EGERTON UNIVERSITY

TEGEMEO INSTITUTE OF AGRICULTURAL POLICY AND DEVELOPMENT

Off-farm Work and Fertilizer Use among Smallholder Farmers in Kenya

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Outline

- Introduction and Motivation
- Data
- Methods
- Findings
- Conclusions
- Policy Implications

Introduction & Motivation

- Rural development strategies and policies in Kenya have emphasized on increasing farm productivity as a way out of poverty

- The effectiveness of this strategy is a subject of debate as:
  - poverty rates continue to be high among rural communities esp in SSA
  - Agricultural productivity has stagnated over time
  - Poverty rates high in low agricultural potential areas that are difficult to reach directly with interventions targeted towards the farm sector

Q. Could the off-farm sector be a potential entry point for such areas ??

- Indeed multiple job-holding (combining farming and off-farm work), though uncommon outside of agriculture has been the norm rather than exception.

Introduction & Motivation

Q. Why do households diversify into the off-farm sector?

- Mixed evidence on the reasons rural households diversify into off-farm work (OFW)

Push factors

- ✓ Low farm earning (high input prices and low output prices)
- ✓ Weather shocks - drought
- ✓ Market imperfections (credit and crop insurance)
- ✓ Lack of land/poor quality
- ✓ Human and physical asset endowments (capacity)

Pull factors

- ✓ Wages or earnings from OFW labor market compared to the farm earnings
- ✓ Availability of employment opportunities-local labor market characteristics and public investment (capacity)

- Most studies generally agree that OFW helps to supplement family incomes in rural areas of developing countries

Introduction & Motivation

- From the concept of agricultural transformation increased agric productivity
  1. stimulates the development of the rural non-farm sector through growth of linkages and is
  2. key to poverty reduction

- However, agricultural productivity stagnating and poverty is rampant.
- Major impediment is the lack or low use of productivity-enhancing inputs due to:
  1. Unavailability of liquid capital to finance such expenditures
  2. Risk averse nature of small scale farmers

Introduction & Motivation

- Most affected are food crops that lack the institutional support available for cash crops

- Off-farm earnings are considered relevant in this case because:
  - ✓ Could be used to relax the cash constraint of households
  - ✓ could be used to spread the risk of using these inputs.

BUT: OFW could be competing with the farm for resources especially labour

- We approach the problem from two perspectives:

  - Possible competition for resources e.g. labour
  - Potential re-investment of off-farm earnings

Objectives/Research Questions

- Main objective of this paper is to explore whether and how participation in off-farm work impacts on farm outcomes

- The study explores the relationship between off-farm work and farm input use and intensification for smallholder farmers

- Specific Questions
  - What is the distribution and shares of off-farm work across regions and time ?
  - Holding other factors constant, does OFW compete for resources with the farm ?
  - Do off-farm earnings contribute to the financing of productivity-enhancing investments in agriculture?

Objectives/Research Questions

Hypothesis

- Competition for resources may result in a negative relationship between OFW and farm outcomes
- OFW earnings may be used to compensate for the missing and imperfect credit markets by providing ready cash for farm input purchases
- Analysis done by
  - Type of Off-farm Work
  - Across Crops

Objectives/Research Questions

- Type of work
  - Overall Off-farm work
  - Nonfarm work
    - Informal business
    - Salaried/wage employment
    - Agricultural labor/Farm Kibarua: piecework on other farms
- Crops
  - Main staple (maize)
  - Emerging cash crop (vegetables)
  - Traditional cash crop (tea)

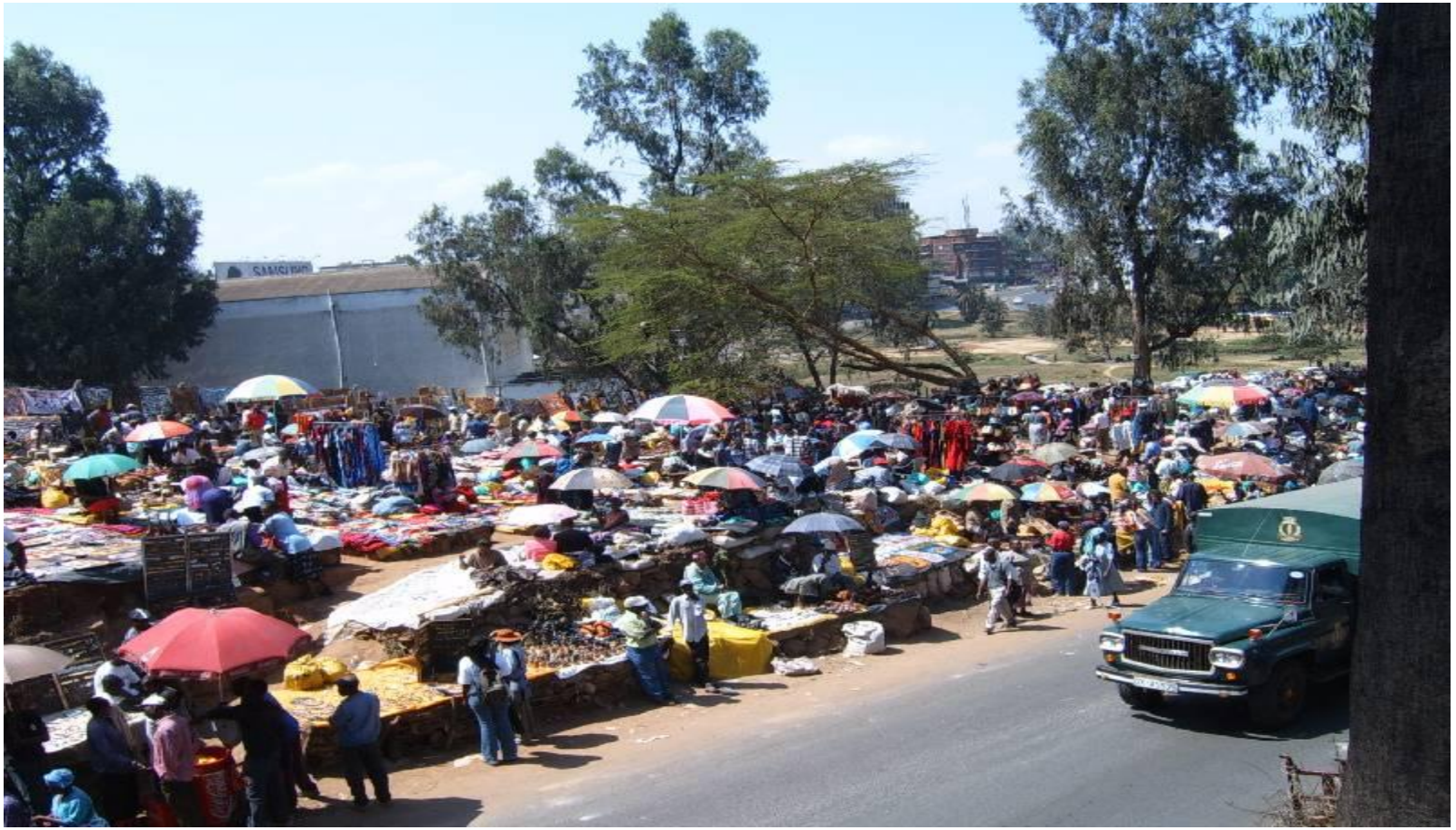
Objectives/Research Questions

- Nature of rural OFW in Kenya varies
  - high end salaried wage labor (teachers and doctors)
  - Profitable business activities (public transport, hotels)
  - Low wage labor (watchman, cook, etc)
  - Petty business & labor activities (shoe shining, farm kibarua, etc)

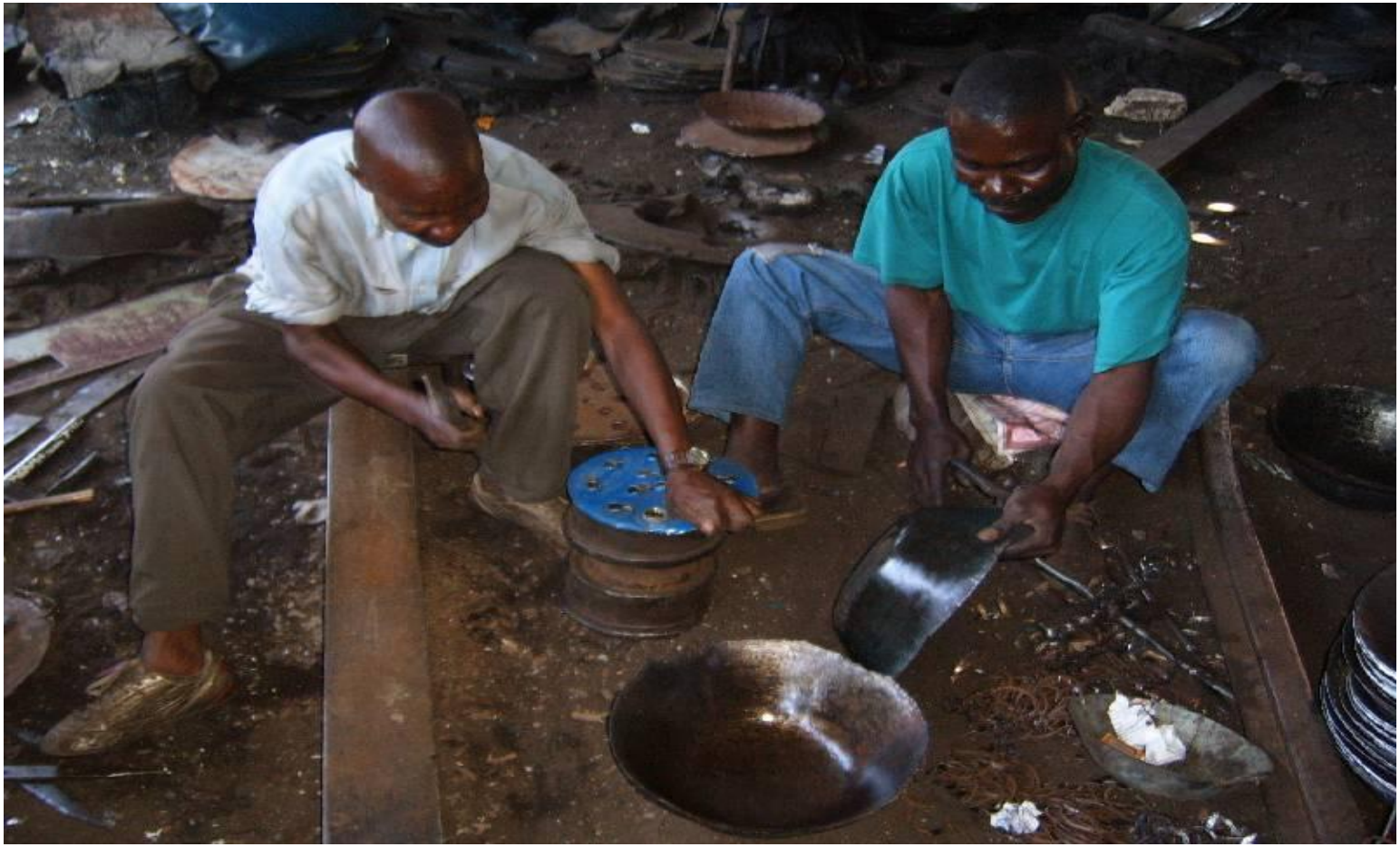
Agricultural labor

Low return business-charcoal burning

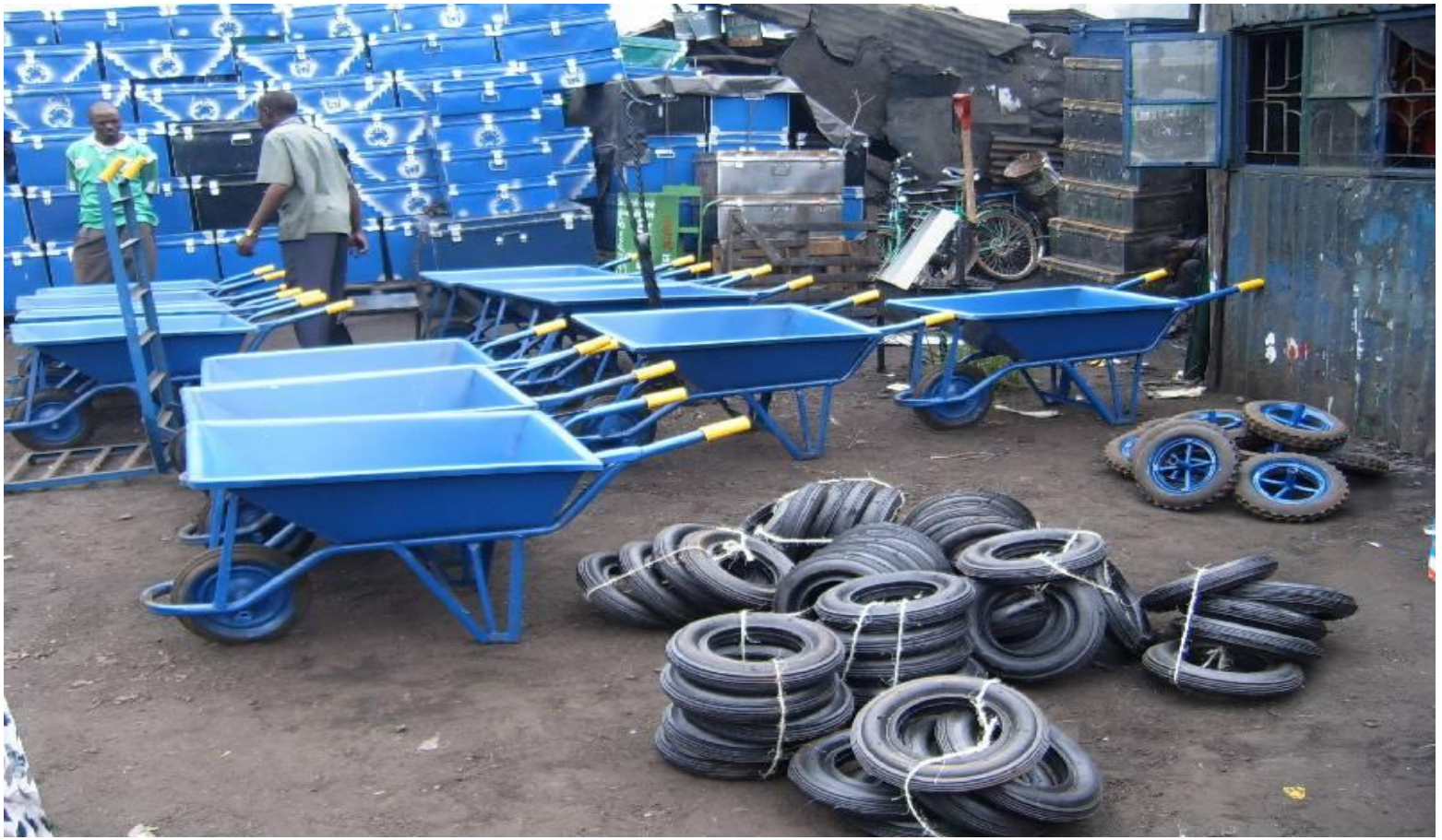
Local Market



Informal business activities-low return

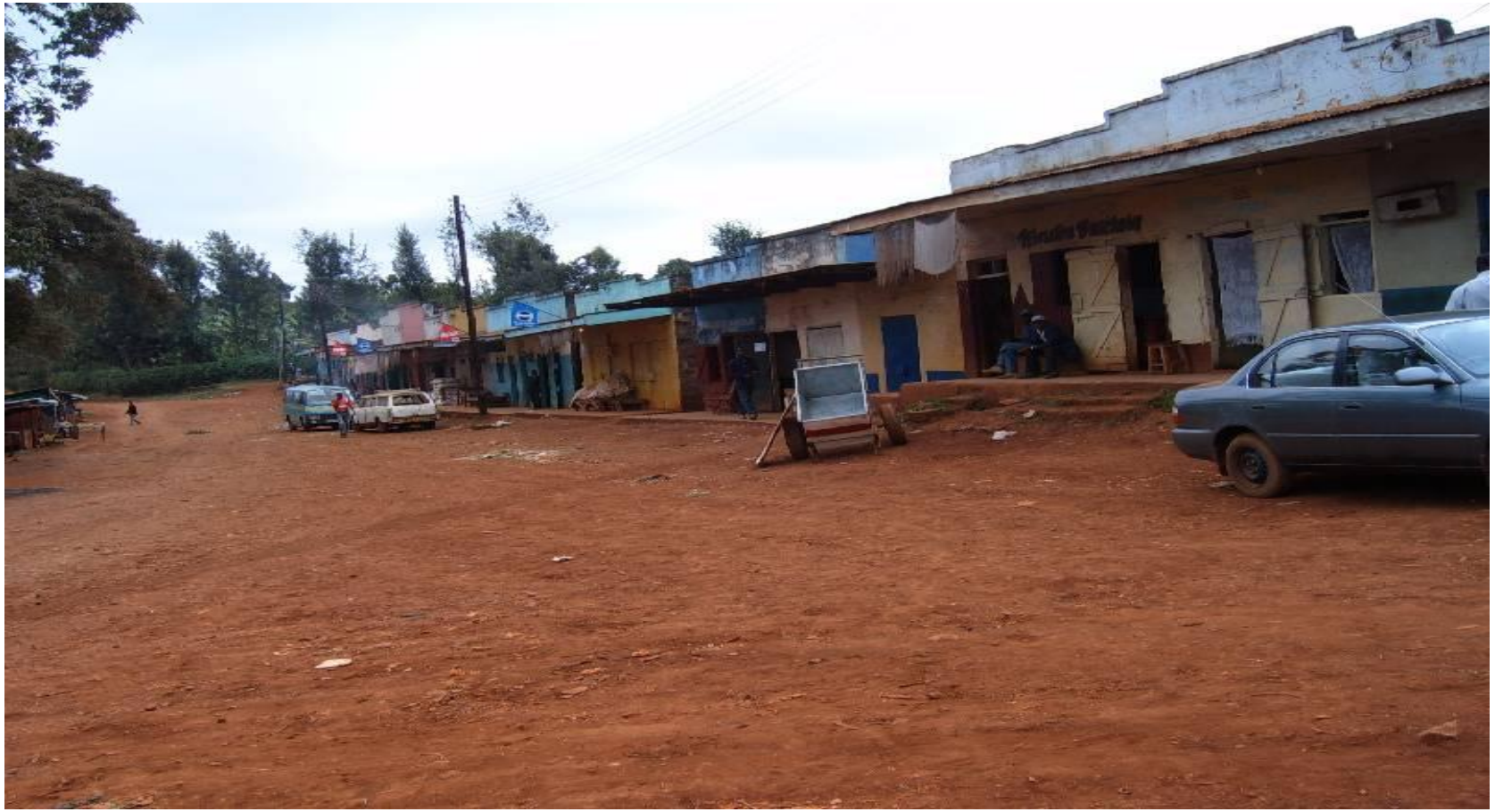


Informal business activities-high return



Hotel Business

Rural town/ local shopping center



Data and Sample

- Tegemeo Rural Household Panel
  - **1999/00, 2003/04, 2006/07, 2009/10**
- Balanced panel:**1243**
- Data on economic, demographic and locational characteristics of households

Conceptual Approach/Methods

- Analytical framework based on the theory of Agric Household Model (AHM) following Singh et al. (1986) and Huffman (1991).

- Input demand functions estimated to determine the factors that affect the farmers' decision to use inputs.
  - Dependent variable structure: Fertilizer Kgs per ha, N nutrient kgs per ha

- To identify coefficients of interest we control for:
  - ✓ Economic incentives facing the household
  - ✓ Investment in public infrastructure
  - ✓ Household resource endowments,
  - ✓ Credit availability
  - ✓ Other income sources
  - ✓ Locational characteristics of household

Methods

Specification Issues

- Zero-expenditure /non-use of fertilizer

  Maize: Censored (CRE)
  Vegetables: Continuous (FE2SLS)
  Tea: Continuous (FE2SLS)

- Envision potential endogeneity of OFW variables
  - Instrumental variables
    - Share of Non-farm earnings - -- Aggregate
    - Distance to electricity

Findings

Distribution of Households with OFW across Agro-regional Zones

Agro-regional zones	% with off-farm work	Off-farm share	Crop share	Livestock share
Coastal Lowlands	0.98	0.67	0.28	.05
Eastern Lowlands	0.97	0.49	0.37	.14
Western Lowlands	0.90	0.45	0.40	.14
Western Transitional	0.87	0.32	0.52	.16
High Potential Maize Zone	0.83	0.36	.38	.26
Western Highlands	0.83	0. 34	.47	.19
Central Highlands	0.86	0.31	.49	.19
Overall	0.88	.40	.42	.18

Characteristics of Households with Off-farm Work by Quintiles of Total Income

Quintile	Total Income (Ksh)	Crop share in total income	Off-farm share in total income	% with salaried wage income	% with Business/ informal income	% with Farm Kibarua income
1 low	39,245	0.49	0.37	0.60	0.49	0.28
2	86,817	0.42	0.37	0.63	0.58	0.20
3	142,092	0.41	0.38	0.66	0.62	0.17
4	226,138	0.40	0.41	0.74	0.63	0.09
5 high	564,763	0.39	0.44	0.77	0.69	0.04
Total	216,945	0.42	0.40	0.68	0.60	0.15

Income Shares by Year

Year	Share of Total income			Share of Off-farm income		
	Crop	Livestock	Off-farm	Business/ Informal	Salaries	Farm Kibarua
2000	.44	.18	.38	.41	.50	.09
2004	.41	.18	.40	.41	.53	.06
2007	.42	.18	.40	.46	.44	.10
2010	.41	.19	.40	.37	.53	.10
Total	.42	.18	.40	.41	.50	.09

Characteristics of Households with and without Off-farm Work

Type of off-farm work	Status	Total income	Crop income	Crop share	Educ. of head	% of Female head	Km to road	Km to Electricity
Off-Farm	Non-participants	138,831	91,752	0.7	5.0	23	7.7	4.1
	Participants	222,420	87,191	0.4	6.3	20	7.5	3.7
Salary	Non-participants	175,071	90,368	0.5	5.7	19	7.9	4.4
	Participants	232,148	86,262	0.4	6.3	22	7.2	3.3
Business /Infor	Non-participants	174,832	82,454	0.5	5.5	25	7.2	3.6
	Participants	239,848	92,772	0.4	6.6	17	7.6	3.9
Farm Kibarua	Non-recipients	223,429	93,832	0.5	6.2	20	7.3	3.7
	Participants	117,531	49,695	0.4	5.0	23	8.6	4.0

Off-farm work Shares by Crop

	Nonfarm				
	Bus-Inf.	Salaries/ remit	Farm Kibarua	All Off-Farm	All On-Farm
	(1)	(2)	(3)	(1+2+3)	(4)
Maize	0.142	0.175	0.027	0.344	0.656
Vegetables	0.137	0.164	0.021	0.322	0.678
Tea	0.085	0.133	0.012	0.230	0.770

Fertilizer use by Off-farm Work Type

Off-farm Work	Maize		Vegetables		Tea	
	% of HH Using	Intensity (kgs/ha)	% of HH Using	Intensity (kgs/ha)	% of HH Using	Intensity (kgs/ha)
Non-Participants	**75**	**80**	**100**	**158**	**100**	**876**
Participants	**66**	**69**	**100**	**151**	**100**	**869**
Total	**66**	**68**	**100**	**154**	**100**	**859**

Effect of Non-farm Work by Crop (N kgs/ha)

Crop	All Nonfarm	Salary	Business
Maize	-***	-***	-***
Vegetables	-**	-**	-**
Tea	+	+	+*

Effect of OFW on Fertilizer Demand on Maize

Type of OFW	Adoption	Intensity
All Off-farm earnings (s-1)	+***	+***
Salaried/Wage employment (s-1)	+***	+***
Business /Informal (s-1)	-	-

Summary/Conclusions

- Generally high off-farm work shares in total hh income across all types of households – 31 to 67%
  - OFW has been Increasing over time
  - Increasing across income groups – highest in high income hhs
  - Relatively high in low ag potential areas ref high potential areas
- Households engaged in OFW have significantly higher total hh incomes and lower crop shares
- OFW shares high for maize producing households followed by vegetables and lastly tea
  - Consistent with relative levels and stability of income from these crops

Summary/Conclusions

- Households engaged in OFW have relatively low use of fertilizer on the 3 crops
  - Lower % of hh using and lower intensities

- Effect of Non-farm work on fertilizer use differs by crop and OFW type but broadly :
  - **Maize: Negative (-)**
  - **Vegetables: Negative (-)**
  - **Tea: Positive (+)**
- Accounting for timing of OFW, the effects on fertilizer use on maize are positive and complementary
  - --- possible reinvestment of off-farm earnings in fertilizer use.

Contribution/Policy Implications

- High OFW shares in low ag potential areas implies possible entry point in reaching these disadvantaged hhs
- Increasing OFW shares with income and over time
  - possible signs of structural transformation in these rural economies? ?
- The positive results on the relationship on fertilizer application in tea
  - consistent with the stability of tea production and incomes allowing for decision making on labor and capital allocations
- The interactions between the farm and off-farm sectors,
  - Imply need for investments in growth of rural economies
  - implications for agricultural growth and transformation of small holder agriculture.

Contribution/Policy Implications

More important is the role played by OFW in

- risky production environments and
- during periods of external shocks to the farming environment

- The importance of OFW in rural household incomes and farm production decisions imply
  - Important to factor OFW in the overall strategies of transforming smallholder agriculture and reducing rural poverty
  - Comprehensive package that takes account of rural economies in totality

Contribution/Policy Implications

- Broadly the question of ***whether and how off-farm work*** affects agriculture has implications on farm productivity enhancement programs and institutional failures.
- Such information can guide policy as to the choice of emphasis on investments such as
  - agricultural research, extensions, input subsidies versus
  - education and public assets that spur growth in the rural economies thus encouraging growth in the off-farm labor market.
- The results imply investments in infrastructure and electricity are key to growth of the off-farm sector.

Thank You