A STUDY TO ASCERTAIN THE COST OF AGRICULTURAL EXTENSION TO PERFORMANCE OF KEY PRODUCTIVE SECTORS OF THE ECONOMY BESIDES AGRICULTURE

DO INVESTMENTS IN AGRICULTURAL EXTENSION DELIVER POSITIVE BENEFITS TO HEALTH, TRADE, WATER AND ENVIRONMNENT: A REVIEW

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CARITAS– 03/11/2017

Background: Attaining the middle income status by 2040

- Requirements
  - Per-capita income should be raised from $506 to $9500 from 2010 to 2040
  - Poverty should be reduced from 24.5% to 5%
  - This can be achieved through increased agricultural productivity through structural transformation
- The expectations and likely impacts from increase agricultural productivity
  - Increased trade volumes
  - Industrialization through agriculture- value addition
  - Increased use of agricultural inputs
  - Increased farm size

Likely impacts of agriculture to health?

- Agriculture supports health
  - Providing nutritious food
  - Income for seeking medical treatment
- Agriculture can also increase the risk of diseases
  - Water related illness (typhoid, malaria, intestinal warms,….)
  - Aflatoxin- Liver cancer
  - Food borne diseases
  - Zoonotic diseases
  - Pesticide poisoning- Neurodegenerative diseases (Parkinson), asthma,..
- Agricultural also recovery from illnesses
  - Antimicrobial resistance –irresponsible and imprudent use AM
    - Prolonged periods of sickness, hospital acquired infection
    - Annual hospitalization costs

Likely impacts to Trade, Water and Environment

- Agriculture, trade and industry
  - Agricultural output is an input trade
  - Source of raw material to industry
- Agriculture creates negative externalities to agriculture
  - Deforestation
  - Swamp reclamation
  - Biodiversity loss
  - Salinity of the soil –in irrigated lands
- Water
  - Pesticides and herbicides- diseases
  - Salinity – reduced crop productivity
  - Fertilizer and utilization in water

What can agricultural extension help with?

- Providing in information and technology transfer
  - Input use
  - Quality – food safety
  - Value addition
- Increased agricultural production
  - Increase farmers knowledge of the agricultural technologies
  - Ensuring that proper use of agricultural technologies
- Increased trade volumes
  - Increased export volumes –reduce the widening BOP
  - Value addition and employment – Improving the TOTs
- Reducing the negative externalities
  - Disease burden

Extension is important: What is the problem

- Issues with agricultural extension
  - Uganda's farmers access is only 12% which very low
    - Only 1200 extension officers exist- administration and biased to crop
  - Access efforts are limited by resources
    - Financing deficits
- Why is there less investment in AE
  - AE is public good
  - AE does not have political gains
  - Benefits AE are indirect to human beings
  - Bounded rationality of political policy makers- limited information
  - Limited research to quantify the Total Economics Benefit of AE
    - Challenges in estimation and attribution

Research Objectives

1. To provide an overview of agricultural extension in Uganda
2. To identify gaps and areas of advocacy in the laws and policies that govern extension service delivery in Uganda
3. To document the linkages between AE and performance of those sectors
4. To document the analytical trends between performance areas in those selected sectors and the performance of AE
5. To establish the value of each shilling or dollar invested in Agricultural Extension
6. Make recommendations on collaborations and joint investments between those sectors on the impact of inadequate prioritization of extension service delivery

Research Questions: What is the problem

- Specific question
  - What are developments in agricultural extension in Uganda
  - Are their gaps and opportunities for advocacy in policies and laws governing AE
  - What are the existing linkages between AE and performance of infrastructure trade and industry, health and water and environment?
  - Do we have evidence on impact of AE and performance of infrastructure trade and industry, health and water and environment?
  - What is the value of the shilling invested or the Cost of not investing in Agricultural Extension relative to these other sectors?
  - What are the trade-offs of not investing or investing in AE to other sectors?

Research Methodology: Data Collection

- The study applied mixed methods
  - Qualitative and quantitative data
  - Mostly secondary data
- Qualitative data
  - Policy documents and laws
  - Published reports
    - Government, research institutions and think tanks
  - Working paper series
    - (IFPRI, EPRC, IITA and other CGIAR group members, OECD)
  - Refereed journal articles
- Quantitative data
  - MAAIF and ministry of finance , UBOS
    - AE expenditures, exports , and imports
    - Household surveys

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OVERVIEW OF THE DEVELOPMENTS IN AGRICULTURAL EXTENSION IN UGANDA

Agricultural Extension in Uganda: Why it matters?

Introduction

- Agriculture is a key sector for sustainable development and poverty reduction in Uganda
  - Employs 72% of its labour force
  - It led to reduction of poverty from 53.2% in 2006 to 19.6% in 2013
  - In 2017, poverty has risen to 27% due to drought

- Poverty is likely to continue to rise
  - Agricultural growth rate is 1.5%
  - Population growth rate is 3.3%
  - There is need to increase agricultural productivity

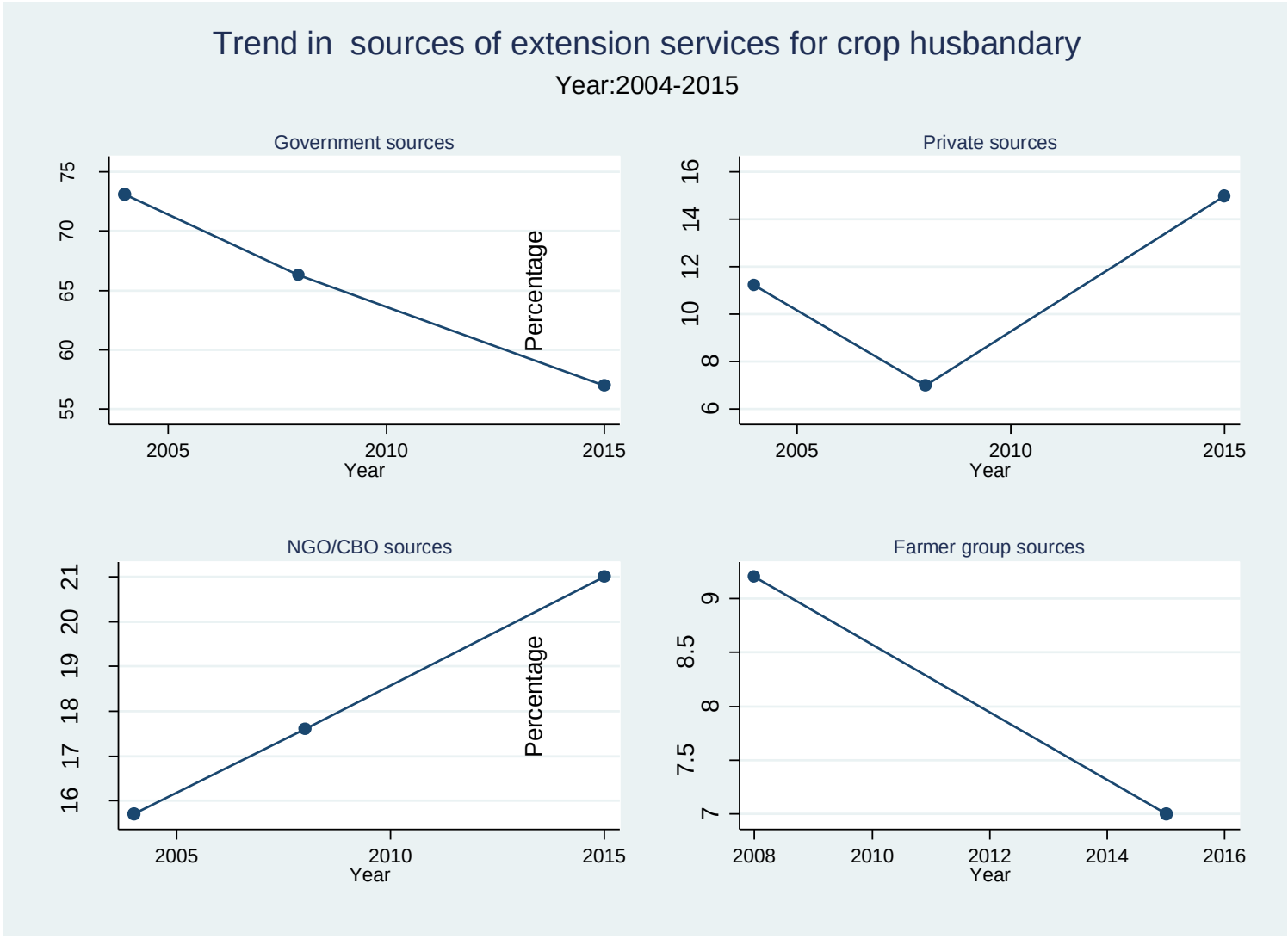
Agricultural Extension in Uganda: Why it matters?

- What can be done to increases agricultural productivity
  - Promotion and development high yielding, drought tolerant, pest and disease resistant varieties
  - Increased use of fertilizers and pesticides
  - Improving market access
  - Better use of technology
- Are we not using modern inputs -
  - Use of modern inputs is no longer universally low
  - In Uganda use of agro-chemicals is low
  - Use of improved seed especially maize is high
    - But quality and misuse is the problem
    - Farmers do not have knowledge of the technologies (53% did not the varieties they cultivated and only 2% can correctly identify
    - In livestock quality is a big problem

The delivery of extension services in Uganda

- Evolution of extension services
  - From independence: Uganda adopted Train and Visit system
  - In the late 1980s and early 1990s this was abandoned because of fiscal challenges
  - AEs were privatized and decentralized
- The reform was expected to reduce administrative costs but this did not happen.
- In 2000, new model (NAADS) was introduced
  - One of the pillars of PMA-framework for poverty eradication
  - NAADS- strengthen farmer capacity to demand and manage advisory services

The effects of NAADS on Agricultural Extension delivery



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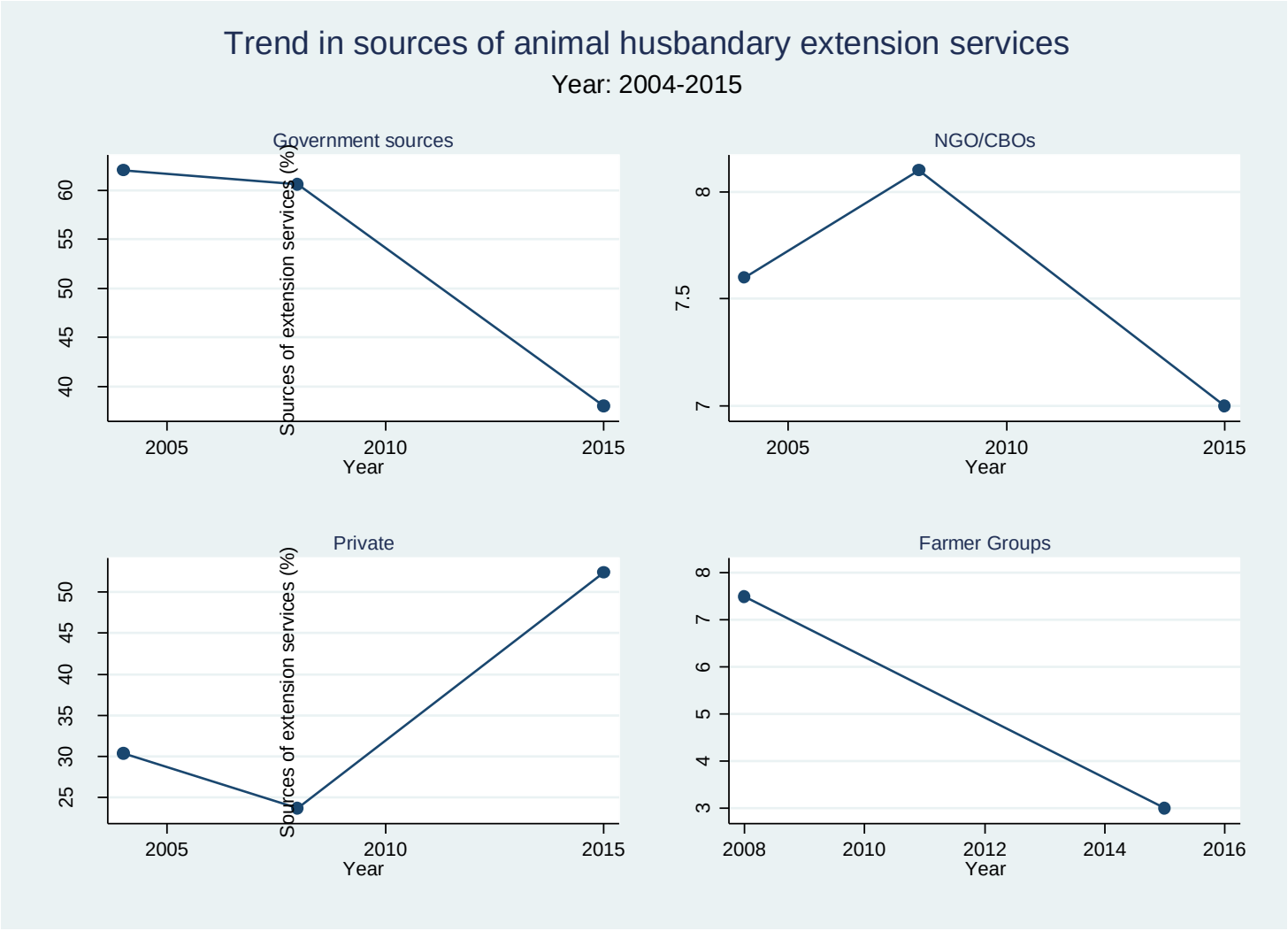
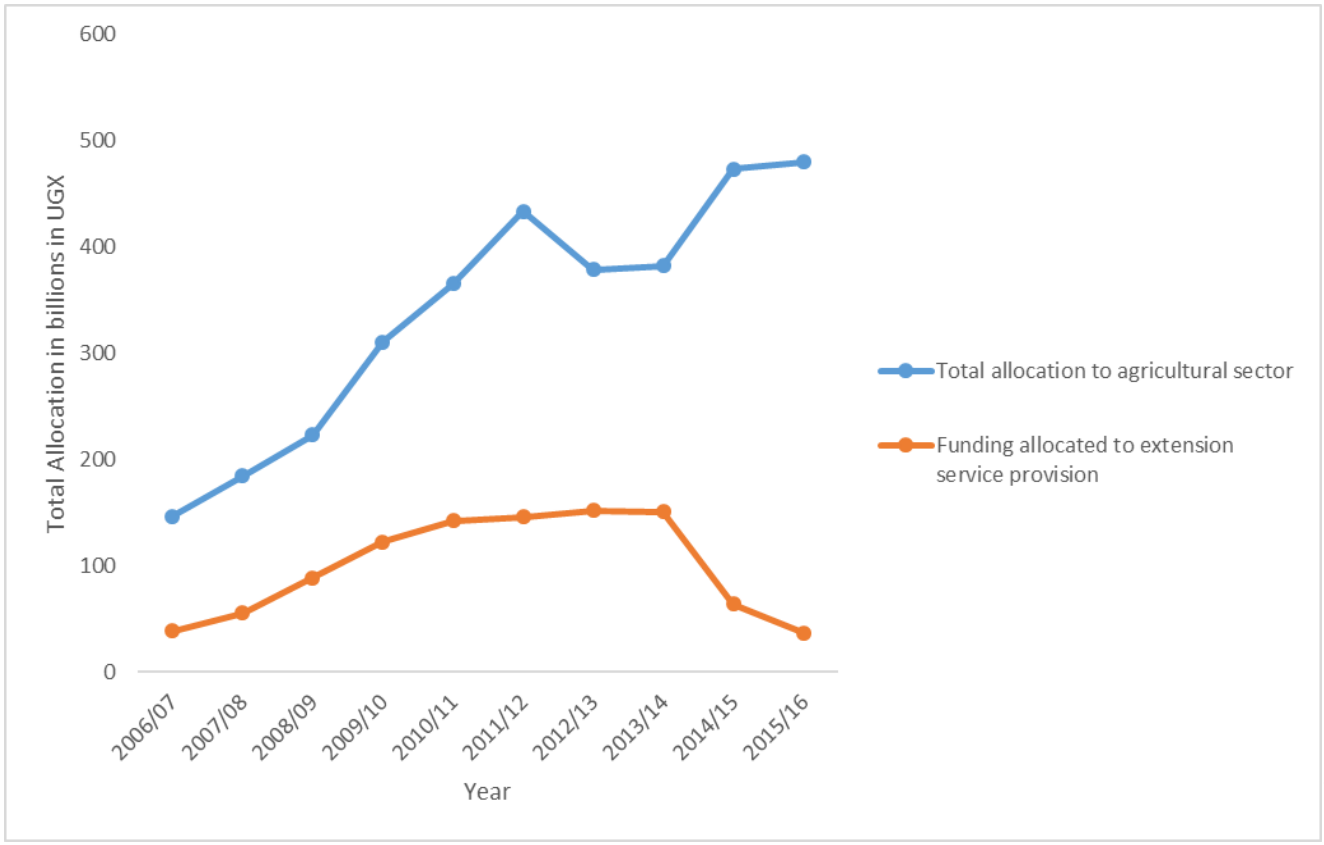


NAADS was abandoned

- NAADs was well intentioned
  - Mechanism for implementation was wrong
  - It was politically captured
  - Its was not owned by MAAIF
  - The structure affected planning process



The birth of New reform: Single Spine Extension System

- Under the new reform NAADS has continued to exist as OWC
  - The focus is input distribution
  - Extension officers are expected technical support to OWC
- However, for it function well, it should be
  - Politically, fiscally and administratively feasible
- Current evidence : the good- farmers
  - More inputs are being delivered than before NAADs
  - Politicians are also happy
  - Extension officers are accessible
- Current evidence: the bad- farmers
  - Limited farmer involvement in enterprise choice and procurement
  - Target beneficiaries of input tend to miss out
    - Inputs like seedlings get wasted

The New reform: Single Spine Extension System

- Current evidence: the good –extension officers
  - Extension officers are happy because they jobs
  - The structure is less complex
- Current evidence: the bad –extension officers
  - Perception of extension officers:- Extension = technology distribution
  - Capacity
  - Logistical challenges :
  - Coordination challenges with OWC
  - Limited Knowledge of agricultural technologies
    - Requiring linkages to research institutions

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ARE THERE GAPS AND OPPORTUNITIES FOR ADVOCACY IN AE IN UGANDA

Policies that govern Agricultural Extension

- Agricultural policy reforms
  - Economics Recovery Program (ERA)-1987
  - Poverty Eradication Action Plan (PEAP)- 1997 revised 2000
  - Plan for Modernization of Agriculture (PMA):- PEAP Frame work
- The focus was increasing agricultural productivity
- But this requires significant investments
  - Maputo declaration 10% by 2015:- this did not happen
- Agricultural extension policy
  - National Agricultural Policy (NAP)-2013
    - Objective is increasing agricultural productivity and extension is key
  - Agriculture Sector Strategic Plan 2015/16-2019/20
  - National Agricultural Extension Policy (NAEP) -2016

National Agricultural Extension Policy (NAEP)

- Purpose: to provide long-term strategic direction for agricultural extension services in Uganda
  - to "transform extension from a system of parallel institutionally fragmented public and non-state actors to Single Spine Extension System (SSES) which is well-coordinated, harmonized, regulated and inclusive of multiple providers addressing diverse needs of the farmers."
- Directorate of Agricultural Extension Service- MAAIF
  - Recruitment has reached more than 60%
  - Out of the 4990 established position, 3062 have been filled
- The challenge
  - Planned budget is 887.99 billion but current allocation only 4.4%
  - This affect provision of extension service
  - Logistics: transport, lab services, and demonstration equipment

Laws: Missing extension related legislation

- Veterinary Surgeons Act of Uganda
  - The act makes provisions for the registration of practitioners of veterinary surgery and for other matters connected with and incidental to the practice of veterinary surgery.
- The existing act is out dated
  - To be surgeon, you pay only 60 shillings
  - If you violate the act you pay only 3000
  - It does not capture changes in the current animal health care
- As a result the quality of services has declined
  - Misdiagnoses of diseases and Wrong drug prescriptions
  - Inefficient and imprudent use of antibiotics and accaricides
    - Antibiotic resistance in animal and humans
    - Accaricides resistance
    - Its estimated that 60 heads of cattle were died in Kiruhura per day in 2012 and 2013

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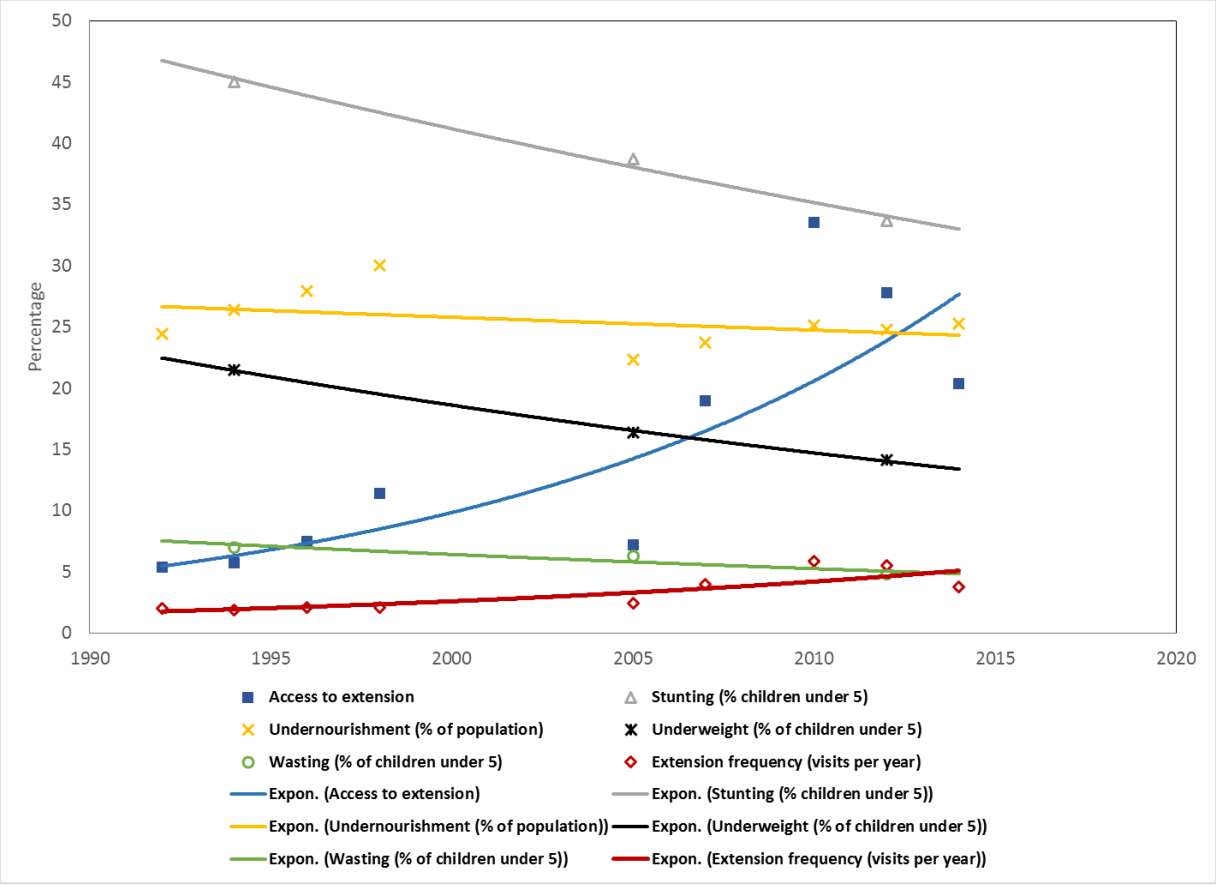
THE RELATIONSHIP BETWEEN AGRICULTURAL EXTENSION AND OTHER

AE and Health: food and nutrition Security

- Food and nutrition insecure households
  - Increased susceptibility to infection, impaired child development, and increased mortality rate
- Impact of malnutrition on the global economy could be as high as US$3.5 trillion per year or US$500 per individual
  - About 45% of which can be attributed to poor nutrition, as well as premature adult mortality linked to diet-related non-communicable diseases
  - In Uganda, its estimated that 15% of all child mortality cases in Uganda are associated with undernutrition and 54% of the adult population in Uganda suffered from stunting as children.
- The associated annual cost of child undernutrition in Uganda are estimated at 1.8 trillion UGX, which is equivalent to 5.6% of GDP

Empirical Data: Ugandan case

- Agricultural extension reduces stunting and wasting but the results are not significant



Empirical Data: Ugandan case

Access to livestock marketing information influence level of calorie daily Intake

Table 1: Determinants of Household Calorie daily consumption

	Fixed effects not controlled	Control for Urban Rural Fixed effects	Controlled for Regional fixed effects
Household size	2110.9***	2106.6***	2099.9***
	(30.70)	(30.62)	(30.45)
Adjusted monthly household expenditure	0.00829***	0.00841***	0.00811***
	(6.24)	(6.32)	(6.04)
Welfare based on usual members	0.0653***	0.0651***	0.0652***
	(28.82)	(28.73)	(28.75)
Poverty line in constant prices	-2.520***	-2.013***	-3.018***
	(-8.47)	(-4.29)	(-8.07)
Poverty status	-3457.6***	-3454.9***	-3243.0***
	(-9.36)	(-9.36)	(-8.57)
Advice on livestock Marketing	2343.6**	2355.8**	2267.7**
	(2.72)	(2.73)	(2.63)
Sex of household head	860.4**	885.2**	897.5**
	(2.70)	(2.77)	(2.81)
Age of the household head	28.59**	28.63**	28.40**

AE and Health: Zoonosis and Food borne diseases

Important Zoonosis in terms of human health impact

Disease	Pathogens/ Agent	Transmission	Illness in humans	Human deaths annually	Human affected annually
Brucellosis	Bacteria (Brucella)	Contact with animals or meat infected with infected animals. Drinking raw milk from infected cattle, goats, camels,	Back pain, Abdominal pain, excessive sweating, Headache, Fever, Joint pain. Weight loss,	25,000	500,000
Anthrax	Bacillus anthracis	Contact with infected animals, wool, meat, or hides	Cutaneous (skin), lungs and gastrointestinal infections	1,250	11,000
Hepatitis E *	Hepatitis E virus	Ingestion of fecal matter especially through drinking contaminated water, food from infected animals,	Abdominal pain and tenderness, nausea and vomiting, Acute liver failure	300,000	14,000,000
Gastrointestinal	Bacteria (Salmonella , E. coli ,)	Contact with infected animals. contaminated food, and water having with excretions from infected animals	Diarrhea, Possible nausea, vomiting, and loss of appetite, Abdominal cramps, Weight loss	1,500,000	2,333,000,000
Rabies	Virus	Bites from infected animals including dogs, cats and bats	Fever, headache , confusion, hallucinations and paralysis	70,000	70,000

AE and Health: Zoonosis and Food borne

- In Uganda, there have been eight zoonotic disease outbreaks and they include
  - In 2010/11, there was yellow fever outbreak affecting 273 cases and resulting to 54 deaths, Ebola in 2007 resulting to 149 cases and 37 deaths; Ebola 2012 affecting 24 cases, and leading to 16 deaths; Marburg 2012 affecting 28 cases and leading to 15 deaths; Anthrax in 2009 had 13 cases, 5 deaths and in 2011 Anthrax had 5 cases and 2 deaths
- This has greatly burdened the human health care system and it is attributed to the weakness in provision of livestock services
- The provision of quality veterinary extension services can reduce the outbreaks and the associated economic costs

Agricultural extension and antimicrobial resistance in humans

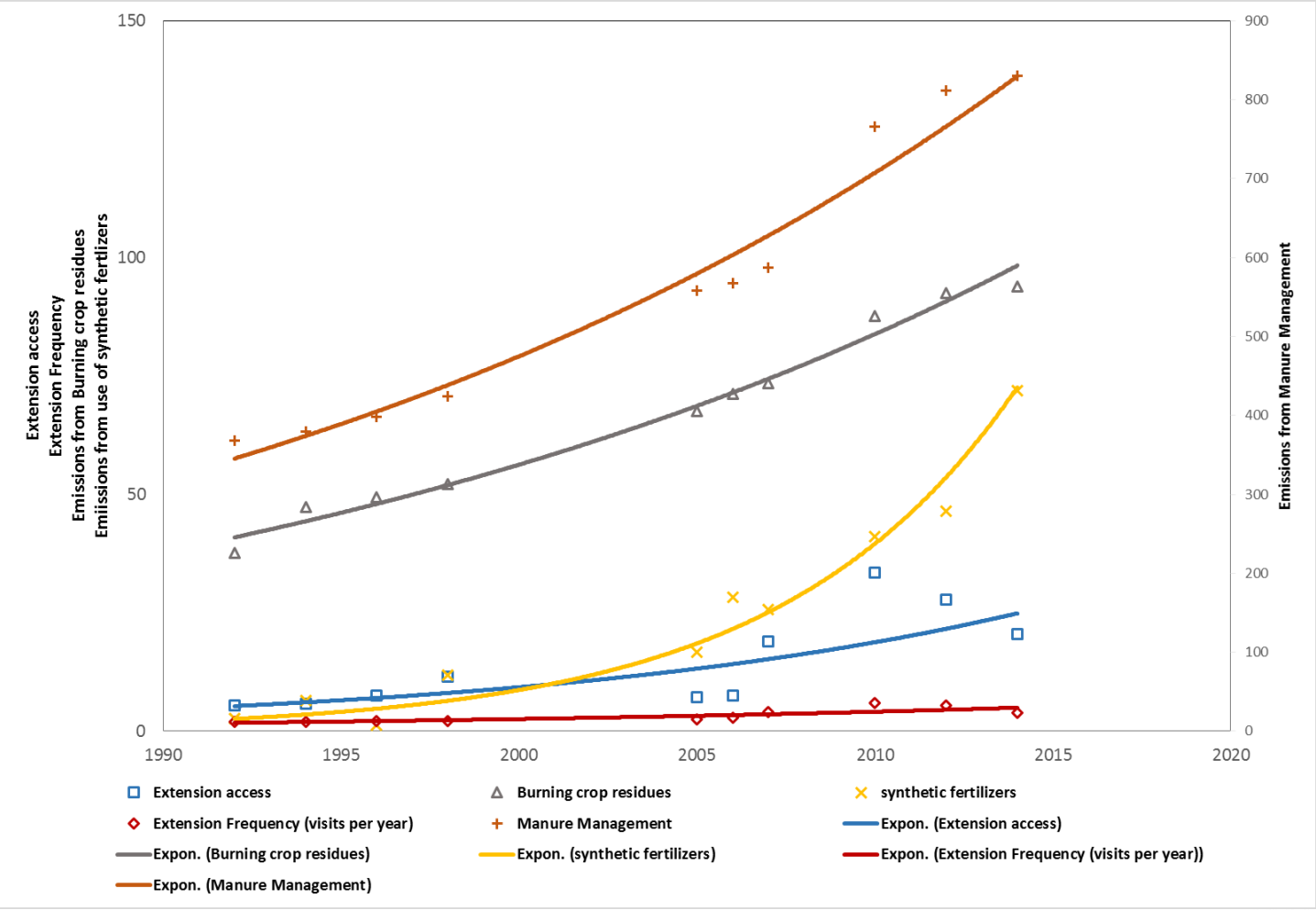
- Antimicrobial agents are to promote growth in animals
  - Food production Vs health effects
- Antimicrobial resistance leads to increased costs in form of
  - increased increased numbers of deaths, increased complications, additional expense, prolonged hospital stays, additional toxicity coupled with the need to receive intravenous therapy
- The challenge in determining economic impact of antimicrobial drug resistance due to so many variables and perspectives involved

AE and Health: Pesticides

- Parkinson disease risk with living in rural areas, drinking well water, and farming as an occupation
- Economic costs and losses can accrue from overuse or misuse of pesticides and herbicides
  - The costs increases with if farmers do not have knowledge about the impacts and use of pesticides like the case of Uganda.
- The good news the use of pesticides is low in Uganda
  - Only 13% use pesticides
  - Use of is likely to increase with increase extension and farmer education as well as pest out breaks.
  - Also use of pesticide for control of house hold insects is on rise.
- Agricultural extension officers should ensure proper use of pesticides

AE and Water and Environment

- The results suggest existence of positive relations between the agricultural extension and emissions but the results are not significant



AE and Water and Environment

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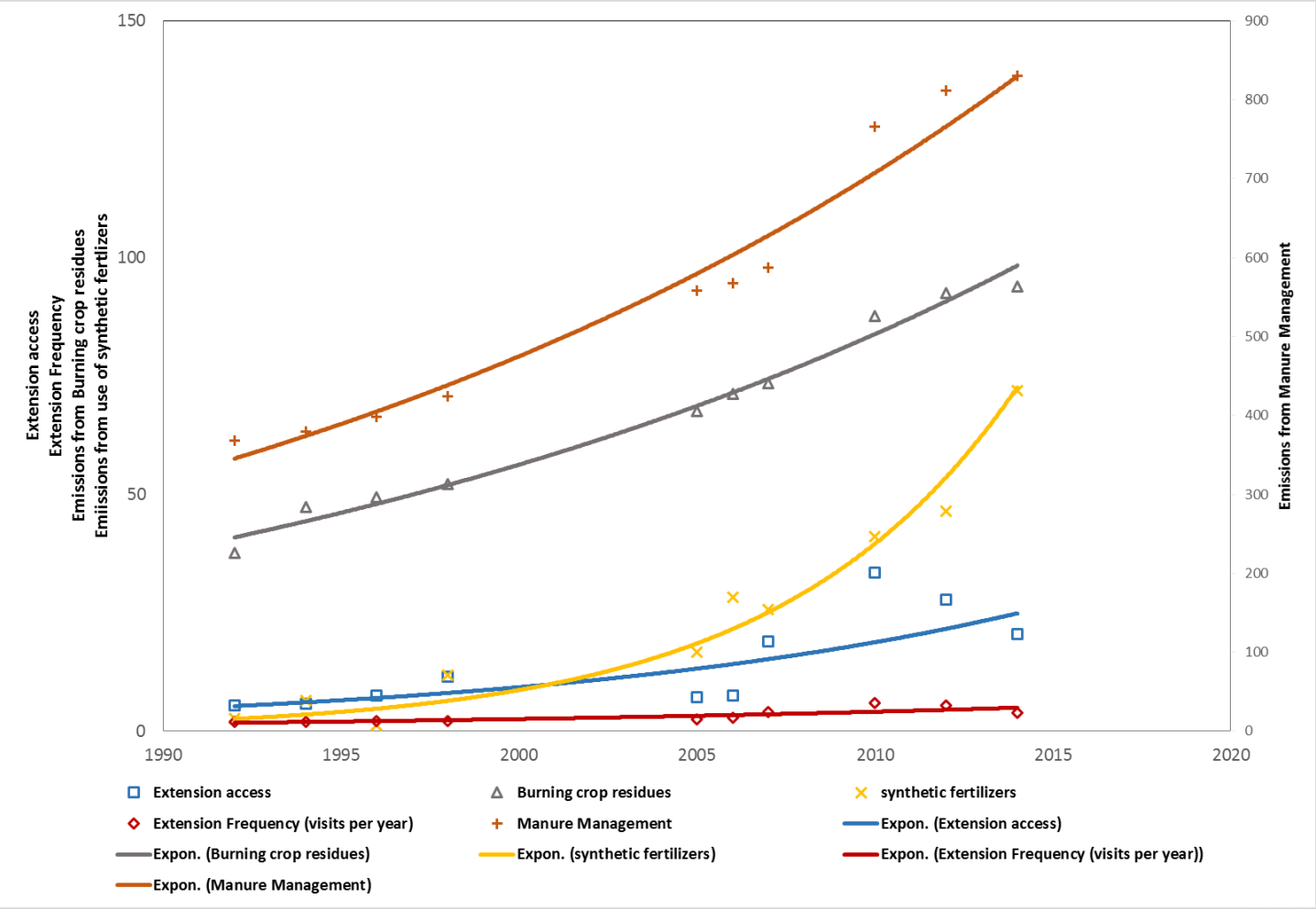
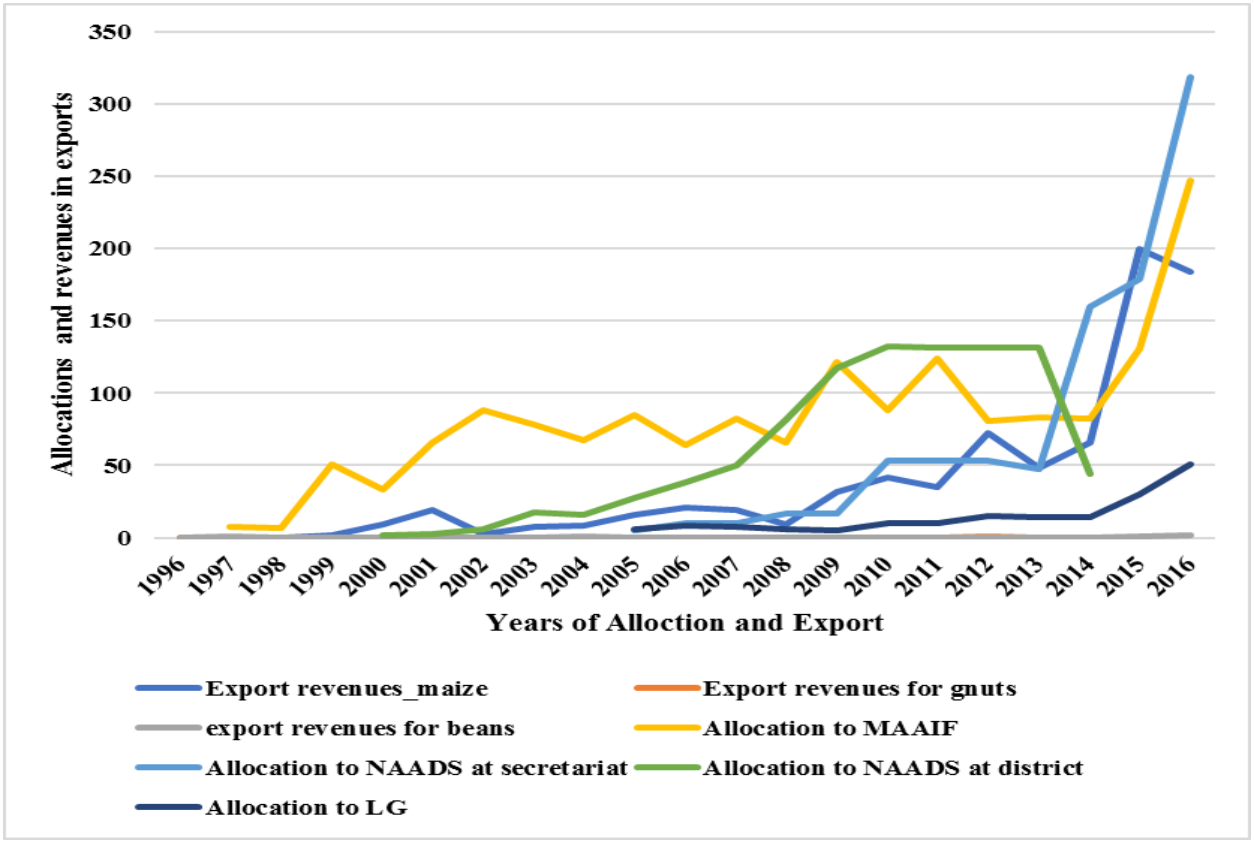


Agricultural Extension and Trade

The results suggest that there is a positive relationship between allocations to the local governments and exports earnings. This suggest that better and increased AE service provision has the capacity to increase export earnings from this agro-produce and increased supply of other products.



Agricultural Extension and Trade

The impact propensity of a shilling investment in local government agricultural extension is 30 shillings in bean export, 6000 shillings in maize export, and 13000 shillings in total agricultural exports

	Bean Export Value	Maize Export Value	GNUTS Export Value	Coffee Export Value	Banana Export Value	Fruit Export Value	Total Crop Export Value
LGA	30.80*	5869.7***	20.66	13495.8	12.71	78.68	12708.6*
	(2.56)	(5.05)	(1.20)	(1.04)	(0.70)	(1.96)	(2.66)
L.LGA	-7.569	-5589.4*	-5.744	12442.9	-40.83	-222.4**	-13656.5
	(-0.30)	(-2.31)	(-0.24)	(0.46)	(-1.08)	(-4.44)	(-2.29)
L2.LGA	-3.330	5152.9*	-1.466	21795.6	-31.93	210.1**	43234.6***
	(-0.17)	(2.71)	(-0.08)	(1.03)	(-1.07)	(5.13)	(8.87)
_cons	-72.44	-27460.8	-25.14	40201.8	1137.9***	-265.9	-13028.7
	(-0.50)	(-1.98)	(-0.15)	(0.26)	(5.23)	(-0.72)	(-0.30)
N	16	16	13	16	16	10	10
R^2	0.637	0.860	0.202	0.655	0.491	0.824	0.954

Trends in Research linking AE and other sectors

- Analysis of linkages between AE and other sectors is generally lacking
  - Existing literature is mainly on the role of AE in improving Nutrition but even is theoretical
  - Quantitative studies based empirical data are largely lacking and if they exist, they link it to the technology rather than AE.
- Why is there limited research in AE linking to other sectors
  - Data problems: Availability and quality
  - Methodological challenges that even limit estimation of contribution of agriculture to the economy
  - Misconception and invisibility of Agricultural extension development programing often resulting from inability to extract rents or positive private gains from extension.

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TO ESTABLISH THE VALUE OF EACH SHILLING OR DOLLAR INVESTED IN AE

AE cost to other sectors

- This unit cost of providing extension to household in Uganda Shillings 66,290
  - Increased susceptibility to infection, impaired child development, and increased mortality rate
- The estimated cost of feeding these households per year if extension services are not provided is about UGX 5,261.4 billion
- Income lost is estimated as UGX 8.4 trillion per year.
- Failure to invest in extension services in Uganda will lead to poor utilization of water for production and hence, making the country lose about UGX 158 billion invested in MWE
- Expenditure on imports is UGX 9.6 trillion on food importation

SUMMARY AND RECOMMENDATIONS SECTORS

Conclusion and recommendation

- The emerging picture is that agricultural policies generally consider extension as very important in improving performance of agriculture but
  - financing limited
  - Legislative and political environment does not favor AE yet
- Agricultural extension is has potential to generate positive benefit to other sectors and cost are likely to be significant but
  - There is limited research to link AE to this sectors
  - Data is generally a problem
- Much of the attention seems to focused in to input distribution and yet the level of technology misuse is high which is likely to affect productivity and generating high costs

Recommendation

- More research in AE linkages with good methodological designs
  - RCTs with target extension messages from specific sectors
  - Investments in data collection
- Community sector (NGO) support
  - Logistical support
- Link Extension officer and research Institutions
  - Technical support and technology knowledge related transfer
- Better coordination between MAAIF and OWC
  - Input distribution
- Promote nutrition sensitive extension for nutrition sensitive agriculture
- Investment in livestock legislative process is required