1.4 Total land under cultivation		

B.2. Number and Value of Household Assets. NB Value is seeking for the estimated value of the assets in their prevailing state as at time of the survey and in 2000.

	Currently		2000	
	Number	Value (USh)	Number	Value (USh)
B.2.1 House (main house)				
B.2.2 Other buildings (i.e. other huts, kitchen, store)				
B.2.3 Furniture				
B.2.4 Furnishings e.g. mat, mattress				
B.2.5 Household Appliances e.g. Kettle, Flat iron, etc				
B.2.6 Electronic Equipment e.g. Radio, Cassette				
B.2.7 Bicycle				
B.2.8 Motorcycle				
B.2.9 Other Transport equipment				
B.2.10 Jewelry and Watches				
B.2.11 Other household assets				

B.3. Number and Value of Enterprise Equipment

	Currently		2000	
	Number	Value (USh)	Number	Value (USh)
B.3.1 Hoes				
B.3.2 Ox-Ploughs				
B. 3.3 Tractor plough				
B.3.4 Pangas, slashers, etc.				
B.3.5 Wheelbarrows				
B.3.6 Other agricultural equipment				
B.3.7 Transport equipment for enterprise				
B.3. Enterprise equipment other than agriculture				

C. AWARENESS AND USE OF INFORMATION ON MODERN PRODUCTION PRACTICES ON HOUSEHOLD'S OWN FARMLAND (including land rented in or borrowed)

C.1. New enterprises adopted after 2000. NB: Question seeks new commodities that were not produced prior to 2000 rather than new varieties or breeds of commodities that were on the farm before 2004.

New enterprises	ENTERPRISE CODE	C.1.1 Year of first time use	C.1.2 Reason for first time use	code	C.1.3 Source of advice/information (see code list)	C.1.4 Number of seasons used	C.1.5 Used now? Yes=1, No=2	C.1.6 If Yes to C.1.5, intensity of use	C.1.7 If No to C.1.5, reason for stopping	code
CROPS								Acres		
LIVESTOCK								Number of animals		
BEEKEEPING								Number of beehives		
FISH FARMING								Number of fish ponds		
See codebook for codes										

C.2. Type of information/advice and technology on household's own farmland after 2000

Production Practice	PRACT ICECO DE	C.2.1	C.2.2 Source of	C.2.3	C.2.4	C.2.5	C.2.6	Code	C.2.7	Code
		Aware of technology or practice? 1=yes, 2=No	advice/ information/ technology (see code list)	Use technology or practice now? 1=Yes, 2=No	Number of seasons used	If Yes to C.2.3, Intensity of use (e.g. acres, no of animals, no of fish ponds, no of beehives, share marketed, etc)	If Yes to C.2.3, Benefits of use		If No to C.2.3, reason for not using practice	
						<u>a. amount</u>	<u>b. unit code</u>			
Crop improved varieties										
Crop management Practices										
Soil Fertility management										
Soil & Water Conservation										
Agro-forestry										
Beekeeping										
Fish farming										

C.2.5

**If Yes to C.2.3, Intensity of use
(e.g. acres, no of animals, no of
fish ponds, no of beehives, share
marketed, etc)**

Livestock breeds

Livestock management practices

Post harvest handling

Marketing

Other (specify)

PRODUCTION PRACTICES AND TECHNOLOGY CODES FOR Section C2

Crop improved varieties See codebook	Crop management practices 201=Disease & pest control 202=Row planting 203=Spacing 204=Weeding 205=Pruning 206=De-suckering 207=Herbicide use 208=Improved crop varieties and/or seed selection 209=Other (specify)	Soil fertility management 221=Chemical fertilizer application 222=Animal manure 223=Green manure 224=Rhizobia 225=Composting and organic residue management 226=Other (specify)	Soil & Water Management 241=Trenches/terraces 242=Mulching 243=Grass bands/strips 244=Water harvesting 245=Irrigation 246=Tillage methods 247=Other (specify)	Agro forestry 261=Planting fruit trees 262=Planting wood trees 263=Quick maturing multi-purpose trees 264=Medicinal trees 265=Woodlots 266=Alley Planting 267=Hedge row planting 268=Utilization of tree products 269=Tree nursery establishment & management 270=Grafting 271=Disease & pest control in trees 272=Other (specify)
Beekeeping 281=Site hives 282=Improved hives 283=Harvesting equipment 284=Honey harvesting 285=Processing 286=Apiary Establishment, 287=Bees wax Processing, 288=Queen Rearing, 289=Hiving bees 290=Other (specify)	Fishery 301=Pond desilting 302=Pond Construction 303=Pond stocking 304=Pond Maintenance 305=Pond fertilization 306=Harvesting gears 307=Other (specify)	Livestock 321=Breed improvement 322=Housing 323=Dry season feeding 324=Feeding & nutrition 325=De-worming 326=Control of ecto-parasites (Spraying Regime) 327=Disease control 328=Pasture management 329=Oxen training 330=Other (specify)	Post-harvest handling 341=Drying 342=Threshing/shelling equipment 343=Storage facilities 344=Pest control 345=Grading 346=Other (specify)	Marketing 361=Output prices 362=Input prices 363=Where to sell 364=Collective marketing 365=Other (specify)

C.2.2 Codes: see codebook

C.2.5 (benefits) Codes: 1=Increased production; 2=Have adequate food in the home; 3=More income to meet household requirements (specify); 4=Bought physical household assets (specify); 5=Bought livestock (specify specie and number); 6=Constructed Iron roof house; 7=reduced erosion; 9=other (specify)

C.2.7 Codes: see codebook

D. AGRICULTURAL ENTERPRISE PRODUCTION ON HOUSEHOLD'S LAND USED FOR FARMING (Including land rented in or borrowed)

D1. Please indicate how the output of enterprises (crop/livestock/fish farming/beekeeping) that you produce on your farm have changed since 2000

Enterprise (crops, livestock, beekeeping, fishery, etc)	ENTERPRISE CODE	D.1.1 Cropping system (for crop enterprises)*	D.1.2 Acreage covered (specify quantity & unit of measure)			D.1.3 Reason for change of acreage or other relevant quantities**	Code	D.1.4 Production (specify quantity & unit of measure)			D.1.5 Reasons of change of production**	Code
			a. 2004	b. 2000	c. Units			a. 2004	b. 2000	c. Units		

ENTERPRISECODE: See section C1

* **Cropping system:** 1=Pure stand (monocropping), 2=Intercropping (two crops), 3=Mixed cropping (more than two crops), 4=Other (specify)

Units codes: 1=acre, 2=number, 3=kg, 4=liters, 9=other (specify)

** **Reasons:** See codebook

D2. Output of Crop Enterprises Using Modern Production Technologies on household's land used for farming (Including land rented in or borrowed)

For all crops grown last year (Section D1) please indicate those using modern technologies and outputs

Crops grown	CROP CODE	D.2.1	D.2.2	D.2.3	Code	D.2.4		D.2.5		D.2.6			D.2.7	Code
		Total Acreage under crop in 2004	Use improved variety Yes=1 No=2	Specify improved variety used last year**		Acreage under improved variety		Cropping system*		Production (specify quantity & unit of measure)			Source of improved seed/planting material***	
						a. 2004	b. 2000	a. 2004	b. 2000	a. 2004	b. 2000	c. Units		

CROPCODE: See ENTERPRISECODES in codebook

* **Cropping system:** 1=Pure stand (monocropping), 2=Two crop intercropping, 3=More than two crop mixed cropping, 4=other (specify)

** **Improved variety codes:** See Section C2 on crop improved varieties

*** **Codes for source of planting Material:** - 1=Bought from stockist, 2=bought from market, 3=bought from multiplication group/farmer, 4=given by extension staff/sub-county, 5=own seed retained, 6=seed retained by other farmers, 7=given by farmer who multiplied seed, 8=given by Service provider, 9=Share from technology development site, 10=given by politician, 11=Other (specify)

D.3. For each of the crops grown last year (Section D.1), which improved production practices, have you used in producing each of the above crops on household's own farmland? Indicate Yes=1; No=2

Crops grown	CROPCODE	D.3.1	D.3.2	D.3.3	D.3.4	D.3.5	D.3.6	D.3.7	D.3.8	D.3.9
		Cropping system*	Recommended Spacing	Recommended Disease/pest control	Inorganic fertilizer	Animal manure	Green manure	Composting	Mulching	Leguminous cover crops

Crops grown	CROPCODE	D.3.10	
		Trash lines	Others (Specify)

CROPCODE: See ENTERPRISECODES in codebook

* Cropping system: 1=Pure stand (monocropping), 2=Two crop intercropping, 3=More than two crop intercropping/mixed cropping, 4=Other (specify)

D.4. Livestock Production

How many livestock does this household own now as compared to 2000

Livestock	LIVESTOCK CODE	Number owned				Change since 2000				
		D.4.1 Now	D.4.2 2000	D.4.3 No. born	D.4.4 No. acquired	D.4.5 Source of acquired animals *	D.4.6 No. sold	D.4.7 No. consumed	D.4.8 No. gone (death, thefts)	D.4.9 No. given away
Cross breed cattle	1									
Local cattle	2									
Improved goats	3									
Local goats	4									
Improved sheep	5									
Local sheep	6									
Improved pigs	7									
Local pigs	8									
Improved chicken	9									
Local chicken**	10									
Other (specify)										

* **Code for source of animals:** 1=NAADS technology development site, 2=NGO not affiliated with NAADS or government (specify), 3=Bought from market, 4=Given by friend/relative, 99=Other specify

** **Count only adult chicken or turkeys**

D.5 Fish Farming Production (if household is not engaged, Skip to D.6)

How many fish ponds do you have in your aquaculture enterprise now and what is the output compared to 2000?

Type of fish	FISHCODE	D.5.1. Number of Fish ponds		D.5.2. Amount harvested			
		a. 2000	b. Now	a. 2000		b. Now	
				Number	Kg	Number	Kg

Fish Code: 1=Clarioid, 2=Tilapia, 3= Mirror Carp 4=Other (specify)

D.6 Beekeeping Production (if household is not engaged, Skip to D.7)

How many beehives do you have in your apiculture enterprise now what is the output compared to 2000?

Category of Hive	BEES CODE	Colonized bees				Uncolonized bees	
		D.6.1. Number of hives		D.6.2. Amount of output (kg)		D.6.3. Number of hives	
		a. 2000	b. Now	a. 2000	b. Now	a. 2000	b. Now
Local/Log Hive	1						
Lang Stroth	2						
Kenya Top Bar	3						
Other (specify)							

D.7. Home Consumption and Marketable surplus

For all enterprises engaged in (Section D1), what proportion of output is consumed, marketed or lost (in 2000 and 2004)?

ENTERPRISE	ENTERPRISE CODE	D.8.1. Share marketed in 2004 (%)	D.8.2. How has marketed surplus changed since 2000*	D.8.3. Share consumed at home in 2004 (%)	D.8.4. How has share consumed changed since 2000*	D.8.5. Storage losses & spillage in 2004 (%)
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See ENTERPRISECODE in codebook

* **Codes for change:** 1=Increased a lot, 2=increased a little, 3=no change, 4=decreased a little, 5=decreased a lot

E.1. Access to Advisory services

E.1.1 Do you have anybody who advises/trains farmers about better farming practices in this area?
_____ 1=Yes, 2= No, 3= Do not Know (If answer is not 1 skip to E2)

E.1.2 From which organization does this person come? _____ (see codebook for codes)

E.1.3 In the past 12 months how many times did you receive advise/training (is visited) by service providers? _____

If E.1.3 is positive, please report the frequency of visitation from various sources of extension services, mentioning the affiliation of the extension service provider(s). Facilitator: In the NAADS district, use information from key informants to ascertain affiliation of NGO/service provider to NAADS. Probe and write the correct names of service provider organizations

Provider	EXTENSIONCODE	E.1.4 Number of times visited in 2004	E.1.5 Change since 2000*
NAADS service providers		1	
Government extension providers		2	
Farmer group member		3	
NGO not affiliated with government or NAADS		4	
NGO but don't know affiliation		5	
Other farmers		6	
Project/program/volunteer providers		7	
Other (specify)			

* **Codes for change:** 1=Increased a lot, 2=increased a little, 3=no change, 4=decreased a little, 5=decreased a lot

In your view, how good were the methods/approaches used to give you advice on better farming practices by various service providers in the past five years?

Provider	EXTENSION CODE	E.1.6 Perception on methods /approaches used ¹	E.1.7 Perception on usefulness of advice ²	E.1.8 Timeliness of service provision ³
NAADS service providers	1			
Government extension providers	2			
Farmer group member	3			
NGO not affiliated with government or NAADS	4			
NGO but don't know affiliation	5			
Other farmers	6			
Project/program/volunteer providers	7			
Other (specify)				

¹ Perception on methods: 1=Very good, 2=Good, 3=Fair, 4=Poor, 5=Very poor

² Perception on usefulness of advice: 1=Very useful, 2=Useful, 3=Somehow useful, 4=Not useful

³ Timeliness of service provision: 1=Timely, 2=Always provided late, 3=Not provided at all

E.2. Indicate availability of information and inputs now and change since 2000. NB: In this table production technology is used to designate the physical object/hard ware of agricultural technology used in production i.e. variety, animal breed, ox-weeder, post harvest equipment like maize shellers etc, while production practices represents the knowledge/skills (soft ware) required for optimal management and utilization of the physical object/component of agricultural technology i.e. plant population and spacing, fertilizer application, disease control, etc.

	Available in community now? (Yes=1, No=2)	Change in availability since 2000*
Information on		
E.2.1 improved crop production technologies		
E.2.2 improved crop production practices		
E.2.3 improved livestock production technologies		
E.2.4 improved livestock production practices		
E.2.5 improved fish farming technologies		
E.2.6 improved fish farming practices		
E.2.7 improved beekeeping technologies		
E.2.8 improved beekeeping practices		
E.2.9 market information (prices, markets, etc) on crops		
E.2.10 market information (prices, markets, etc) on livestock		
E.2.11 market information (prices, markets, etc) relating to fish farming		
E.2.12 market information relating to beekeeping		
Physical Availability of Agricultural production inputs		
E.2.13 improved seeds/planting material		
E.2.14 improved livestock breeds		
E.2.15 improved fish farming technologies		
E.2.16 improved beekeeping technologies		
E.2.17 Inorganic fertilizers		
E.2.18 Pesticides/herbicides		
E.2.19 Farm equipment & Tools		

* Codes for change: 1=improved a lot, 2=improved a little, 3=no change, 4=reduced a little, 5=reduced a lot

F. MEMBERSHIP IN INSTITUTIONS

F.1. Does any person in your household belong to a group/association? _____ 1=Yes, 2=No

What benefits have you realized from the group since 2000, if any? For each member, specify benefits

Name of household Member belonging to group	PID	F.2 Major focus of group (use IFPRI-UBOS codes)	F.3 Gender of member 1=Female, 2=Male	F.4 Benefits realized Codes: 1=Access extension advice, 2=access production inputs, 3=exchange ideas, 4=exchange labor, 5=mobilize savings, 6=get loans, 7=Collective marketing, 8= other (specify)
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G. HOUSEHOLD INCOME AND FOOD SECURITY

G.1. Rank all sources of household incomes in terms of contribution to total household income in 2004, and indicate change in rank since 2000. NB: Question does not restrict itself to only cash income.

Income source	INCOMECODE	G.1.1 Rank in 2004 ¹	G.1.2 Change since 2000 ²	G.1.3 Reasons for change	Code
Crop	1				
Livestock	2				
Fishery	3				
Beekeeping	4				
Non-farm**	5				

¹ Rank the sources where 1=most important source, and 5=least important source. ...

² Codes for change: 1=Increased a lot, 2=increased a little, 3=no change, 4=decreased a little, 5=decreased a lot

Codes for G.1.3 (reasons): see codebook

** Non-farm includes all sources of income other than agricultural production. i.e. remittances, brick making, physical transfers, casual labor, salaried/wage labor, Bodaboda, trade, etc)

G.2. Do you feel the general well being and food security situation in your household has improved/worsened since 2000?

	WELFARECODE	G.3.1 Change since 2000	G.3.2 Reasons for change	Code
Average wealth level	1			
Availability of adequate food	2			
Nutritional quality of food	3			

Codes for change: 1=improved a lot, 2=improved a little, 3=no change, 4=worsened a little, 5=worsened a lot

Codes for G.3.2 (reasons): see codebook

APPENDIX B: FARMER GROUP SURVEY QUESTIONNAIRE

**National Agricultural Advisory Services (NAADS)
Impact Assessment
Farmer Group Questionnaire**

Enumerator and Supervisor Details:

Enumerator name..... Code.....

Enumerator name..... Code.....

Supervisor:

Name..... Signature Date.....

Supervisor's comments
.....

Sub-county NAADS Coordinator/Sub-county chief:

Name..... Signature Date.....

Comments
.....

District: NAADS Coordinator/District Agricultural Officer

Name..... Signature Date.....

Comments
.....

Farmer Group Code No:

Date:

Latitude:

Longitude:

Altitude:

A: GROUP IDENTIFICATION

Name	Code							
Region								
District								
Sub-county								
Parish								
Village								
Group Name								
A.1. Year formed								
A.2. Number of members now	With no disabilities				With disabilities			
(adults are >=30 years	Adults		Youth		Adults		Youth	
Youth are <30 years old)	a. M	b. F	c. M	d. F	e. M	f. F	g. M	h. F
A.3. Number of members when formed	With no disabilities				With disabilities			
(adults are >=30 years	Adults		Youth		Adults		Youth	
Youth are <30 years old)	a. M	b. F	c. M	d. F	e. M	f. F	g. M	h. F
A.4. Reason for change								
Code								
A.5. Number of participants in group	With no disabilities				With disabilities			
interview	Adults		Youth		Adults		Youth	
(adults are >=30 years	a. M	b. F	c. M	d. F	e. M	f. F	g. M	h. F
Youth are <30 years old)								

Region: 1=central, 2=eastern, 3=northern, 4=western

District codes: see codebook

Reasons for change codes: see codebook

B. BACKGROUND INFORMATION ON ENTERPRISES:

B.1. What areas does this group focus on?

Activity	FOCUSCODE	B.1.1 Now 1=Yes, 2=No	B.1.2 At time of formation 1=Yes, 2=No
Crop production	1		
Livestock production	2		
Aquaculture	3		
Beekeeping	4		
Agricultural marketing	5		
Non-farm activities	6		
Savings and credit	7		
Savings	8		
Mutual support	9		
Religious matters	10		
Other (please specify)			

B.1.3. What are the three most important focus areas now (list the major one first)?

a. _____ b. _____ c. _____ (enter FOCUSCODE from above)

Give the 3 most important reasons for change in major focus, if any

	Most important reasons for change	Code
B.1.4a.		a.
B.1.4b.		b.
B.1.4c.		c.

Reasons for change codes: see codebook

If answer in B.1.1 (major focus) is 1, 2, 3, 4 or 5 → B.2, otherwise → B.4

B2. What are the main agricultural enterprises that the group is engaged in? State the major objective of engaging in each enterprise, and indicate how objective has changed since 2000.

Enterprise	ENTERPRIS ECODE	B.2.1 Major objective now ¹	B.2.2 Change since 2000 ²	B.2.3 Main reason for change	Code
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ENTERPRISECODE: see codebook (household questionnaire)

¹ **Major objective codes:** 1=Cash income only, 2=Subsistence only, 3=Both cash income and subsistence, but equal importance, 4=Both cash income and subsistence, but cash income more important, 5=Both cash income and subsistence, but subsistence more important, 6=other (specify)

² **Change codes:** 1=increased importance of cash income (or reduced importance of subsistence), 2=increased importance of subsistence (or reduced importance of cash income), 3=no change

Reasons for change codes: see codebook

B.3. For each of the enterprises (Section B2), what production practices and technologies do you use now that you were not using in 2000?

Enterprise	ENTERPRISE CODE	B.3.1 Production practice or technology used now but not before 2000	B.3.2 Reason for use of the new practice	Code	B.3.3 Number of group members who use the practice on their own farmlands	B.3.4 Source of information / knowledge on practice or technology used
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ENTERPRISECODE: see Section B2

Production practice codes: see codebook

Reasons for use codes: see codebook

Sources of information codes: see codebook (household questionnaire)

B.4. What are the five most important enterprises for males and females in the community now and in 2000?

Enter with the first enterprise (a.) being the most important and (e) the fifth most important. (NB. Facilitator, first establish the views of women and then establish those of men. Probe for reasons why each enterprise is important for each category).

	MALES			FEMALES				
	Now	ENTERPRISE CODE	2000	ENTERPRISE CODE	Now	ENTERPRISE CODE	2000	ENTERPRISE CODE
a.								
b.								
c.								
d.								
e.								

ENTERPRISECODE: see Section B2

B.5. Give the 3 most important reasons for change in importance of enterprises for men and women, if any. Facilitator: Enter the reasons cited by men/women in their order of importance, where the first one is the most important reason.

Most important reasons for change in importance or enterprises for males	Code
B.5.1	
B.5.2	
B.5.3	
Most important reasons for change in importance or enterprises for females	Code
B.5.4	
B.5.5	
B.5.6	

Reasons for use codes: see codebook

C. ACCESS TO ADVISORY SERVICES

C.1.1 Do you have anybody who advises/trains farmers about better farming practices in this community? _____ 1=Yes, 2= No, 3= Do not Know (If answer is not 1 skip to C2)

C.1.2 From which organization does the person(s) come? _____ (See Section B.4.)

C.1.3 In the past 12 months how many times did you receive advise/training (visited) by service providers? _____

If C.1.3 is positive, please report the frequency of visitation from various sources of extension services, mentioning the affiliation of the extension service provider(s). Facilitator: In the NAADS district, use information from key informants to ascertain affiliation of NGO/service provider to NAADS. Probe and write the correct names of service provider organizations

Provider	EXTENSION CODE	C.1.4 Number of times visited in 2004	C.1.5 Change since 2000*
NAADS service providers	1		
Government extension providers	2		
Other Farmer groups	3		
NGO not affiliated with government or NAADS	4		
NGO but don't know affiliation	5		
Project/program/volunteer providers	6		
Other (specify)			

* Codes for change: 1=Increased a lot, 2=increased a little, 3=no change, 4=decreased a little, 5=decreased a lot

C.2. What enterprises are receiving extension advisory services in your community?

Enterprise	Code
C.2.1	
C.2.2	
C.2.3	
C.2.4	
C.2.5	
C.2.6	
C.2.7	
C.2.8	
C.2.9	
C.2.10	

Enterprise/Activity codes: see Section B2

C.3. For each enterprise indicate the number of technology demonstrations and benefits realized

Activity/Enterprise	Code	C.3.1	C.3.2	C.3.3	Code
		Number of technology demonstrations	Organization	Benefits realized	

ENTERPRISECODE: see Section B2

Organization codes: see Section B.3.4

Benefit codes: see codebook

C.4. In your view, how good were the methods/approaches used to give you advice on better farming practices by various service providers in the past five years (since 2000)?

Provider	EXTENSION CODE	C.3.4 Perception on methods/ approaches used ¹	C.3.5 Perception on usefulness of advice ²	C.3.6 Timeliness of service provision ³
NAADS service providers	1			
Government extension providers	2			
Other Farmer groups	3			
NGO not affiliated with government or NAADS	4			
NGO but don't know affiliation	5			
Project/program/volunteer providers	6			
Other (specify)				

Note. Establish group's perception on the issues for each category of people providing advisory services. Where divergent views emerge, guide the group to gain consensus and pronounce them selves on a definite group position. Nevertheless also record the views and supporting reasons of those who initially did not hold the same view as the group's position.

¹ Perception on methods: 1=Very good, 2=Good, 3=Fair, 4=Poor, 5=Very poor

² Perception on usefulness of advice: 1=Very useful, 2=Useful, 3=Somehow useful, 4=Not useful

³ Timeliness of service provision: 1=Timely, 2=Always provided late, 3=Not provided at all

C.5. Indicate availability of information and inputs now and change since 2000. NB: In this table production technology is used to designate the physical object/hard ware of agricultural technology used in production i.e. variety, animal breed, ox-weeder, post harvest equipment like maize shellers etc, while production practices represents the knowledge/skills (soft ware) required for optimal management and utilisation of the physical object/component of agricultural technology i.e. plant population and spacing, fertilizer application, disease control, etc.

	Available in community now? (Yes=1, No=2)	Change in availability since 2000*
<i>Availability of Information on</i>		
C.5.1 improved crop production technologies		
C.5.2 improved crop production practices		
C.5.3 improved livestock production technologies		
C.5.4 improved livestock production practices		
C.5.5 improved fish farming technologies		
C.5.6 improved fish farming practices		
C.5.7 improved beekeeping technologies		
C.5.8 improved beekeeping practices		
C.5.9 market information (prices, markets, etc) on crops		
C.5.10 market information (prices, markets, etc) on livestock		
C.5.11 market information (prices, markets, etc) relating to fish farming		
C.5.12 market information relating to beekeeping		
<i>Physical Availability of Agricultural production inputs</i>		
C.5.13 improved seeds/planting material		
C.5.14 improved livestock breeds		
C.5.15 improved fish farming technologies		
C.5.16 improved beekeeping technologies		
C.5.17 Inorganic fertilizers		
C.5.18 Pesticides/herbicides		
C.5.19 Farm equipment & Tools		

* Codes for change: 1=improved a lot, 2=improved a little, 3=no change, 4=reduced a little, 5=reduced a lot

C.6. If you were in a position to make a decision on the type of enterprises/activities to promote in this community, which five most important enterprises/activities would you promote and why? List the enterprises in order of importance with the most important on top and give the reason why.

Enterprise/Activity	Code	Reasons for promoting enterprise	Code
C.6.1			
C.6.2			
C.6.3			
C.6.4			
C.6.5			

Enterprise/Activity codes: See Section B2

Reasons codes: see codebook

D. CHANGES IN LIVELIHOODS ASSOCIATED WITH ADVISORY SERVICES

D.1. For each source of advisory service received, list three most important benefits in livelihoods for males and females in your community since 2000

Advisory provider
EXTENSIONCODE
<i>Benefits for Males</i>
D.1.1
Code
D.1.2
Code
D.1.3
Code
<i>Benefits for Females</i>
D.1.4
Code
D.1.5
Code
D.1.6
Code

Organization codes: See Section B.3.4

Benefits codes: see codebook

D.2. For each source of advisory service received, list three most important drawbacks in livelihoods for males and females in your community since 2000

Advisory provider
EXTENSIONCODE
<i>Drawbacks for Males</i>
D.2.1
Code
D.2.2
Code
D.2.3
Code
<i>Drawbacks for Females</i>
D.2.4
Code
D.2.5
Code
D.2.6
Code

Organization codes: see Section B.3.4

Drawbacks codes: see codebook

D.3. Give the 3 most important factors/conditions contributing to or constraining realization of benefits. List the factors/conditions in order of importance with the most important on top

<i>Most important factors/conditions contributing to realization of benefits</i>	<i>Code</i>
D.3.1	
D.3.2	
D.3.3	
<i>Most important factors/conditions constraining realization of benefits</i>	<i>Code</i>
D.3.4	
D.3.5	
D.3.6	

Codes: see codebook

E. FARMER INSTITUTION BUILDING

E.1. Since 2000, in which areas has your group received assistance in terms of training to effectively help the group carryout its functions. List 2 most important organizations involved in training

Area of training	TRAIN CODE	E.1.1 Received training? 1=Yes, 2=No	E.1.2a Number of trainings received	E.1.2b Which group members were involved? (1=all, 2=males only, 3=females only, 4=executive only, 5=other sub-group)	E.1.2c Organization	E.1.2d Organization
Rights and responsibilities	1					
Group initiation, growth and development	2					
Leadership skills and development	3					
Developing constitution or bye laws	4					
Planning (e.g. enterprise selection and identification of constraints)	5					
Monitoring and Evaluation	6					
Entrepreneurship skills (farming as a business)	7					
Sustainable natural resource management	8					
Marketing	9					
Gender consideration in group development and agricultural production	10					
HIV/AIDS consideration in group development & agricultural production	11					
Record Keeping	12					
Savings mobilization	13					
Credit access and management	14					
Income generating activities	15					
Inter-group farmer associations	16					
Other (Specify)						

Organization codes: see Section B.3

E.2. Does the group allow for mobilization of savings or other capital items? _____
 1=Yes, 2=No

E.3. If yes, what is the total amount of assets (savings, capital items, other) that have been mobilized by the group members from 2000 to the present date

	<i>INVESTCODE</i>	<i>E.3.1.</i> <i>2000</i>	<i>E.3.2.</i> <i>2001</i>	<i>E.3.2.</i> <i>2002</i>	<i>E.3.4.</i> <i>2003</i>	<i>E.3.5.</i> <i>2004</i>
Savings (US\$)	1					
Vehicles (US\$)	2					
Equipment (US\$)	3					
Technology development/ demonstration site (acres)						
Other (specify)						

E.4. For each item (Section E3), indicate how it is utilized and who decides on how

INVEST CODE	E.4.1. How is it managed	Code	E.4.2 How is it utilized?	Code	E.4.3. Who is involved in the management or decides on how it is used?
------------------------	---	-------------	--------------------------------------	-------------	---

Management code: 1=One group members takes lead, with other contributing to day to day upkeep, 2=Collectively by all group members (equal participation/contribution to management), 3=Sub-group manages. 4=Executive members only 5=Individual members, 9=other (specify)

Code for involvement in management decision making: 1=all members, 2=males only, 3=females only, 4=executive only, 5=other sub-group

Utilization codes: see codebook

F. FARMER EMPOWERMENT

F.1. How easy is it for ordinary people to express their views to those in authority above them (LCs, sub-county/district officials)

1=very easy, 2=somewhat easy, 3=somewhat difficult, 4=very difficult, 5=impossible

F.2. How easy/difficult is it for all group members to express their views in group decision making _____ 1=very easy, 2=somewhat easy, 3=somewhat difficult, 4=very difficult, 5=impossible

F.4. What are the three most important factors that have brought about the change?

- a.
- b.
- c.

F.5. Compared to 2000, how stronger/empowered does the group/people feel in communicating/expressing their needs/grievances to those above them?

Category of leaders	F.5.1 How empowered does group feel*	F.5.2 Do the various categories respond better with services than before**
Sub-county Farmers Forum		
Sub-county Political leaders /Council		
Technical public officers		

***Empowerment code:** 1=very empowered, 2=slightly empowered, 3=no change, 4=slightly reduced empowerment, 4=much reduced empowerment

****Effectiveness of Response code:** 1=More faster response, 2=slightly fast response, 3=same level as before/ no change, 4=slightly reduced response than before, 5=Much worse than before

F.5. Cite up to three examples to support your answer (see codebook F4)

- a.
- b.
- c.

G. GROUP PARTICIPATION (requirements, roles and responsibilities)

G.1. What is required of group members, and how have they changed compared to 2000?

Membership requirements	REQUIREMENT CODE	G.1.1 Is this required 1=Yes, 2=No	G.1.2 If yes, state amount or requirement now	G.1.3 State amount of requirement in 2000	G.1.4 Units	G.1.5 Reasons for change, if any	Code
Membership fee	1						
Participation in meetings	2						
Level of income	3						
Physical capital	4						
Gender	5						
Age	6						
Location/residence	7						
Level of education	8						
Religion	9						
Other (specify)							

Unit codes: see codebook

Reasons for change codes: see codebook

G.2. How are members fulfilling their roles and responsibilities and how have they changed compared to 2000?

Membership responsibilities	RESPCODE	G.1.4 How well members performing now in carrying out their responsibilities	G.1.5 Change in performance since 2000	G.1.6 Reasons for change	Code
Enterprise selection	1				
Participation in meetings	2				
Participation in demonstrations/ training	3				
Management of TDS	4				
Development of constitution and bye-laws	5				
Other (specify)					

Performance codes: 1=Very good, 2=Good, 3=Fair, 4=Poor, 5=Very Poor

Change in performance codes: 1=improved a lot, 2=improved a little, 3=no change, 4=deteriorated a little, 5=deteriorated a lot.

Reasons for change codes: see codebook

G.2. What are the three most important factors contributing to achieving the goals and objectives of the group?

Factors contributing to achieving goals and objectives	Code
G.2.1	
G.2.2	
G.2.3	

Codes: see codebook

*What are the **three** most critical problems facing the group? How have these problems been solved or attempted to be solved?*

Problems	Code	Solutions or attempts to solve	Code
G.2.4			
G.2.5			
G.2.6			

Codes: see codebook

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