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Knowledge and Innovations for Farmers from Teaching Agriculture in Ugandan Primary Schools: A Study of Kumi Communities in the Teso Sub-Region

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Abstract

Kumi communities consist of Bukedea, Kumi and Ngora districts whose agriculture is increasingly complex with declining productivity because of population increase, climate change, low yielding technologies used & poor market access impacting negatively on yields and environment. More knowledge & innovations are needed by farmers. Teaching agriculture in primary schools raised hopes, hence the study. The design was exploratory. In-depth interviews, focus group discussions, questionnaires, documents and observations were used to collect data from 40 primary schools randomly selected. Of 2,069 respondents, 1,951 were head teachers, teachers and primary seven students & 118 were farmers including extension workers purposively selected. Qualitative data were analysed using open coding & axial coding based on objectives and research questions. Agricultural productivity and its growth rate were found low caused by many factors. Education quality and innovations attained by farmers were not assuring for successful farming and rural living. Primary school agriculture was poorly conducted encountering implementation problems such as limited land, no funds, unfavourable weather and lack of improved inputs. Forty five percent (45%) of the students preferred farming as an occupation. The key innovations attained were literacy and numeracy important in the use of improved inputs; knowledge and skills for several farm operations including environmental management and good family living. On ranking school completion rates and farm output of 16 sub-counties, Spearman Rank Order coefficient computed was positive ($r = 0.421$ with $r^2 = 0.1772$, 18% at 0.05 α). Increased farm output was explained by 18% through completed primary education by farmers. Smallholder farms in Kumi for years may only be run commercially through intelligent and differentiated policies, addressing market access, jobs in non-farm economy and social transfers to improve welfare of the poor. Primary school agriculture through innovations attained by farmers enhances production thus the need for more investment in it.

Keywords: agricultural productivity, educational innovation, innovations, policy, primary education, primary school agriculture, sustainable agriculture and technologies

1. Introduction

1.1 Background

Uganda is now a country of over 112 administrative districts consisting of over 181counties, 1382 sub-counties, 22 Municipalities, 174 Town Councils and only one City, Kampala which has a population of 1,516, 210. Each district is a Local Government that gets partial funding from the Central Government to which it is accountable through the Ministry of Local Government. The country's population from the Housing Census 2014 was at 34,856,813 with 49% male and 51% female. In that Census, the rural population mainly employed in agriculture was 28,430,800 (82%) while the urban population was 6, 426,013 (18%). According to the 2014 Census, there are 7,353,427 households in Uganda. With an average household size of 4.7 people, there are, therefore, 6, 049,106 households in rural areas most of which are engaged in agriculture (Uganda Bureau of Statistics, 2014).

The system of education in Uganda is a 7:6:3 model. One enters the Grade one class of the Primary School, P1 at the age of 6 years and spends 7 years for the full primary school cycle up to the age of 13 to graduate in P7 with Primary Leaving Examination (PLE) for entry into secondary education which lasts 4 and 2 years in two different

phases and then to tertiary institutions or University for 2-3 years. In 2013, Uganda had over 18,000 primary schools enrolling over 8.5 million pupils, the secondary school enrollment was over 1.2 million for over 5,000 schools, the tertiary institutions were over 500 enrolling over 4000 students each and there were 32 universities graduating over 40,000 students with degrees and diplomas every year since about 2010 (Uganda Bureau of Statistics, 2014; Uganda's Ministry of Education and Sports, 2013). Universal Primary Education (UPE) was launched in 1997 but started graduating its first lot of UPE graduates in 2004 from its pioneer group with now an average dropout rate of 65%. There is also Universal Secondary education (USE). Since the start of UPE and USE, the numbers of leavers from institutions ranging from primary to university have been rising sharply.

The country's agricultural sector whose performance is on the decline contributed about 20.9% to Gross Domestic Product at the market prices by the end of 2014 (Uganda Bureau of Statistics, 2014). This contribution was from over 4 million smallholder farms (about 1% of the global 450 million smallholder farms), cultivating 8.4 million hectares and a handful of estate farms cultivating 68, 446 ha. These farms grow food crops and cash crops, rear livestock and fish for subsistence and export. Only 30% of the total land of 199, 807sq. km is cultivated which is about 59,942 sq. km leaving a huge potential area uncultivated including the potential for fish farming and bee keeping. The sector employs majority of the 82% living in the rural areas (Höffler, Funch, Melchers, 2014; Uganda Bureau of Statistics, 2014; Uganda's Census of Agriculture, 2009).

1.2 Agricultural Productivity

There is expressed optimism in African agriculture and food systems which are changing rapidly and positively. There is good emphasis placed on the needs of the smallholder farmers as a part of the food systems and supply chain: considering agricultural productivity, food security, and nutrition in the context of overall economic development and social stability (Meridian Institute, 2013). The smallholder farmers are achieving productivity gains and contributing significantly to agricultural growth in some African countries through policies empowering more women who play central roles. That leads to women building business management skills and securing better data for decision making from farmers' organizations with supporting best practices, innovations and information. The optimism further highlights the needs of smallholder farmers, emerging transformations in agriculture and agri-food sectors such as from the efforts of the implementation of the Comprehensive African Agriculture Development Programme (CAADP), the role of the private sector, and other forces of change in Africa such as better governance and education which includes primary education and agricultural extension. In building Africa's youth to engage in agricultural entrepreneurship, agriculture offers an attractive mechanism for building skills, accessing education and training opportunities for the generation of youth who are key to the future of Africa. Mosher (1966) premised that optimism on giving farmers incentives, markets, transport, input supplies and research information as essential needs ; and education, credit, group action, improving the land base and national planning as accelerating needs. Ellyne (1995) and World Bank (1993) concurred that "Uganda does not have a comparative advantage in the manufacture of automobiles but it has a comparative advantage in agriculture. The Sub-Saharan region is a region with food shortage but Uganda has a surplus." Following that, Uganda is considered a country of great agricultural potential whose output thus food security, income and standards of living stood good chances of getting better for sustainable agriculture and development.

1.3 Education and Agricultural Productivity

Maliyamkono *et al.* (1982) in a study covering Eastern Africa found there was a positive relationship between education/training and productivity. The report said: "Empirical evidence suggests that there is a relationship between education and productivity, which implies that more educational achievement results in higher levels of productivity. What is unresolved, however, is the type of education that can increase productivity more than other types; and further whether an emphasis on this type of education would also increase equality." Accordingly, Ellyne (1995) advised that education is a type of investment. It is investment in human capital. Education gives knowledge and skills in industry for production. Primary education, primary health care, infrastructure, agriculture, value addition, employment and the judicial system are urgent priorities in the Ugandan environment.

1.4 Primary Education and Agricultural Productivity

The literature reviewed on primary education in Uganda indicated that a large proportion of the population between the ages of 6-24 lacked permanent functional and productively usable skills. This is attributed to the quality of education provided. The likely consequences of such a situation for the country were increased unemployment, unproductive population and less innovative labour force. Such consequences threatened sustainable use of agricultural resources with which Uganda was well endowed. Economic growth towards sustainable development was also jeopardized. The benefits, expectations and values from primary education in Uganda were addressed by various works (Bitamanzire, 1990; Carasco et al., 1996; Kanyike, 1995; Kiyimba, 1995;

Odada & Semana, 1991; Uganda's Minisitry of Education and Sports, 1992; World Bank, 1994).

Odaet (1992) pointed out the usefulness of the primary school agriculture in Uganda as follows: "The primary school helps create awareness for environmental problems in a number of ways. Much has been emphasized in the primary agricultural syllabus and that of geography. Children are taught to read, count and the introduction of agriculture in primary schools has helped. Schools create awareness through involvement in environmental protection especially their participation in Wildlife Clubs, self-reliance activities and how to protect the environment". The revised curriculum for agriculture went even further in the provision of skills (National Curriculum Development Centre, Uganda, 2000).

1.5 Theoretical/Practical Implications

Although smallholder farms will continue to dominate production agriculture in Kumi communities, the promotion of differentiated measures to meet their divergent needs should be sustained to raise productivity. Teacher training institutions need to prepare more innovative teachers to teach primary school agriculture properly to give better quality education to farmers thus innovations. These must be accompanied by using the necessary requirements needed for successful teaching of agriculture (Carasco et al., 1996; Eisemon et al., 1992; Mills, 1985).

1.6 Conceptual Framework; Context Description; Problem Domain

The conceptual framework declared that education influences agricultural productivity through the human factor in the production process. Education, among other factors, accelerates productivity through knowledge-based decisions (Mosher, 1966; Heneveld & Craig, 1996). Therefore, any educational innovation, which makes education more relevant to production, influences farm output, food security and income (Watts, 1973; Epeju, 2003). Figure 1 shows the relationships among the different variables investigated in the study.

2. Methodology

2.1 Purpose of the Study

The purpose of the study was to investigate how educational innovation embracing teaching agriculture in primary schools would help the Kumi communities, using knowledge and innovations it provides to improve farm output thus food security, income and employment, especially for the astronomical numbers of primary school leavers who retreat to agriculture in rural areas on failing to continue with schooling. Kumi communities are located in the Teso Sub-region of Uganda which covers 12,182 sq. km with a population of 1,843, 343 (UBOS, 2014; Fountain Publishers, 2011). Kumi communities consist of the districts of Bukedea (188,918 people), Kumi (258,073 people) and Ngora (142,487 people) covering a total area of 2,861 sq. km (UBOS, 1991, 2014; Fountain Publishers, 2011). Agriculture practised is increasingly complex. High population, climate change, low yielding technologies and market access impact negatively on yields and environment. More knowledge and innovations are needed from research institutions and farming schools (Balk, 2014). The area has over 300 primary schools which all use the country's approved curriculum (Fountain Publishers, 2011; National Curriculum Development Centre, 1990). Teaching of agriculture in schools raised hopes hence the study.

2.2 Research Design: Project Approach

Exploratory design with *ex post facto design* aspects integrated was adopted using both qualitative techniques and quantitative ones to seek information from primary seven students, teachers and head teachers in 40 primary schools and selected farmers with their agricultural advisors in Kumi communities. The design was deemed useful in securing insights into the feelings and experiences of the respondents for understanding benefits from primary education offered to the communities for activities in the communities especially farming. The effects of education on agricultural productivity were analysed in a composite form using simple correlation coefficients for data available. It was a survey using the qualitative approach more for capturing educational qualities important for rural life and agricultural productivity.

2.3 Objectives and Research Questions

The objectives of the study were:

- To describe the status of agricultural productivity in Kumi Communities
- To assess the quality of primary education offered in Kumi Communities
- To determine whether primary school agriculture offered in schools enhanced knowledge and innovations needed by farmers in Kumi Communities

- To assess the extent to which agricultural productivity in Kumi Communities depended on primary education of the farmers

The research questions were:

- What is the state of agricultural productivity in Kumi communities?
- Are the qualities that primary education gives learners in Kumi Communities relevant for successful farming and rural living?
- Does instruction in agriculture offered at school really prepare primary school leavers for successful farming and for living in the villages of Kumi communities?
- Do farmers with primary education perform better than those without?

2.4 Variables

The study was interested in variables that depicted primary education offered in Kumi communities as prescribed by the national model of approved curriculum which embraced teaching agriculture. These formed the *independent variables* that affected agricultural productivity variables which were regarded as *dependent variables*. In between there were many factors that may have worked against the realisation of expected outcomes in production. Those variables were regarded as *moderating variables* consisting of other factors important in production besides education. Figure 1 shows all those variables that could be identified.

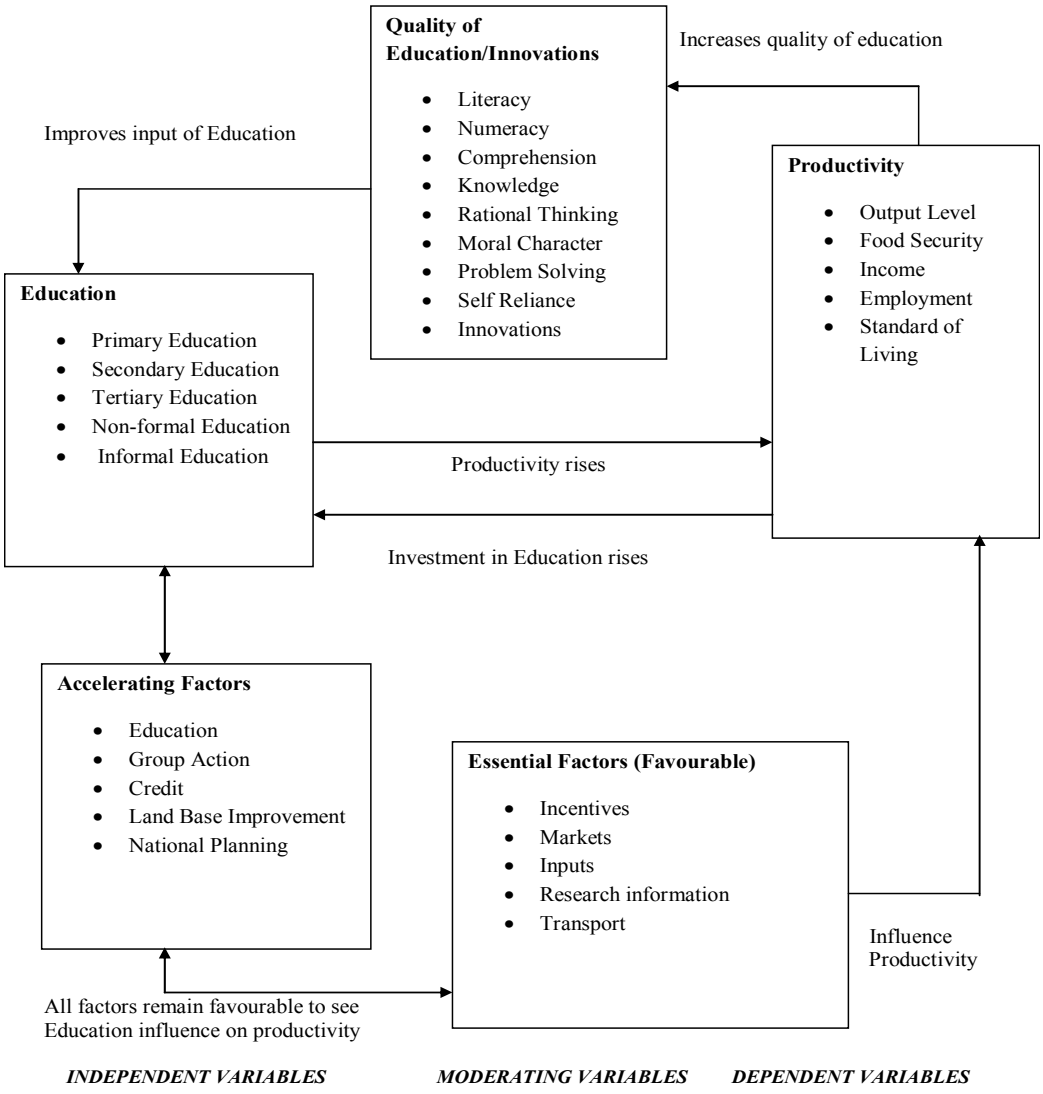

Figure 1. What contributes to productivity?

2.5 Data Collection and Analysis; Evidence

The study started in 1995 with an inception report in 1996. In 2014-2015, several consultations, field observations and library research were done to streamline the evidence to date. In-depth interviews, focus group discussions, questionnaires, documents and observations were used to collect data from 40 primary schools randomly selected. Of the respondents, 1,951 respondents were head teachers, teachers and primary seven students; and 118 farmers and extension workers were purposively selected giving a total of 2,069 respondents. Qualitative data were analysed using open coding and axial coding based on objectives and research questions. Spearman Rank Order Correlation was computed to show direction and magnitude of the relationship between completed primary education and agricultural productivity (Kothari, 1992).

3. Results and Discussion

3.1 The state of Agricultural Productivity in Kumi Communities

Kumi communities are rural. In 2014 Household Population Census, 100, 562 households were established, all of which were engaged in agriculture in one way or another (UBOS, 2014). Currently, there are over 100, 000 smallholder farms in the area but no estate farms. Some schools have teaching farms. Land is limited as population soars to over 151 persons per sq.km. The area is low lying and flat with an altitude of over 1000 m above sea level and a modified equatorial climate getting moderately heavy rainfall and high temperatures. In the area, crops are grown and livestock is kept (see Tables 1 and 2). There is low use of improved inputs.

Table 1. Crops grown in Kumi Communities

CEREALS	LEGUMES	PERENNIAL CROPS	FIELD CROPS	ROOT CROPS	VEGETABLE CROPS	FRUIT CROPS
Maize	Groundnuts	Cashew nuts	Cotton	Cassava	Onions	Bananas
Finger millet	Soya beans	Forest trees	Sunflower	Sweet potatoes	Tomatoes	Citrus
Sorghum	Cow peas	Shea-nuts	Simsim	Yams	Cabbages	Mangoes
Rice	Beans	Sugar-cane	Cucumber /water melons		Cauliflower	Pawpaw
	Bambara groundnuts		Pasture		Egg plant	Passion fruit (yellow)
	Pigeon peas				Carrots	Pine apples
	Green grams				Local vegetables	

Source: Department of Agriculture, Kumi (2014).

In Table 1, smallholder farmers in Kumi communities can grow over 35 different types of crops. This potential is good for the community as the residents can grow what they immediately need and may have surplus for sale. There are no factories to add value to many of the crops except a few small scale grinding mills for dry foods such as cereals that are found around trading centres where one finds electricity. In order to exploit the existing agricultural potential most farmers who are smallholders have had only primary education. What they can do with the possible enterprises at hand depends on what they can do with the knowledge and innovations largely attained from primary school agriculture and general primary education.

In Table 2, Kumi communities have 3% of the national cattle herd; 1.8% of the national goats' population; 3% of the national sheep population; 3% of the national pig population and 2% of the national poultry population (Uganda's Ministry of Agriculture, Animal Industry and Fisheries, 2009). Breeds used are mainly indigenous ones which are low yielders. For instance, a local lactating cow produces only 8 litres of milk weekly. Nonetheless, the potential is good except for limited land for expansion. Other possible livestock rearing activities include fisheries, apiary (beekeeping) and keeping of rabbits. Knowledge and innovations from primary school agriculture to an

extent influenced productivity trends in the possible livestock production in the area.

Table 2. Livestock numbers in Kumi Communities, 1995 and 2011

LIVESTOCK	DISTRICTS						DISTRICT	TOTALS
	BUKEDEA		KUMI		NGORA			
	1995	2011	1995	2011	1995	2011	1995	2011
Cattle	4,336	86,141	8,675	173,500	5,990	46,555	19,001	306,196
Goats	2,894	54,810	5,790	110,010	5,556	58,877	14,240	223,697
Sheep	565	10,013	1,132	20,376	1,040	10,618	2,737	41,007
Pigs	1,465	23,264	2,929	46,864	2,046	20,786	6,440	90,914
Donkeys	11	-	0	-	0	-	11	-
Poultry	57,245	225,247	80,257	321,028	72,590	258,303	210,092	804,578

Sources: Department of Veterinary Services, Kumi (1995) and Fountain Publishers (2011)

It is clear that the area has reasonable agricultural potential which can keep the smallholder farmers hopeful other things remaining favourable. For sustainability, primary schooling with primary school agriculture serviced it through knowledge and innovations farmers attained at school and through contacts with schools (Robertson, 2014).

There was an increasing trend in areas cultivated for different crops except in 1992 and 2007 when there was a long drought and floods respectively (climate change effects) and price drops. Sweet potatoes generally survive long droughts and generally the urban areas and neighbouring countries gave attractive markets to the crop especially during short food supply times.

Both tables (Tables 1 and 2) indicate figures to show how the smallholder farmers strive to work through circumstances they find themselves to engage in with enterprises such as sweet potatoes yielding 7, 500 kg per hectare as the highest yield level because it is the area's commercial crop while low yields were in finger millet a popular food crop giving only 916 kg per hectare (ha^{-1}) which was much lower than the expected 1,400 kg per hectare on smallholder farms. According to its low yields, low prices and market imperfections amongst other factors, cotton is no longer a profitable cash crop. Table 3 shows a comparison of yields attained on smallholder farms with those obtained on farms in Ugandan research stations. The yields on smallholder farms ha^{-1} are generally lower (Bank of Uganda, 1992). Primary school agriculture and education in general are important for improvement and sustainability of agriculture (Rigby & Cáceres, 2001; Eisemon et al., 1992)

Table 3. Comparison of crop yields in Kg per Hectare on Kumi farms and on Ugandan research station farms

CROP	YIELD HA^{-1} ON KUMI FARMS in KGS	YIELD HA^{-1} ON RESEARCH STATION FARMS in KGS*
Finger millet	916	2,400
Sorghum	1,596	2,000
Maize	1,000	2,890
Groundnuts	1,000	1,400
Cowpeas	400	600
Beans	954	1,275
Cassava	4,442	15,000
Sweet potatoes	7,500	17,000
Bananas	6,996	14,450
Cotton	300	1,000
Sunflower	1,212	2,000
Cashew nuts	502	700

Comparison figures cited by Bank of Uganda (1992) Exports.

Through the interviews and focus group discussions, 118 farmers and extension workers interviewed concurred by consensus that the key constraints to agricultural production in Kumi communities included the following factors:

"Problems of declining soil fertility on limited land (less than 2 ha per household)
Lack of oxen and appropriate affordable technology
Problems of pests and diseases
Irregular and inadequate seed supply of high yielding varieties
Unavailability and high cost of improved inputs compared to unpredictable produce prices
Unfavourable weather
Lack of profitable markets for produce
Poor state of feeder roads for access
Lack of transport for farmers
Poor storage of produce thus over 30% was generally lost
Low incomes
Restocking after heavy war losses was difficult without loans or credit".

Although there was no mention of education of the farmers and the training of the extension workers, appropriate education was no doubt important in addressing the constraining problems to assure sustainability. Yield results in Table 3 from research stations demonstrate that use of improved inputs, educated and trained workers they engaged cannot be ignored in attaining the higher yields. This is why teaching of agriculture gave good hopes for the smallholder farmers to uphold sustainability.

3.2 Qualities and Innovations Primary Education Gives Learners in Kumi for Successful Farming and Rural Living

Affected by many factors including education, agricultural productivity and its growth rate in Kumi communities were low. On primary education of the area, the school enrolment for over 300 primary schools and for a population of nearly 600,000 people stood at 179,944 (40 % male: 90,095 and 50% female: 89,849). The enrollment was served by a total of 3, 257 teachers (58% male: 1,885 and 42% female: 1, 372) giving a teacher: student ratio of 1:55 (Fountain Publishers, 2011). Primary education is fraught with many challenges that led to a great dropout rate of 65% annually in the completion of the primary cycle in P7. The reasons cited by students, teachers and head teachers appeared satisfactory on effective teaching to give quality and innovations. According to Mills (1985), the expected educational quality from a school should assure the following attributes in school leavers as attained in terms of knowledge, practical skills, ability to think rationally, moral conduct and problem solving. One thousand nine hundred and fifty one (1,951), 94% of the total respondents by consensus gave factors in schools that affect quality and use of innovations as:

"Lack of money for school requirements
Parental reluctance to support children at school
Children held at home to work
Sickness at home
Lack of interest for schooling
Poor academic performance
Children get married early (12-17 years old)
Lack of facilities at home
Chronic illness
Insecurity
Lack of materials for learning
Sexual harassment
Teachers' absenteeism and poor teaching
Violation of school rules
Becoming over-age for schooling".

Agriculture was one of the eleven subjects schools taught as derivatives of the nine subjects prescribed by the National Curriculum Development Centre (1990). In different schools agriculture was offered differently. There were three common forms by which it was offered, which were: as a part of Science or as a manual activity or as a separate subject as stipulated nationally. The curriculum was revised in 2000 so that agriculture should get proper handling in schools spelling out essential requirements for its proper teaching (NCDC, 2000; Inter-Agency Commision, 1990). Three decades of persistent efforts, agriculture was really not taught by well trained teachers for different reasons in different schools and did not get the expected support. The teaching of agriculture often conflicted with school land use by teachers or community or for other uses by the school. Schools gave the following reasons for failure to teach agriculture as an educational innovation to support Uganda's agricultural development.

"Shortage of land and declining soil fertility
Lack of tools, equipment and machinery
Unfavourable weather
Lack of various inputs such as seeds, fertilizers and other improved inputs
Problems of pests and diseases
Lack of enough time on the timetable
No qualified teachers to teach it well
Lack of funds for necessary support
Marketing and transport problems".

The students, teachers and head teachers, altogether 1951, who responded through interviews and focus group discussions, suggested that a way forward or solutions can come through these ways:

"Schools to secure enough land
Secure improved inputs, tools, equipment and machinery
Recruit trained teachers for agriculture
Improve the management of teaching it
Make learning more interesting
Use technology that reduces toiling
Provide security for crops and farm animals
Secure markets for produce at good prices
Communities to give more support".

Generally, instruction in primary school agriculture was poorly done with implementation problems such as land lacking ,no funds, and unavailability of improved inputs namely certified seed, improved breeds, fertilizers, pesticides, machinery and equipment.

On qualities and innovations attained from primary education against the background described, the students (1,345) by consensus said they attained these competencies:

" Literacy and numeracy
Knowledge and skills for farming
Growing crops for food
Creating self-employment
Raising money and wealth for marriage
Capacity to use advice from extension workers
Keeping a family fed and clothed
Control human diseases through good feeding
Base for learning a lot
Important for environmental management

Good moral conduct

Ability to think rationally

Physical fitness through games and sports".

3.3 Instruction in Agriculture Offered at School as a Preparation of Primary School Leavers for Successful Farming and for Living in the Villages of Kumi Communities

From school activities including instruction in agriculture, the students (1,345) by consensus felt they were not adequately prepared for successful farming and for living in the villages of Kumi communities. They further affirmed that even for passing the PLE, preparation left a lot to be desired according to results known. They confessed that their preferences for different occupations and life styles were shaped by their parents and guardians more than by the schools. Both mother and father exerted a lot of influence. The main occupations of the people and the people themselves living around their homes also had influence on them. Table 4 shows results of the students' responses.

Table 4. Occupations of parents, people in communities and occupational preferences of primary seven students as perceived by P7 students in the forty sampled schools of Kumi communities

OCCUPATION	**FATHER'S OCCUPATION**		**MOTHER'S OCCUPATION**		**PEOPLE IN COMMUNITY**		**OCCUPATION PREFERENCE BY P7 STUDENTS**	
	RESPONSES	%	RESPONSES	%	RESPONSES	%	RESPONSES	%
FARMING	880	70.0	810	66.0	1122	95.1	787	45.0
TEACHING	147	11.0	74	6.0	6	0.5	245	14.0
LEADERSHIP	52	4.0	9	0.7	1	0.1	70	4.0
BUSINESS	46	4.0	78	6.0	13	1.1	134	8.0
POLICE	22	2.0	4	0.3	0	0.0	80	5.0
NURSE	21	2.0	50	4.0	0	0.0	93	5.0
DOCTOR	19	2.0	0	0.0	1	0.1	155	9.0
CARPENTRY	15	1.0	0	0.0	0	0.0	22	1.0
DRIVER	11	0.8	0	0.0	0	0.0	32	2.0
ENGINEER	10	0.7	0	0.0	0	0.0	28	1.5
FISHING	7	0.6	0	0.0	14	1.2	30	2.0
BUILDER	6	0.6	0	0.0	0	0.0	15	1.0
FORESTRY	2	0.2	0	0.0	0	0.0		2
								0.0
HOME MAKING	0	0.0	144	12.0	0	0.0		7
								0.0
BREWER	0	0.0	50	4.0	4	0.3		0
								0.0
TAILORING	1	0.1	6	0.5	0	0.0	28	1.5
MUSICIAN	0	0.0	0	0.0	0	0.0		5
								0.0
OTHER	15	1.0	6	0.5	19	1.6	22	1.0
n	**1254**	**100**	**1231**	**100**	**1180**	**100**	**1755**	**100**

Most of those students who preferred living in the village also preferred farming (45%) and those who preferred moving to towns (55%) preferred those jobs associated with towns. The forty five percent (45%) were those students whose parents were themselves in the occupation of farming (70% of the fathers were in farming and 66% of the mothers were in farming). The people in the community in farming were 95.1%. Those students (45%) who

liked to live in rural areas to do farming gave the following reasons:

"More comfort is in the village
Able to do agriculture in the village
Able to get firewood in the village
Easier to get food and water
There is land for agriculture
Village exports food to the town
Best thing in the village is farming
Self reliance is good in the village
Living in the village is better than in town
Pollution and sanitation problems in town".

The students (55%) who opted out of farming and rural living gave the following reasons:

"Too much digging in the village
More business in town
Better chances of employment in town
Better services in town
Easier to meet basic needs in town
Essential commodities are easier to get in town
No electricity in the village
Education is better in town
Living in the village is bad
Lack of capital in village".

The school activities appeared to have inadequate agenda for addressing the issues of the two differing groups directly. Nonetheless, the schools had a role in correcting attitudes which alienated students from their rural origins. Indeed, parents and people in the communities influenced students' preferences for the different occupations they opted for in their lives.

3.4 Do farmers with primary education perform better in farming than those without?

The students (1,345) who responded by consensus believed that primary schooling helped the farmers who had it to perform better than those who did not have it for the following reasons:

"Able to speak English for scientific farming
Attain knowledge and skills in agriculture
Use better technology and agrochemicals
Attain better knowledge of weather and timeliness
Able to manage environment better
Conserved soils and water better
Able to handle better loan applications
Able to secure better human relations for marketing
Demonstrated more concern about better performance on tasks
Showed more commitment and appreciated advice
Able to keep records for profitable management"

Although these were affirmative statements in support of primary schooling from all the respondents, the situation on the ground was not so rosy. Some of the affirmative statements were traceable to school activities and the nature of peasant farming among other things. Where school and community activities were perceived as punitive especially for agriculture, the attitudes of the respondents were negative while where they were profitably applied they generated positive attitudes.

3.5 How Does Primary Education Improve Agricultural Productivity in Kumi Communities?

Education is no doubt an important and peaceful means of transforming people. This was the rationale for investing in education so as to develop human capital needed in production. Respondents (2,069) by consensus stressed that there were several benefits in educating people such as:

> "Getting knowledge and skills for employment
>
> Becoming more productive through new skills and knowledge
>
> Ability to make better decisions
>
> Ability to carry out business more profitably
>
> Skills in making things and building
>
> Spirit of working together for development
>
> Good citizenship for security of person and property
>
> Self-reliance and positive attitudes
>
> Environmental management strategies
>
> Learning from past mistakes".

These benefits were vital for the development of the communities which particularly depended on the sustainable use of agricultural resources. Table 5 shows how completion of primary education is positively correlated to agricultural productivity of the communities demonstrating that through primary school agriculture farmers can derive knowledge and innovations that enhance their capacity to practise sustainable agriculture.

Population Census data for the completion of primary education percentages for the ages of 6-12 and using the expertise of the agricultural staff in consultation with education staff of Kumi Communities, education and agricultural productivity of 16 sub-counties of the communities were ranked. On ranking 16 sub-counties using school completion rates and farm output, Spearman Rank Order coefficient was positive ($r = 0.421$; $r^2 = 0.1772$, 18% at 0.05 α). Increased output could only be explained by 18% of completed primary education of farmers. Though low, it was positive and higher than 12% given by secondary education completion rates and farm output (Kothari, 1992; Eisemon et al., 1992). It corroborates with the finding that social rate return to primary education is higher than that of secondary education (Psacharopoulos, 1991; Maliyamkono et al., 1982)

That evidence was corroborated by two respondents who remarked as follows:

> Respondent I: "Education affects production and production affects education. A school is not just buildings. Education of a family actually translates into what a home looks like and a home is a basic unit of production. A lot of what children can do reflects on the state at home".

> Respondent II: "The educated ones are picking up faster than the uneducated ones. They are the ones more willing to take up the loans and keep the records required in the loan implementation".

It is noteworthy that improvement in the quality of education thus knowledge and innovations contributed to sustainable agriculture.

Table 5. Correlation between Completed Primary education by Age 6-12 years and Agricultural Productivity by Sub-County in Kumi Communities, Spearman's Rank Order Correlation

SUBCOUNTY	COMPLETED PRIMARY EDUCATION %	EDUCATION RANK	AGRICULTURAL PRODUCTIVY RANK	DEVIATION (D)	D^2
ATUTUR	18.8-23.6%	4	8	-4	16
BUKEDEA	18.8-23.6%	3	6	-3	9
KACHUMBALA	14.8-15.2%	8	1	+7	49
KANYUM	14.8-15.2%	7	5	+2	4
KAPIR	14.4-14.8%	10	11	-1	1
KIDONGOLE	13.3-13.8%	14	7	+7	49
KOBWIN	13.3-13.8%	11	3	+8	64
KOLIR	11.7-13.8%	15	15	0	0
KUMI	14.4-14.8%	9	13	-4	16
KUMI TOWN COUNCIL	23.6-33.3%	1	12	-11	121
MALERA	11.7-13.3%	16	16	0	0
MUKONGORO	16.2-18.8%	6	2	+4	16
MUKURA	16.2-18.8%	5	10	-5	25
NYERO	13.3-13.8%	13	9	+4	16
NGORA	23.6-33.3%	2	4	-2	4
ONGINO	13.8-14.4%	12	14	-2	4
r-value	**0.421 at 0.05 α**				

Source: Population Data (1991) and Agriculture Staff (2014).

4. Conclusions and Recommendations

Agricultural productivity in Kumi Communities was low because of many constraining factors including poor education of farmers. Educational innovation of primary school agriculture though fraught with many implementation problems provided knowledge and farming innovations to be used by farmers for sustainable agriculture. Forty five percent (45%) of the students preferred farming as an occupation and majority of the people (95.1%) in the communities are in agriculture. Relevant education of prospective and practising farmers may enhance production in the high agricultural potential of the area described in the study. Quality primary education including other types of education no doubt facilitated the realisation of positive results for increasing agricultural productivity other factors remaining favourable. Regular local and national studies on education of farmers in Uganda are necessary. Findings of such studies would lead to more informed policy and improved agricultural productivity by more investment. More investments in agricultural education and extension will enhance capacity of farmers to practise sustainable agriculture leading to sustainable development enshrined in national, regional and global agenda.

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