THE RELATIONSHIP BETWEEN AGRICULTURAL INPUTS/EXTENSION SERVICES AND HOUSEHOLD CROP PRODUCTION IN UGANDA (1990-2017)

BY

AYEBARE MERAB

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DEDICATION

I dedicate this work to my beloved supervisor Mr Katongole Nasser, my lovely dad, Mr. Byaruhanga Geofrey and my friends Susan, Isaac, Ronald ,immaculate and Ellen for their continued and timely support and guidance towards the completion of my work.

MAY THE ALMIGHTY GOD BLESS YOU ALL

DECLARATION

I Ayebare Merab declare that this dissertation and its contents represent my own work and have not previously been submitted for a degree at this or any other University.

Signed.....

Date.....19/07/2018.....

APPROVAL

I certify that this research report by Ayebare Merab Registration number 1153-05144-00515 , carried in Uganda under my supervision is now ready for submission to the College of Economics and Management, Kampala International University for assessment.

Signature.....

Date....19/7/18.....

Mr Katongore Nasser

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List of Acronyms

ADF	Augmented Dickey Fuller Test
ARDCs	Agricultural Research And Development Centers
ARDCs	Agricultural Research and Development Centers
CIS	Community Information System.
DV	Dependent variable
FAO	Food and Agricultural Organization
FY	Financial Year
GDP	Gross Domestic Product
HH	House Hold
IILS	International Institute for Labor Studies
IV	Independent Variable
JESE	Joint Effort to Save the Environment
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MFPED	Ministry of Finance Planning and Economic Development
NAADS	National Agricultural Advisory Services
NARO	National Agricultural Research Organization
NARS	National Agricultural Research System
NASS	National Agricultural Statistics System
NGO	Non Governmental Organization
OPI	Outreach and Partnership Initiative
PMA	Plan for Modernization of Agriculture
RNF	Rural Non Farm
TCC	Talent Calls Club
UBOS	Uganda Bureau of statistics
USL	Uganda Seeds Limited
USP	Uganda seed Project
VAR	Vector Auto Regression
VEC	Vector Error Correlation

ABSTRACT

The main purpose of this study was to ascertain the nature of the relationship between agricultural inputs/extension services and house hold crop production in Uganda. In doing so, the study sought to unravel the short-run and long-run dynamics between the variables. The study reviewed both theoretical and empirical aspects of relationship between the variables. The study found out co integration between agricultural inputs/extension services and house hold crop production. The existence of co integration implies that there is stable long-run 1equilibrium relationship between agricultural inputs/extension services and house hold crop production. They have the same trend processes and can stay in a fixed long-run relationship. However, the VAR analysis reveals that agricultural inputs/extension services significantly and positively impacts house hold crop production in the long run. Furthermore the study revealed that there is a weak negative correlation of 0.0122 between the variables of study.

One important policy implication of our study is that, by knowing the past values of house hold crop production, we can predict rate at which agricultural in puts/extension services will produce in future.

Another policy implication is that the government should put more efforts in monitoring and evaluating the agricultural development programs both in the short run and long run as the study revealed that there will be a positive impact in the long run if the programs are well implemented and also chances of no results are in the long run are expected if there is no change in monitoring.

CHAPTER ONE

BACKGROUND

1.1 Background

1.1.1 Historical background

Productivity performance in the agricultural sector is critical to improvement in overall economic well-being globally, and it has therefore been the subject of at least seven multi-country studies (Block, 1994; Frisvold and Ingram, 1995; Thirtle et al., 1995; Lusigi and Thirtle, 1997; Rao and Coelli, 1998; Chan-Kang et al., 1999; Suhariyanto et al., 2001; Lilyan et al, 2004). These studies, though they covered different time periods and different sets of sub-Saharan African countries, have been reasonably consistent in reporting positive average productivity gains during the 1960s, deterioration or no gain in productivity during the 1970s, with a recovery to positive gains during the 1980s and early 1990s. The present study aims to provide a more comprehensive understanding of agricultural productivity growth in Uganda, and the potential influence of access to services.

Agriculture remains the backbone of the economies of most African Countries. In Uganda, 85% of the population is engaged in Agricultural production which contributes 42% of the national gross domestic product, 80% of the export earnings and employs 90% of the labor force (UBoS, 2014). According to the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) Development Strategy and Investment Plan 2005/2008, the main Agriculture sub-sectors include crops contributing about 80%, livestock contributing 13% and fisheries contributing about 6%. Over 95% of the farmers are smallholders with landholdings ranging from 0.5 to 10 acres. Majority of these smallholder farmers have rich indigenous knowledge that has sustained their livelihoods, food security as well as land productivity for hundreds of years with very little or no use of artificial fertilizers, pesticides and veterinary drugs.

The importance of rural credit services can be best understood by examining their potential contribution to the development of the agricultural sector. Agriculture forms a significant part of the lives of the rural households, who in the case of Uganda constitute about 85% of the population (UBoS, 2014). Many of the agricultural activities are spread over time (Ray, 1998), for example, adoption of a new technique or a new crop requires investment in the current period with payoffs in the future. Much of the industrial activity in the country is agro-based. Even though its share in total GDP has been declining, agriculture remains

important because it provides the basis for growth in other sectors such as manufacturing and services. Being the largest employer, the majority of women (83 percent) are employed in agriculture as primary producers and contribute 70-75 per cent of agricultural production. In the face of the global financial crisis, agriculture is contributing a lot of foreign exchange revenue from regional trade and therefore improving the country's balance of payments position, and in the process helps to stabilize depreciation of the shilling (UBoS, 2014).

Out of about 31 million Ugandans, 85% live in rural areas of which 73.3% are engaged in subsistence agriculture (UBoS, 2014). Most of the agriculture is characterized by small land holdings with a few isolated commercial holdings (Musiime et al., 2005). In addition to supporting livelihoods, agriculture sector contributes to the national revenue. In 2009, the sector provided about 70% of the employment in the country and contributed to 90 percent of the total export (UBoS, 2010). However, the share of the agriculture sector to Gross Domestic Product (GDP) has continued to decline from 20.2% in 2004/05 to 14.7% in 2009/10 and 13.9 % in 2011/12 (MFPED, 2011). Even though its share in the total GDP has been declining, agriculture remains important because it provides the basis for growth in other sectors such as manufacturing and services (Government of Uganda, 2010).

Agricultural export production in Uganda hinges on the efforts of rural producers and processors who typically receive the least benefits from the marketing and processing of their products.

Nurturing and building the capacity of farmers' groups is one way of improving quality, profitability and marketing efficiency. Moreover, because Uganda is landlocked country, regional development initiatives are likely to have significant returns for markets and for efficient transportation and the regulation of product quality. Clearly the effective implementation of policies to expand the access of services to encourage agricultural exports urgently needs to be addressed to benefit smallholder farmers as they produce and process these goods (Kyomugisha, 2008).

The study will focuss on maize and banana because they are the commonly grown in the all the parts of Uganda except in northern part where matooke is not grown in the entire region .Both crops are cultivated with about 86 per cent of Uganda's agricultural households (UBoS, 2014) . Maize is the number-one staple food for the urban poor, in institutions such

as schools, hospitals and the military. Also, the crop is the number-one source of income for most farmers in Eastern, Northern and North-Western Uganda (Ferris et al., 2006).

Although the role of agriculture in poverty reduction and overall growth in Uganda is well recognized, investment in the sector remains minimal, at 5% and less than 10% as agreed in the Maputo declaration (UBoS, 2014). The slow pace of socioeconomic transformation in Uganda can therefore be attributed to the neglect of the agricultural sector as an engine of growth (Tibaidhukira, 2011). Many studies from the literature have suggested that modest increases in agricultural production are largely due to expansion in cultivated land, constraints of access to credit services, extension services, access to market services and growth of institutions (Pratt, 2008).

However, few studies have addressed the access to credit, extension, market services and maize productivity and yet the government of Uganda and her partners have continuously invested a lot of funds, from the World Bank funded Agricultural Extension Project in 1992 to the current NAADS phase II, agricultural productivity has slowly grown with the maize crop fluctuating between seasons (Delgado, 2003; Fernandez-Cornejo, 2006; Okoboi, 2011; Okoboi, Kuteesa, & Barungi, 2013.

Agriculture is the dominant sector of Uganda's economy. This sector contributes about 21 percent to total Gross Domestic Product (GDP) and over 90 percent to total export earnings. It provides 80 percent of employment and most industries and services in the country are based on this sector. About 85 percent of the population live in rural areas of the country where they derive their livelihood from agriculture. Much of the agricultural production in Uganda takes place at household level essentially using household labor. It has been estimated that women contribute about 75 percent of the labor force. Agricultural production in the country is based on smallholder production. There are now about 2.5 million such holders who carry out rain fed agriculture and who, on average, cultivate less than 2 hectares mainly using a hand hoe (UBOS, 2007) and household outputs, adding **value** to production and ensuring a stable market for selected agricultural products.

One way of monitoring these objectives is through the establishment of a well organized Community Information System (CIS) supplemented by National Agricultural Statistics System (NASS) building blocks of:

- Population and Housing Census – Agricultural Module,
- Uganda Census of Agriculture and Livestock,

- Agricultural Sample Surveys under UNHS,
- Permanent Agricultural Statistics System and
- Other Institutions such as Meteorology Department etc.

These need to regularly report on the human population that exists in a given location and their characteristics, their economic status, the income of their households and the overall welfare of the communities in which they live.

1.1.2 Theoretical background

The study was based on the theory of production but it also showed the application of the economic efficiency theory and transaction cost theory in simple terms . The production theory explains the process of combining various inputs to produce an output for consumption (Battese, 1992).

The Production function signifies a technical relationship between the physical inputs and physical outputs of the firm, for a given state of the technology.

$Q = f(X1, X2, X3,\ldots,Xn)$

Where X1, X2, X3,…,Xn are various inputs such as land, labor, capital among others. In this study agricultural services like NAADS program, access to extension and access to markets are used as proxies for the inputs in this theory of production.

Q is the level of the output for a firm.

If labor (L) and capital (K) are only the input factors, the production function reduces to;

$Q = f(L, K)$

1.1.3 Conceptual back ground.

The study focused on two variables i.e. the dependent variable and independent variable

Dependent variable

The dependent variable was household crop production, of the selected crops that were measured as a continuous variable, depending on the different inputs used, extension services, technology used and it was measured in terms of maize and banana production quantities.

Independent variables

In this study the independent variable was inputs/extension services which was clearly explained or measured as;

(i) In puts including use of purchased seeds and seedlings, chemical fertilizers, variety seeds, pesticides and manure used.

(ii) Agricultural technology including adoption of practice with respect to: soil fertility management, crop protection and farm management; cropping system (pure and inter-cropping).

(iii) Extension: visit by any extension worker, number of visits, and participation in NAADS training program

1.1.4 Contextual Background

The study was carried out in Uganda as it is argued that there is a negative relationship between agricultural inputs and extension services and household crop production both in the short and long run.

1.2. Problem Statement

Uganda, like many developing countries in the world particularly those on the continent of Africa continue to increasingly find it extremely difficult for their escalating populations to be food secure yet part of the low food production is sold by the population. The only approach of increasing the incomes of these entirely rural subsistence farmers, who dominate the agricultural production systems in Uganda and with limited adoption to modern agricultural practices, is to increase agricultural production and its quality through provision and use of inputs such as pesticides, fertilizers, labour, machinery, high yielding seeds and above all extension services.

It should however be observed that with costs notwithstanding, Uganda registered a reduction in the number of people living in absolute poverty from 56 percent in 1992 to 38 percent in 2004. Despite Uganda's fertile soil and favorable climate, five percent of rural households continue to experience food insecurity. The economy grew by an average of 5.3 percent in the 2005/06 financial year, a reduction from 6.6 percent in the 2004/2005 period. The reduction in growth resulted mostly from a prolonged drought, leading to reduced agricultural production and other factors (FAO 2006). The hurdle is to know why

despite all above applications (including introduction of drought resistant crops), the food security situation still remains somehow un- certain and why most crop yields remain dropping towards under one ton/hectare (UBOS 2016) .From the agricultural report of FAO 2017, house hold crop production is still very low on the annual basis despite the government programs like NAADS, introduction of new methods of farming like the use fertilizers and herbicides and small scale improvement in technology all of which have been applied in almost in all the parts of Uganda since agriculture is the leading sector in the country. The study therefore seeks to establish the relationship between agricultural inputs/extension services and house hold crop production and examining the impact both in the short run and long run.

1.3 Objectives

The main objective of the study was to establish the relationship between agricultural inputs / extension services and household crop production.

The specific objectives included:

1. To find out whether there is a short run relationship between inputs/extension services and house hold crop production.
2. TO determine whether there is a long run relationship between inputs/extension services, and house hold crop production.

1.4. Hypotheses

1 H_O: there is no short run relationship between inputs/extension services and house hold crop production

2 H_O: there is no long run relationship between inputs/extension services and house hold crop production

1.5 Scope of the Study

1.5.1 Time Scope

The study considered values of input/extension services and total maize and banana household production figures from 1990 to 2017.

1.5.2 Subject Scope

The study focused on two variables i.e. inputs/extension services (IV) and household crop production (DV).

1.5.3. Geographical Scope

The study was carried out in Uganda by the use of secondary data.

1.6. Significance of the Study

This research will contribute to the growing literature addressing the issue of house hold crop productivity in developing countries with specific emphasis on the input and extension services.

The research findings will contribute to the ongoing academic debate about the contradictions of the long run and short run relationships between inputs/extension services and household crop production Uganda.

The research results will add on the existing literature, which will be used as reference by various academicians for further research conduction on this topic and other related issues.

The report will act as a requirement in fulfillment for the award of a bachelor's degree of Economics and applied statistics of Kampala International University for the researcher.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical review

The study is based on the theory of production. The theory explains the process of combining various inputs to produce an output for consumption (Battese, 1992).

The Production function signifies a technical relationship between the physical inputs and Physical outputs of the firm, for a given state of the technology.

$Q = \underline{f(X1, X2, X3,\ldots,Xn)}$

Where X1, X2, X3,…,Xn are various inputs such as land, labor, capital among others. In this study agricultural services as access to credit, access to extension and access to markets are used as proxies for the inputs in this theory of production.

Q is the level of the output for a firm.

If labor (L) and capital (K) are only the input factors, the production function reduces to;

$Q = f(L, K)$

The above production function describes the technological relationship between inputs such as land, labor, capital and output of the firm (Battese, 1992). In this study, the independent variable was agricultural services, specifically access to credit services, access to extension services and access to markets while the dependent variable was maize productivity. The household was considered to be both a maize farm and enterprise, just like in the production theory and uses various inputs such as access to credit services, access to extension services and access to markets to produce an output that is yield.

The strength of the theory of production is that it enables the understanding of the relationship between inputs and output, which benefits producers by minimizing the costs associated with inputs and consumers due to the lower prices derived from lower costs for the producer. This relationship is also essential in distinguishing between the short-run and the long-run, where the short-run is the period of time where at least one factor of production is

fixed and in the long-run all factors of production are variable and the state of technology changes.

However, notwithstanding its strengths, the theory of production has also weaknesses such as: it is extremely difficult to measure the productivity of a single employee, let alone measure how this productivity increases or decreases as one more worker is added, the theory does not explain the role and effect of legal and social limitations as well as it does not account for exogenous factors such as management which influence production.

The competing theories are the theory of economic efficiency (technical and allocative efficiency) (Chukwuji, *et al.*, 2006), the theory of the farm household (Barnum and Squire, 1997), and the transaction costs theory (de Janvry et al., 1991).

The theories of economic efficiency, whether technical and allocative efficiency measures only the technical or allocative efficiency of the firm, in this case the household (Barnes, 2008). Therefore the theory of production is better suitable for this study since it considers the amount of maize output per hectare.

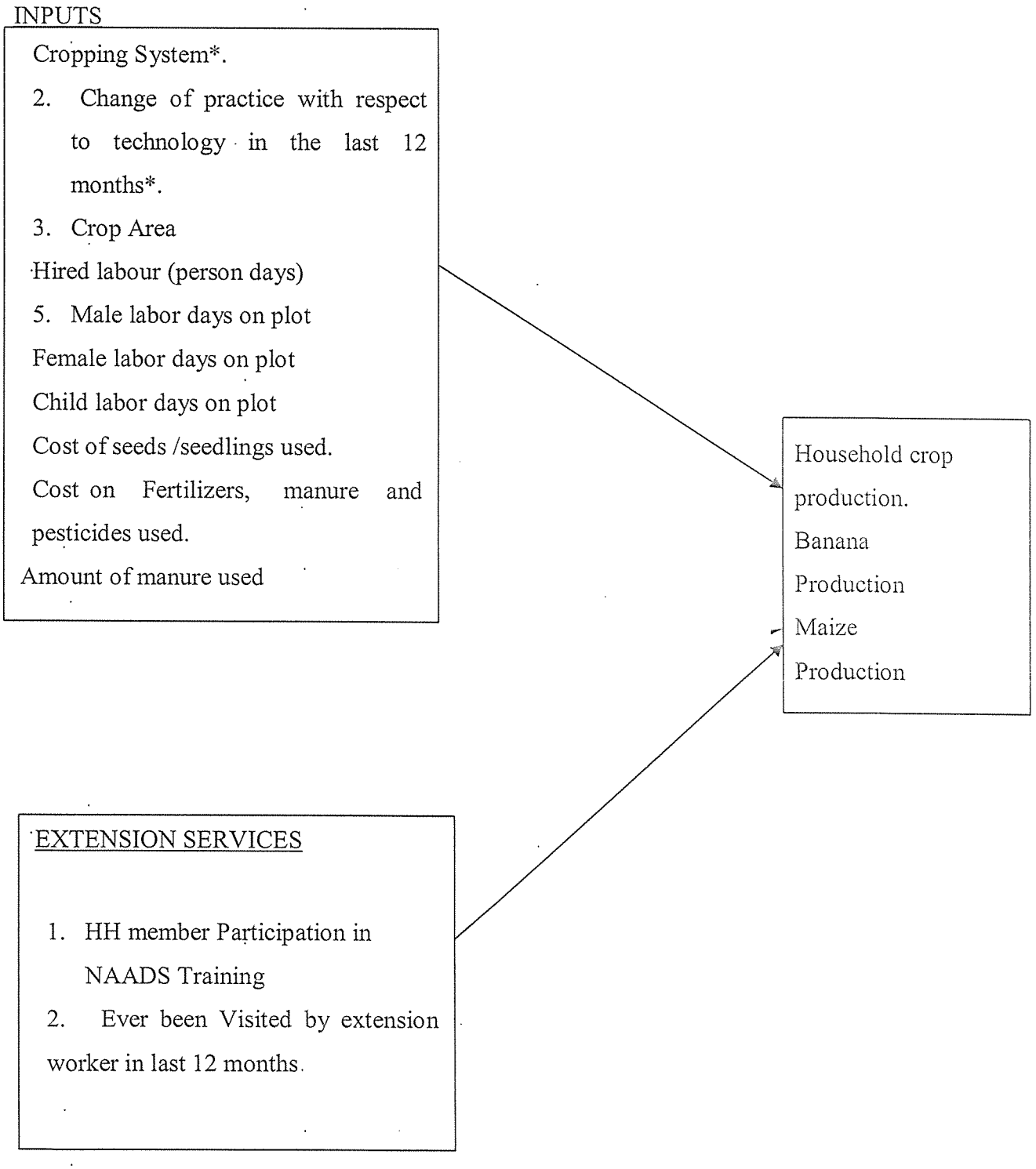
In the farm-household model, agricultural households are assumed to maximize utility subject to the production function and time and income constraints (Barnum & Squire, 1997). This is not a case for most households in Uganda which do not consider utility maximization and thus the theory of production will be better suitable for this study.

The transaction costs theory explains the farmers' behaviour in terms of transaction costs as a determinant in the input and output markets (de Janvry et al., 1991). Though, this is relevant with most of small holder maize and banana farmers; most times there are other determinants for the output markets. Therefore, the theory of production is better for this study.

Theory of production has been extensively used to the development work of most economies. In Uganda, the theory of production has been applied in the National Agricultural Advisory Services (NAADS) as one of five core programmes under the Plan for Modernization of Agriculture (PMA).

Other studies have also employed the theory of production to model production and productivity in agriculture and other sectors (Nyamekye, 2016; Felipe & Adams, 2005; Battese, 1992). Most of these have modelled productivity .

2.2 Conceptual Framework



- The figure above further elaborates how inputs/extension services(IV) were measured in particulars to describe their effect on the DV(House Hold crop production).The inputs were measured in terms of cropping System, Change of practice with respect to technology in the last 12 months, crop Area ,hired labour (person days),cost of seeds /seedlings used, cost on fertilizers, amount of manure and pesticide used. Extension services were measured in terms of HH member Participation in NAADS training and whether there HH has ever been visited by an extension worker in last 12 months AND house hold crop production was measured in terms of banana production and maize production.

2.3 Empirical review

2.3.1 Examining the short run effect of inputs/ extension services on household crop production.

The International Institute for Labor Studies – IILS (2006) showed that access to agricultural land is a necessary condition for making an agricultural livelihood/improvement in crop productivity in the short run, but it is not a sufficient condition. Livelihoods based on land depend on the mobilization of other factors of production - the mobilization of labor and application of a range of productive inputs, such as fertilizers, pesticides, animal traction, agricultural technology and improved implements. Secure livelihoods also depend on the maintenance of yields and the avoidance of agricultural practices which lead to land degradation.

The Food and Agricultural Organization (FAO) of the United Nations (1990) indicated that there is mounting evidence that Rural Non Farm (RNF) income is an important resource for farm and other rural households, including the landless poor as well as rural town residents in the short run. Further studies inferred that increasing the availability of inputs and improving access to market outlets will encourage farmers to engage swiftly in production and increase output in the short run. (FAO, 2001).

The factor bias of agricultural technology (labour-intensive or capital-intensive) and the seasonality of farm labour requirements influence the supply of labour to RNF employment. Crop technology may use labour so intensively that little is left for the family to use in off-farm activities. Such an image of labour-using agriculture constraining off-farm labour availability can be found in Asia's "monsoon economy", with marked seasonality in rice cropping owing to rainfall patterns. Planting and harvesting occupy labour in peak seasons of

farm employment. Demand for farm labour is generally low during the rest of the year, hence the need for off-farm sources of income during the slack period in the short run. However recent studies indicate that to improve household crop production in the short run, capital intensive techniques of production must be used though it still adopted at a lower scale in developing countries Uganda inclusive (FAO, 2016).

A recurrent theme of development policy in Africa the postcolonial period has been to "modernize" agriculture and improve productivity in the short run. This has many strands (Bernstein 1992), but an important component has been the promotion of greater marketed output, increased production and improved productivity through the application of modern inputs (fertilizers, new varieties, pesticides, herbicides). Bernstein suggests that there are three major approaches to "modernizing" agriculture when production is organized on the basis of peasant farms: (i) "the smashing of the peasantry through direct dispossession typically achieved by violence";

(ii) "'bypassing' peasant farming" through large scale production (capitalist or state farm) on unoccupied cultivable or grazing land; and

(iii) "to 'lock in' peasants (or at least those commanding adequate resources) through higher - and controlled- levels of input and credit use, and controlling (increased) output through the organization of marketing and processing, thus achieving greater specialization, and standardization. He further suggests that if the above approaches are put into consideration, house hold crop productivity increment is an assured deal in the short run.

The current productivity observed in the Ugandan farming community is very low in the short run, in many cases much lower than the genetic potential expressed under optimal conditions in research stations (NARO, Annual Reports, 2000–2005). This low productivity is due to soil fertility depletion, heavy reliance on basic indigenous technology including the use of unimproved and low-yielding planting material, limited practice of crop protection, high postharvest losses arising from inadequate storage and processing capacity, etc. (Ministry of Finance, Planning and Economic Development, 2013).

Accordingly, the PMA seeks to improve agricultural market input and output in the short run through various strategies, including: 1) improving the availability and timely distribution of high yielding, quick maturing, pest and disease-resistant planting and stocking materials; 2) encouraging the participation of the private sector in seed multiplication, processing and

marketing; 3) promoting the use of fertilizers by farmers; and 4) developing an effective network of stockiest to make vital inputs available and accessible to the farming community (Government of Uganda 20014).

Seed is a crucial input determining yield in the short run (Muhhuku 2002). If bio–fortified varieties are to attain rapid, widespread distribution through an efficient seed scheme must be in place. For grain crops this will be available with the setting–up of Uganda Seeds Limited (USL) and the proposed close linkages with NARO and NAADS. However, to date neither the Uganda Seed Project (USP) nor USL have dealt with vegetatively–propagated crops which are more prone to carrying disease from one generation to the next, have a slow rate multiplication and are often highly perishable thus can contribute to an improvement in the household crop productivity in the short run. A case in point is sweet potato, where experience throughout East and Central Africa have demonstrated that the maintenance of stocks to have a timely and adequate supply of planting material at the onset of the rains is a major production constraint. Uganda Seeds Limited has hitherto only been concerned with grain crops, thus alternative schemes must be developed for the vegetatively propagated crops.

A major factor influencing yield is seed quality. The seed industry in Uganda is largely undeveloped, with farmers relying almost entirely on their own low-yielding seed supplies thus hindering productivity in the shortrun.TO improve productivity in the short run, proper governance must be in place and better food organizations must be formed. Parliament of Uganda 2001.

The National Agricultural Advisory Service (NAADS) equates to the first pillar of the PMA and began operations in 2001, but was officially promulgated in the National Agricultural Advisory Services act (2005). The mission of the NAADS, which replaces the previous extension services, is to increase farmer access to information and technology through effective, sustainable and decentralized advisory services with increased private sector involvement (Government of Uganda 2000).presently the NAADS program has crossed all the regions of Uganda to improve crop productivity in the short run as it is giving quality maize seedlings and many others ,new breeds of live stock and it has assisted in giving knowledge about controlling the banana bacteria wilt disease which had almost cubed down matooke production in western Uganda.(government of uganda 2017).

2.3.2 Examining the Lon run relationship between input/extension services and household crop production.

FAO (1958) demonstrates sustained production and conservation as aims of agriculture but the population worldwide falls short of meeting this aim as there is still food shortages and soils are deteriorating because of decrease in fertility and organic matter and it is still predicted in the long run due to continuous population increase.. Loss of soil fertility leads to low crop productivity and inputs such as fertilizers facilitate the farmer to raise yields of crops such as maize, banana (Food-type), rice and coffee. Therefore, all efforts made to increase agricultural efficiency and hence production / productivity, more inputs, agricultural technology as well as extension advise receipt is paramount in the long run.

African New Economic Network (ANEN) Ugandan NGO partners emphasize similar agro-ecological practices (intercropping, zero grazing, agro forestry, botanical pesticides, etc.). The adoption level by farmers of the various techniques promoted by Talent Calls Clubs (TCC) and Joint Effort to Save the Environment (JESE) located in Goma Sub-county on the outskirts of Kampala yielded some results. It is interesting to note that those techniques requiring the purchase of equipment or other inputs, even modest, tend to have low adoption rates. For example, due to the simplicity and efficacy of the method, it was expected that liquid "manure", a fertilizer made from green leaves, would be widely adopted. However, out of 25 farmers trained in making liquid manure, only 9 were seen using this technique in follow-up visits. The Community Action for Rural Developments-CARD (active in Lugolole parish, a savanna area in Eastern Uganda 1989) staff explained that the purchase of the relatively cheap containers needed to hold the liquid prevented wider adoption. Similarly, demonstrations on making solar ovens did not lead to the adoption of the technique because the ovens require glass, which costs US $20.

In contrast, techniques that are low-cost or based on local resources exhibited wider adoption. For example, a workshop conducted by CARD with farmers on making fuel-efficient mud stoves using locally-available clay resulted in 75 out of 100 farmers adopting this kind of stove. Similarly, 30 farmers received training on mulching as a way to retain moisture, control weeds, reduce soil erosion, and add organic matter to the soil. The mulch is made of crop residues available on-site and was adopted by 42 farmers. As a last example, all 48 farmers receiving training from TCC on intercropping banana or plantain, with other crops like beans and passion fruit, eventually ended up practicing intercropping and application of other inputs (Toler, D.L. 1996.).

Uganda has one of the lowest crop and livestock yields in Sub- Saharan Africa (SSA), despite an excellent agro-climatic environment (yields on research stations are 2 to 5 times higher than farm yields). It is widely believed that the stagnation of agricultural productivity in Uganda can be traced to little use of modern inputs, yet about 30 percent of Ugandan soils are categorized as being of low productivity.

One of the important factors underlying the low level of modern input use is lack of an efficient distribution system that would ensure timely availability of inputs at reasonable prices. To increase agricultural productivity in Uganda in the long run, there is need to use productive inputs like fertilizer, pesticides, high-yielding crop varieties, and improved livestock breeds. There is need to carry out studies on productivity efficiency and input use, and to determine product-input combination and product-product mix (IFPRI, 2003).

Agricultural extension in Uganda has undergone a number of transformations from regulatory 1920- 1956, advisory 1956-1963, advisory education 1964-1971, dormancy 1972-1981, recovery 1982- 1999, educational 1992-1996, participatory education 1997-1998, decentralized education 1997- 2001 and now agricultural services under contract extension systems. Each of those up to 1997- 2001 had strengths to build on and weaknesses to change or improve, but had challenges of the socio-economic and political environment. In addition there have been marked changes in the concept of agriculture, which is increasingly seen in terms of commercial or farming for market with emphasis on modernization of agriculture and use of participatory approaches in the process.

All evolutions over time through transformation into unsustainable service were for several reasons; There was no policy on agricultural extension until the establishment of National Agricultural Advisory Services (NAADS), the transformation of extension did not build on the strengths of the past, the relied upon expert advice has mainly been foreign more than local and the dependence on donor funding; The policy and mechanisms to empower the farmer to demand, pay and control extension services are in place (*Semana, 1999*).The dilemma is that the majority of the Ugandan farming community is predominately peasantry/subsistence with a small fraction that can be regarded emergent farmers. Such population may not respond sustainably to the now farmer owned contract extension system including changing patterns of donors.

The National Agricultural Advisory Service (NAADS) equates to the first pillar of the PMA and began operations in 2001, but was officially promulgated in the National Agricultural Advisory Services Act (2005). The mission of the NAADS, which replaces the previous extension services, is to increase farmer access to information and technology through effective, sustainable and decentralized advisory services with increased private sector involvement (Government of Uganda 2000). The NAADS is strongly orientated towards commercializing agriculture and improving the linkage between farms and markets and focuses on a decentralized, demand-driven approach to the provision of extension services thus improving production in the long run. Farmer contributions and matching grants from local and national government authorities, along with farmer contributions, are used to contract private service providers to advise them on technology, thereby replacing the old bureaucratic extension system with a programme that offers the farmers a much greater level of ownership and accountability (ASWG, 2003; Faye et. al, 2005).

The NAADS Programme initially covered 6 districts in 2001/02, but an aggressive rollout from 2004 into early 2006 brought the total coverage to 47 districts and 344 sub-counties (ASPS II 2005). The programme expansion was planned in a geographically-phased manner to ensure that sufficient capacities, both in terms of staff and target groups, were available for successful implementation. According to this plan, all districts should be incorporated into the NAADS Programme by the end of 2008 (ASWG, 2003).

As of July 2003, 5005 farmer groups had registered with the NAADS, and a further 3633 groups had registrations pending. Notably, approximately 60 percent of the group members were female. In addition, 2243 technology development sites had been developed at an approximate cost of 540 million Uganda Shillings, and were being utilized by 42,918 farmers. A total of 51 different improved technologies relating to a range of enterprises, including temperate fruit trees, honey production, livestock and fish, were being tested at these sites (ASWG, 2003).

In the districts and sub-counties that had not yet been included in the NAADS Programme, graduates of the programme were employed to provide advisory services to farmers. MAAIF provided logistical support, mainly in the form of motorcycles and training, and most of the operational expenses were covered by the local governments.

As of December 2014, the NAADS was serving approximately 15,000 farmer groups, with an average of 19.7 farmer households per group. Thus, some 600,000 rural households

(approximately 2.5 million individuals) had received or were receiving advisory services from NAADS at that time (Faye et. al, 20015) The formation of farmer groups under the NAADS programme has resulted in: (a) improved organization and financing of beneficiaries (farmers) at the local level, allowing them to demand better service provision; (b) improved access to information, including better technology at the technology development sites; and (c) farmers having greater input into planning processes at the local government level, resulting theoretically, at least in plans that should meet local-level needs more effectively, accessing credit facilities, promoting female household crop productivity to increase productivity levels in the long run.(ASWG, 2003).

Low productivity of Ugandan farmers both in the short and long run is attributed to research and extension services that are not adequately demand-driven and low use of new technologies by farmers even when they are available. Uganda's Plan for the Modernization of Agriculture assigns first priority to agriculture extension and research, focusing on achieving greater relevance in both the research and extension programs. This effort is supported by a multi-donor National Agricultural Advisory Services Project (NAADS)– designed to make poor farmers aware of and equipped to adopt, improved technology and management practices. By the end of 2006, the project was operating in 37 districts out of a total of 80. By the end of 2007, it is expected to have reached 64 districts. Surveys carried out in 2006 indicated that farmers in those counties covered by the NAADS Project are adopting technologies that lead to real improvements in yields and farm incomes. Productivity of those farmers is reported to be 27 percent higher than those in areas not currently served by the project (IDA/World Bank, 2007).

It should be noted that;

- The NAADS project continues to expand rapidly.
- 64 percent of farmers groups have reported replicating some aspects of the new project technology on their own fields.

Agricultural transformation is seen to start by increasing the productivity per unit area through adoption of high-yielding, pest and disease-resistant crop varieties, use of appropriate crop and animal husbandry practices, maintenance of soil fertility through use of organic and inorganic manures, and the development of soil water management skills (MAAIF/MFPED, 2000).

In an effort to make agricultural research more needs-oriented, the Government of Uganda carried out an extensive review of the entire National Agricultural Research System (NARS), under the auspices of the PMA in 2001. The overall objective was to create a more decentralized and demand-led NARS. Based on the findings of this review, a National Agricultural Research Policy was produced and approved by Government in 2004 (MAAIF, 2004).

The new policy will ensure that: (a) technology decisions are made only after the issue has been discussed by representatives of all groups likely to be affected by the activities/decisions; (b) each new technology will be considered in terms of its costs and benefits, including the opportunity costs of the required inputs and the market prospects for increased output; and (c) researchers and advisors will examine potential risks and labor requirements and their possible effects on different categories of people in rural households and will discuss their findings with the relevant groups (e.g. farmers) prior to enactment. In this way, it is hoped that the future technologies developed and made available under the NARS will better reflect and address the problems experienced by various categories of farmers, especially resource-poor individuals such as women and children (ASWG, 2003).

Enactment of the National Agricultural Research Policy was delayed until June 2005. However some activities within the Agricultural Research Programme began at the start of fiscal year (FY)

2004/05 (Government of Uganda 2004; TJRPMA 2004). Recent efforts by NARO to increase its outreach activities and decentralize research under the new NARS policy have resulted in the initiation of an Outreach and Partnership Initiative (OPI) for establishing Agricultural Research and Development Centers (ARDCs), which are located in key ecological zones, where they intend to: 1) improve the efficiency and effectiveness of agricultural research services; 2) promote and solicit for specific zonal agricultural demands; and 3) assess technologies suited to particular zones. The OPI initiative has resulted in a high level of participation from farmers and other individuals in the private sector, and the ARDCs are run by steering committees composed of district officials, politicians and farmers who are tasked with planning and implementation from the zonal to sub-county levels. At each level, workshops quite often precede research activities, and in many cases, the private sector has become involved in promoting the new technologies (ASWG, 2003).

CHAPTER THREE:

METHODOLOGY

3.0 Introduction

This section presents the procedures that were followed in execution of data so as to arrive at statistically meaningful results. The section contains the research design, study population, sample size, data type and source, data methods/techniques, data processing and analysis, model specifications and problems and solutions.

3.1 Research Design

The study focused on time series data about inputs/extension services and household crop production therefore; quantitative research design was used.

3.2 Study population

The study population was the whole of Uganda as agriculture is the leading sector in Uganda thus being out in all the parts of the country and affected by different weather conditions. Therefore it is not easy to use a small case study to describe the overall production

3.3 Sample Size

The study used a sample of annual data from1990-2017 thus the sample size was considered to be 27 data points in this report.

3.4 Data Type and Source

The study used secondary data about banana and maize production quantities from the Crop Survey module of the Uganda National Household Survey 2016/2017 from the website of UBOS .

3.5. Methods/ Techniques

3.5.1. Dependent variable

The dependent variable was the house hold crop production, of the selected crops that was measured as a continuous variable, depending on the different inputs used, extension services and technology used.

3.5.2. Independent variables

These included:

(i) Inputs including use of purchased seeds and seedlings, chemical fertilizers, variety seeds, pesticides and manure used.

(ii) Technology including adoption of practice with respect to: soil fertility management, crop protection and farm management; cropping system (pure and inter-cropping).

(iii) Extension: visit by any extension worker, number of visits, and participation in NAADS training program

3.6 Model Specification

The model below was fit to determine the overall relationship between inflation and economic growth

House hold crop production= a+binputs/extension services

Where house hold crop production is the DV, a is the constant, b is the slope/gradient and inputs/extension services is the IV.

The model below was fit to test the long run and short run effect of inflation on GDP.

$HHPt = a + \Sigma biIESt\text{-}i + et$

Where

HHPt = house hold production figures in the current year

IESt-i = lagged value of input/extension services

et = the error term.

3.7 Data Analysis and presentation

Data was obtained from the Crop Survey module of the Uganda National Household Survey 2016/2017 from the website of UBOS as it is carried out annually and results are presented according to the unnual performance .Data was analyzed using stata, spss and minitab statistical packages and the results were presented using tables and outputs.

3.8 Data used.

YEAR	House hold Crop Production	In puts/Extension services
1990	4.534250255	189.9751145
1991	2.725358116	115.446731
1992	2.908881717	44.38008967
1993	2.094678075	26.0193367
1994	0.087752152	45.06802909
1995	4.902509814	30.13687145
1996	3.104710383	6.848497549
1997	8.126671806	9.37643764
1998	5.81417017	4.57248128
1999	2.006902006	3.09526852
2000	1.818172994	8.785706852
2001	4.818175569	-0.11313055
2002	-0.0328829	11.11730588
2003	1.852412846	4.534475811
2004	5.211469456	-3.169556342
2005	2.972718241	7.806740874
2006	3.273946331	15.58754999
2007	2.814977774	-1.741185294
2008	7.123188525	2.405620218
2009	4.830122611	7.321247318
2010	5.124893046	6.364276547
2011	3.259682897	34.00744492
2012	2.22404842	10.57880648
2013	5.846880939	6.155820696
2014	0.489713884	21.71429596
2015	0.238341952	4.031526918
2016	1.816473956	3.440116351
		5.079794909
2017	1.778222756	

Source: Crop Survey module of the Uganda National Household Survey 2016/2017 from the website of UBOS .

CHAPTER FOUR

DATA ANALYSIS

This chapter consists of statistical outputs, tables, conclusions and simple inferences about the findings of the study.

4.1 Agricultural inputs / extension services and house hold crop production

The purpose of the study was to determine the relationship between agricultural inputs/extension services and house hold crop production

4.1.1Testing for normality

Variable	Method	Results	Significan value
House hold crop production	Sharpilo wilkson(RJ)	0.982	0.01
	Anderson and darling(AD)	0.46	0.294
Agricultural inputs/extension services	Sharpilo wilkson(RJ)	0.728	0.01
	Anderson and darling(AD)	0.452	0.005

Table 2: Normality Results

The results from table two obtained from Minitab show that both agricultural inputs/extension services and house hold crop production are normally distributed using the Sharpiro Wilkson(RJ) test and Anderson and darling (AD) tests for normality .For RJ, if the value is approaching to one, we conclude that normality exists and for AD if the value is approaching zero, we conclude that data is normally distributed.

4.1.2 Correlation analysis.

Package	Correlation coefficient	Significant value
Stata	-0.0122	
Minitab	-0.012	0.951

Table 2: Correlation Results

Results from table 2 show that there is a weak negative correlation between agricultural inputs/extension services and house hold crop production of -0.012 with a significant value of 0.951 implying that there is a weak negative linear relationship between the variables.

4.1.3 Testing for Autocorrelation

Durbin's alternative test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	0.389	1	0.5328

H0: no serial correlation

Output 1: Autocorrelation Results

Durbin Watson test for autocorrelation was used and the criterion is that reject HO that there is no serial correlation if prob>chi2 is less than 0.05. From the output below, since the prob>chi2 =0.5328 is greater than 0.05 we accept HO that there is no serial correlation .This implies that correct results about between agricultural inputs/extension services and house hold crop production are obtained.

4.1.4.1Unit root test

Test	Macro economic variable			Test static	Prop
Dickey Fuller	House hold crop production			-4.39	0.003
		Test critical value	1%	-3.736	
			5%	-2.994	
	Agricultural inputs/Extension services			-8.935	0.000
			1%	-3.736	
			5%	-2.994	

Table 3: Dickey Fuller Results

The study used dickey fuller test at 5% level of significance.

Ho: The time series data is non-stationary; the criterion is that if the test statistic is more negative or in absolute terms is greater than 5% level of significance, reject Ho.

Results of unit root tests reported in table 3 shows that there is stationarity in time series about data on both agricultural inputs/extension services and house hold crop production using the Dickey fuller test of unit root.

4.1.4.2 Johansen test

Corrgram house hold crop production

LAG	AC	PAC	Q	Prob>Q	[Autocorrelation]	[Partial Autocor]
1	0.1231	0.1261	.47116	0.4925		
2	0.0044	-0.0093	.47179	0.7899		
3	-0.0029	0.0034	.47207	0.9250		
4	-0.1908	-0.2401	1.7464	0.7823		
5	-0.1881	-0.2426	3.0384	0.6941		
6	-0.2316	-0.3325	5.0867	0.5327		
7	-0.0914	-0.2266	5.4206	0.6088		
8	-0.0760	-0.2596	5.663	0.6849		
9	0.0596	-0.0906	5.8202	0.7578		
10	-0.0635	-0.5111	6.0086	0.8145		
11	0.0985	-0.3856	6.4881	0.8389		
12	0.1998	-0.1266	8.5841	0.7380		

. corrgram inflation

LAG	AC	PAC	Q	Prob>Q	-1 0 1 [Autocorrelation]	-1 0 1 [Partial Autocor]
1	0.5072	0.5131	8.0042	0.0047		
2	0.1853	0.0773	9.1132	0.0105		
3	0.1515	0.2817	9.8848	0.0196		
4	0.1612	0.0407	10.794	0.0290		
5	0.0594	0.1862	10.923	0.0529		
6	-0.0330	-0.1227	10.964	0.0895		
7	-0.0412	0.0224	11.032	0.1372		
8	-0.0508	0.1020	11.141	0.1939		
9	-0.0582	-0.0459	11.291	0.2563		
10	-0.0715	-0.0234	11.529	0.3178		
11	-0.0760	0.5462	11.814	0.3778		
12	-0.0537	-0.4724	11.966	0.4484		

Output 2: Johansen Stationarity Results

The criteria is that if the prob>Q is less than 0.05 we reject Ho that time series data is stationary. from the results in output 2, it is evident that all the probabilities are greater than 0.05 for house hold crop production thus we accept H_O that the times series data is stationary and from the results about inputs/extension services it is shown that majority of the probabilities are greater than 0.05 therefore we also accept Ho that the series are stationary.

4.1.5 Regression Analysis

House hold crop production	Coefficient	Standard error	t-value	p-value
Agricultural inputs/Extension services	-0.0006	0.0102	-0.06	0.951
Constant	3.291	0.463	7.11	0.000

Table 3: Regression Results

Regression Equation

House hold crop production = 3.291 - 0.0006 **inputs/extension services**

The regression output above was obtained from stata to determine the relationship between agricultural inputs/extension services and house hold crop production in Uganda and it shows that a unit change in agricultural inputs/extension services leads to a decrease in household crop production by 0.0006 and that without agricultural inputs/extension services , there is a positive change in economic growth by 3.291 meaning that agricultural inputs and extension services have not yet been implemented actively.

4.2 Long run effect on of Inflation on Economic Growth

The first specific objective of the study was to find out whether there is long run effect on of Inflation on Economic Growth

4.2.1 Lag selection.

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-144.43				683.211*	12.2025*	12.2285*	12.3006*
1	-141.885	5.0898	4	0.278	773.244	12.3237	12.4019	12.6182
2	-139.942	3.8846	4	0.422	926.878	12.4952	12.6254	12.9861
3	-133.248	13.388*	4	0.010	757.347	12.2707	12.453	12.9579
4	-132.459	1.5796	4	0.812	1032.12	12.5382	12.7726	13.4218

Endogenous: householdcropproduction inputsextensionservices
Exogenous: _cons

Output 3: Lag Selection Results

The above statistical output 3 was obtained from Stata, the criterion is that where we see a star, they are the number of lags to be selected, and we make a conclusion basing from where majority of stars lie. From our output, LR requires us to select 3 lags but FPE, AIC, HQIC and SBIC show that we should select no lag.

4.2.2 Testing for Cointegration

Maximum Rank	Parms	LL	Eigin value	Trace statistic	5% Critical value
0	2	-187.8144		57.6107	15.41
1	5	-167.10548	0.78433	15.5928	3.76
2	6	-159.30906	0.43871		

Table 4: Co integration Results

This test was used to give evidence whether there is a long run relationship between agricultural inputs/extension services and house hold crop production thus presence of cointegration indicates that there is a long run relationship between the two variables of the study.

Unit root tests have shown that both agricultural inputs/extension services and house hold crop production are integrated of order one. Therefore, we had to test for co integration between these two variables to check whether they have a stable long-run equilibrium relationship. The Johansen test of co integration using the trace statistic was conducted. The lags to enter the system were chosen using FPE, AIC HQIC and SBIC which all chose 0. The results using the trace statistic are presented in the table above.

Ho :there is zero co integrating equations ,the criterion is that if the trace statistic is greater than the critical value at 5% level of significance, reject H_O

From table 4Since the trace statistic at r = 57.6107 is greater than its critical value of 15.41, we reject the null hypothesis that there are zero co integrating equations at five percent level of significance. Therefore, we conclude that agricultural inputs/extension services and house hold crop production are co integrated. This means that, a linear combination of agricultural inputs/extension services and house hold crop production will lead to a long-run stable equilibrium relationship.

4.3Short run effect on of Inflation on Economic Growth

The first specific objective of the study was to find out whether there is a short run effect of agricultural inputs/extension service on house hold crop production.

4.3.1 Vector Autoregressive model

This was used to explain objective one that is testing for a short run relationship and to give further evidence about objective two

Beta	coefficient	Standard error	Z	p>|z|	Lower interval at 95%	Upper interval at 95%
Household crop production	1					
Inputs/extension services	0.2354623	0.0346318	6.80	0.000	0.1675853	0.303393
Constant	-4.916669					

Table 5: Vector Autoregressive Model

The model, HHPt = -4.9166+0.2355 IESt-i was obtained to test the short run and long run relationship between agricultural inputs /extension services and house hold crop production.

Ho: There is no short run relationship, the criterion is that if the z- statistic is less than 0.05, reject Ho

From the output above since the z- value is greater 0.05, we accept Ho that there is no short run relationship and the negative value of a constant indicates that there is a long run relationship between agricultural inputs/extension services and household crop production.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.0 Introduction

This chapter presents the summary of the findings from the model used by the author, the conclusion basing on the objectives of this paper and the results from the model, the recommendations mainly for policy makers and finally the areas for further research.

5.1. Summary of findings

The objective of this study was to investigate the effect of agricultural inputs/extension services and house hold crop production in Uganda for the last 27 years (1990 to 2017) using Vector Error Correction Model and regression analysis.

The Author performed a correlation analysis and the result revealed that there is a weak negative correlation between agricultural inputs/extension services and house hold crop production of about 0.012 and the negative relationship is theoretically expected.

The regression analysis-using stata gave evidence that a unit change in inputs /extension services leads to a decrease in house hold crop production by 0.0006 and that without inputs/extension services, there is a positive change in house hold crop production by 3.291.

R square equal to 0.01% means that the variations in inputs/extension services can explain the variations in house hold crop production by 0.01%.

The unit root test for stationary using dickey Fuller test and johansen test revealed that the two variables were stationary after the first difference i.e. integrated of order one I(1) and SIC for selecting lags indicated that the data needs no lag . Then the johansen Co integration test was conducted and this indicated that there was one co integrating equation suggesting the existence of a long run equilibrium relationship, in addition the negative coefficient of the Error correction term confirmed the existence of the long run equilibrium relationship.

Vector Error Correction Model also revealed that there is no short term relationship between inputs/extension services and house hold crop production as revealed by Erriscsson, iron and Tryon (2001) in their research about agricultural in puts and crop production in Uganda.

In conclusion the researcher released that there is a long run relationship between agricultural inputs/extension services and household crop production and as reviewed by FAO (2014). "Rural Non-Farm Income In Developing Countries

5.2 Policy Recommendations.

Basing on the findings, Uganda should ensure that agricultural inputs/extension services like NAADs are monitored and implemented successfully in the short run as it affects house hold crop production in the long run.

Results also indicate in the short run the inputs/extension services are not effective meaning that some parts of the country have not seen the essence of such government programs; therefore the government should put new policy measures on how to extend the services to all households in the short run to attain better results in the long run.

5.3. Areas for further research.

This research used data of only two crops that is banana and maize and also a few indicators of inputs and extension services therefore the data obtained gave a weak negative correlation and this justifies the small R-Squared value in the model therefore for any other research on house hold crop production more so in developing country like Uganda, more crops like coffee and beans should be involved and others services not only NAADS such as local council agricultural training schemes should be involved to give a true image of house hold crop production in Uganda.

Though the empirical results show that I used a good model (VEC), I believe if more data points were taken this research could yield more better results therefore there is need to adopt more than 27 data points in this kind of research and, there is an assumption that its greatly related therefore a need to have a wider range of period.

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APPENDICES

Appendix 1: Regression analysis

```
. reg householdcropproduction inputsextensionservices
```

Source	SS	df	MS
Model	.017690099	1	.017690099
Residual	119.065297	26	4.57943451
Total	119.082987	27	4.41048101

Number of obs	= 28
F(1, 26)	= 0.00
Prob > F	= 0.9509
R-squared	= 0.0001
Adj R-squared	= -0.0383
Root MSE	= 2.14

householdcropproduction	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
inputsextensionservices	-.0006343	.0102061	-0.06	0.951	-.0216134	.0203447
_cons	3.291392	.4630668	7.11	0.000	2.339545	4.24324

Appendix 2:correlation analysis

```
. cor householdcropproduction inputsextensionservices
(obs=28)
```

	householdc~n	inputsexte~s
householdc~n	1.0000	
inputsexte~s	-0.0122	1.0000

Appendix 3:lag selection

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-144.43				683.211*	12.2025*	12.2285*	12.3006*
1	-141.885	5.0898	4	0.278	773.244	12.3237	12.4019	12.6182
2	-139.942	3.8846	4	0.422	926.878	12.4952	12.6254	12.9861
3	-133.248	13.388*	4	0.010	757.347	12.2707	12.453	12.9579
4	-132.459	1.5796	4	0.812	1032.12	12.5382	12.7726	13.4218

Endogenous: householdcropproduction inputsextensionservices
Exogenous: _cons

APPENDIX 4: Augmented Dickey Fuller Test

```
. dfuller householdcropproduction

Dickey-Fuller test for unit root                   Number of obs   =        27

                         ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -4.391            -3.736            -2.994           -2.628
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0003

. dfuller inputsextensionservices

Dickey-Fuller test for unit root                   Number of obs   =        27

                         ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -8.935            -3.736            -2.994           -2.628
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

Appendix5: Normality test

```
. swilk householdcropproduction

                    Shapiro-Wilk W test for normal data

    Variable |   Obs        W           V          z       Prob>z
-------------+--------------------------------------------------
 householdc~n |    28    0.95995       1.210      0.392    0.34765

. swilk inputsextensionservices

                    Shapiro-Wilk W test for normal data

    Variable |   Obs        W           V          z       Prob>z
-------------+--------------------------------------------------
 inputsexte~s |    28    0.55047      13.575      5.370    0.00000
```