

# Finding Missing Markets: Evidence and a Disturbing Epilogue from an Export Crop Intervention in Kenya

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# Motivation

- Why do most farmers grow crops for local markets when export markets seem to be much more profitable?
- Potential answers:
  - Lack of access to capital
  - Physical infrastructure (e.g., roads)
  - Missing information about profitability or lack of human capital required for adoption
  - Risk (export markets, local transactions, crop itself)

# Motivation

- In the region we study in Kenya:
  - Access to capital is limited because
    - Banks and MFIs have tried crop financing and farm input loans but have generally failed.
    - Exporters have tried extension services and out-grower credit schemes with mixed results.
    - Small-scale agro-supply vendors sell seeds and agro-chemicals on credit but have limited penetration.
  - Road infrastructure is poor and smallholder farmers have insufficient means of transportation
  - Trust issues with buyers in Nairobi

# What we do

- We conduct a field experiment with DrumNet, a for-profit Kenyan NGO, to examine whether extension, credit and marketing services helps farmers (organized in Self Help Groups) adopt, finance and market export crops.
  - This is a package, but we also randomize credit vs no-credit to identify specific role of credit constraints

# Outline

- DrumNet Program
- Experimental Design
- Results on Impact Evaluation
- Discussion & Results on Social Networks
- Conclusions

# DN Program

- DrumNet is an NGO with aim to being for-profit
  - Encourages the production of an export crop
  - Cashless micro-credit program
  - Direct linkage to commercial banks & exporters
- Wants to solve trust problems found in contract farming.

# DrumNet Program

- A farmer that wants to be a member of DrumNet has to:
  - Be a member of a registered SHG.
  - Express an interest in producing the export crop (French beans, baby corn).
  - Have irrigated land.
- Upon registration, DrumNet members
  - Receive a 4 week orientation on Good Agricultural Practices and EUREPGAP requirements.
  - Open a personal savings account with local bank.
  - Make a cash contribution of USD 10 that will serve as collateral for a line of credit of up to 4 times that amount to purchase inputs (seeds and fertilizer).

# DrumNet Program

- Farmers are organized into groups of 5 who are jointly liable for the loans taken out.
- At harvest time, DrumNet negotiates a price with the exporter and arranges for the produce pick-up at pre-specified collection points.
- A transaction agent is appointed in each collection point to serve as liaison between DrumNet and the farmers.
- At these collection points, farmers grade their produce and package it, although exporter has the final word on the grading.
- Once the produce is delivered to the exporter, the exporter pays DrumNet who in turn deducts any loan repayment and credits the rest to the member bank account.



# Experimental Design

## Location

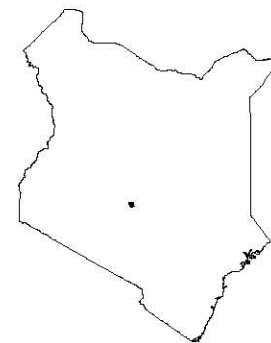
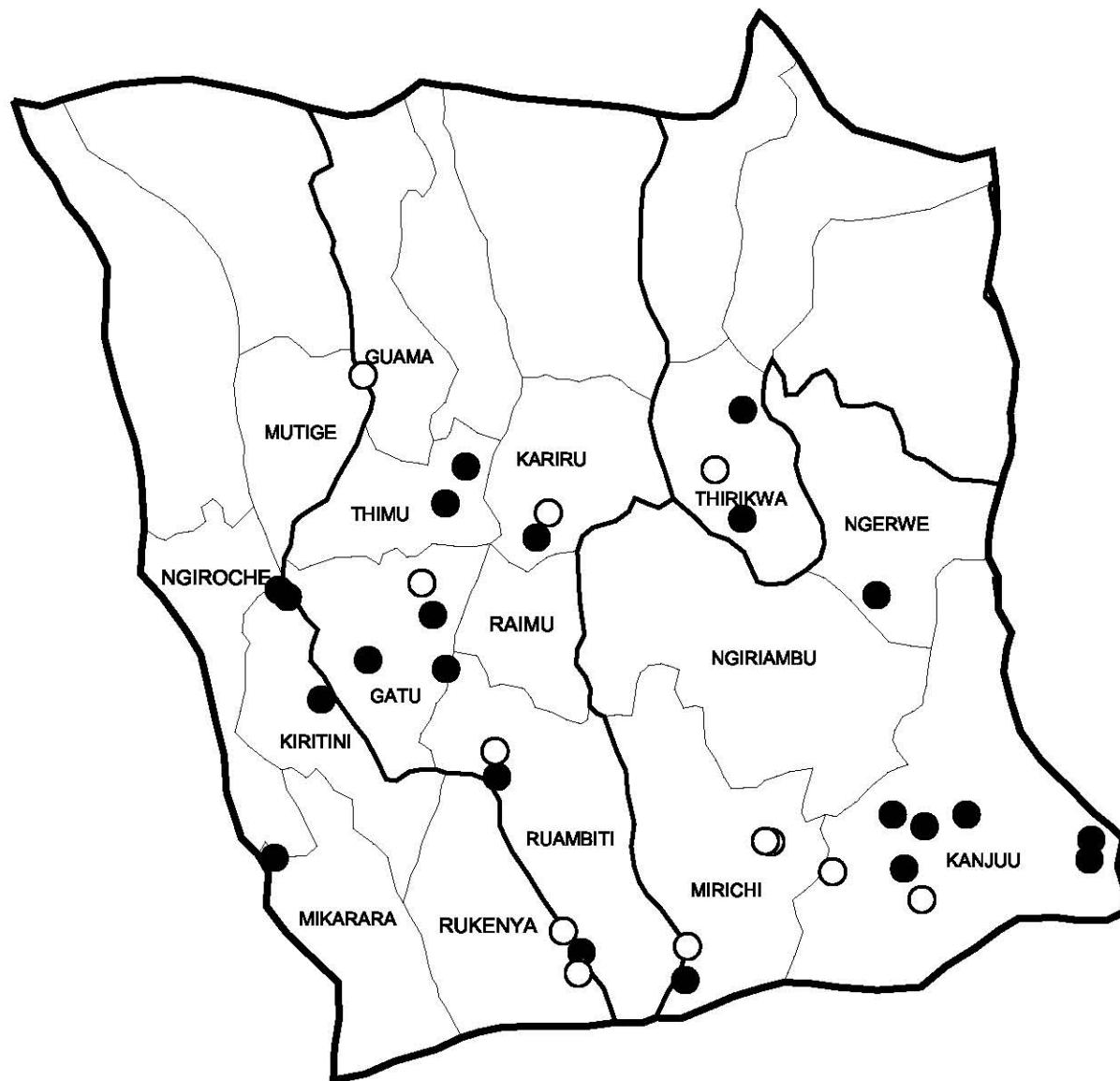
- Gichugu division in the Kirinyaga district. It was chosen because of its agro-climatic conditions (similar to original DN locations) and because the clustering of participants was feasible logistically.

## Sample Framework

- Original sample of 96 registered SHGs including disbanded groups. Run a “filter” survey to find out the status.
- Final sample of 36 SHG whose combined number of members reached the target DrumNet capacity of 750 individuals (20-40 members in a group).

## Randomization of SHGs

- 12 got all services except for credit
- 12 got all services including credit
- 12 Control
  - All analysis will cluster standard errors within SHG



- Treatment
- Control



# Experimental Design

36 SHG

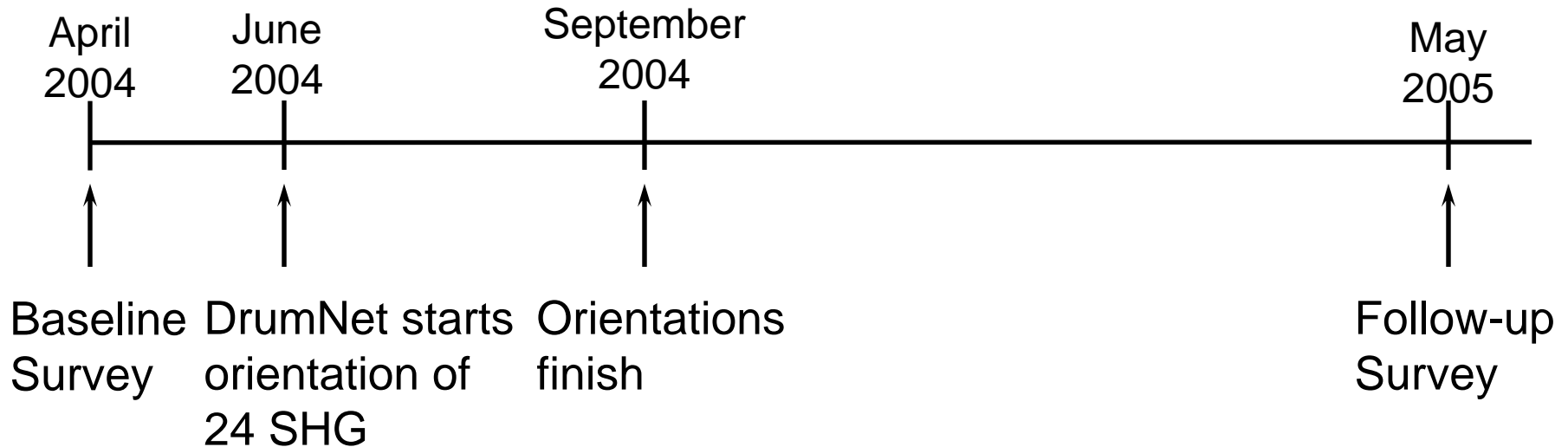


Table 2  
Individual determinants of Participation in DrumNet OLS

	All (1)	Credit (2)	No credit (3)	All (4)
Treatment group included credit	0.108 [0.084]			0.110 [0.084]
<i>Member</i>				
Age of member	0.002 [0.002]	0.002 [0.003]	0.002 [0.001]	0.002 [0.002]
Literacy	0.151 [0.064]**	0.202 [0.111]*	0.106 [0.074]	0.148 [0.065]**
Risk tolerance	-0.038 [0.050]	-0.037 [0.075]	-0.043 [0.064]	-0.040 [0.049]
Months as member in SHG	0.001 [0.001]	0.002 [0.001]	0.000 [0.002]	0.001 [0.001]
Member of SHG is an officer (1=yes)	0.291 [0.057]***	0.396 [0.076]***	0.175 [0.064]**	0.296 [0.057]***
Deposit in a formal bank (1=yes)	0.003 [0.041]	0.036 [0.074]	-0.018 [0.031]	0.000 [0.042]
Log of total annual household income	0.003 [0.024]	-0.004 [0.045]	0.013 [0.023]	0.103 [0.053]*
Log of total annual household income squared				-0.015 [0.007]**
Number of household members	0.030 [0.008]***	0.026 [0.014]	0.035 [0.007]***	0.031 [0.008]***

Table 2  
Individual determinants of Participation in DrumNet OLS

	All (1)	Credit (2)	No credit (3)	All (4)
<i>Land</i>				
Harvest yield per acre (in 100,000 Ksh)	-0.006 [0.047]	-0.091 [0.056]	0.019 [0.042]	-0.004 [0.044]
Proportion of land that is irrigated	0.074 [0.072]	0.070 [0.130]	0.091 [0.077]	0.081 [0.068]
Total landholdings (Acres)	0.027 [0.014]*	0.021 [0.023]	0.035 [0.017]*	0.029 [0.014]*
<i>Production</i>				
Grows export crops (1=yes)	0.069 [0.058]	0.053 [0.121]	0.095 [0.029]***	0.058 [0.058]
Sells to market (1=yes)	-0.133 [0.043]***	-0.168 [0.071]**	-0.105 [0.045]**	-0.138 [0.043]***
Uses hired labor (1=yes)	-0.065 [0.059]	-0.089 [0.070]	-0.013 [0.103]	-0.067 [0.058]
Uses Machinery and/or animal force (1=yes)	-0.166 [0.091]*	-0.168 [0.130]	-0.097 [0.099]	-0.166 [0.090]*
Mean dependent variable	0.340	0.415	0.273	0.340
Observations	450	212	238	450
R squared	0.16	0.2	0.13	0.16

# Summary of Participation

- Among individual determinants,
  - Literacy, being a SHG officer, household size and having irrigated land predict participation.
  - Income: middle-income most likely to join
- All in all, participants are not the wealthier farmers nor those that use the most efficient production techniques.

Table 3  
Impact of DrumNet  
OLS

Panel A: Treatment										
	Export Crop	Proportion Land devoted to cash crops	Use of inputs	Production of french beans (1,000Kg.)	Production of baby corn (Kg.)	Value of harvested produce (in Khs 1,000)	Total spent in marketing (in Khs 1,000)	Logarithm of HH Income	Loan from Formal Institutions	Deposit in Formal Institutions
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Post	-0.004 [0.059]	-0.079 [0.018]***	0.049 [0.018]***	0.660 [0.769]	11.120 [34.783]	-7.094 [5.136]	3.569 [2.113]	-0.109 [0.097]	-0.053 [0.013]***	0.123 [0.029]***
Post x Treatment	0.192 [0.067]***	0.043 [0.023]*	-0.004 [0.019]	1.620 [1.270]	396.711 [99.618]***	4.883 [6.269]	-3.531 [1.781]*	0.087 [0.110]	0.044 [0.016]***	0.070 [0.036]*
Num. Observations	1983	1779	1822	1981	1981	1603	1653	1566	1672	1672
R-squared	0.27	0.13	0.07	0.21	0.07	0.26	0.02	0.16	0.05	0.17

Table 4  
Impact of DrumNet  
OLS

Panel B: Credit vs. No Credit										
	Export Crop	Proportion Land devoted to cash crops	Use of inputs	Production of french beans (in 1,000 Kg.)	Production of baby corn (Kg.)	Value of harvested produce (in Khs 1,000)	Total spent in marketing (in Khs 1,000)	Logarithm of HH Income	Loan from Formal Institutions	Deposit in Formal Institutions
Post	-0.004 [0.059]	-0.079 [0.018]***	0.049 [0.018]***	0.662 [0.770]	11.304 [34.793]	-7.147 [5.136]	3.558 [2.114]	-0.110 [0.097]	-0.053 [0.013]***	0.123 [0.029]***
Post x Credit	0.226 [0.077]***	0.049 [0.027]*	-0.009 [0.022]	2.338 [1.759]	460.965 [148.606]***	2.164 [9.098]	-4.018 [2.017]*	0.011 [0.118]	0.029 [0.022]	0.080 [0.044]*
Post x No Credit	0.159 [0.071]**	0.037 [0.028]	0.001 [0.020]	0.926 [1.454]	334.676 [125.350]**	7.338 [6.175]	-3.103 [1.784]*	0.162 [0.119]	0.057 [0.014]***	0.062 [0.037]
Num. Observations	1983	1779	1822	1981	1981	1603	1653	1566	1672	1672
R-squared	0.27	0.13	0.07	0.21	0.07	0.26	0.02	0.16	0.05	0.17
Mean dep. variable	0.526	0.568	0.961	4.546	148.614	40.133	1.379	3.495	0.032	0.800
<i>P-value of Test Post x Credit = Post x No credit</i>										
	0.291	0.695	0.534	0.481	0.507	0.567	0.484	0.116	0.176	0.629



Table 5. Impact of DrumNet (Prior Exporters versus New Adopters)

OLS

	Pct. Land devoted to cash crops		Use of inputs		Production of french beans (1,000 Kg.)		Production of baby corn (Kg.)	
Grows export crops at baseline	Yes	No	Yes	No	Yes	No	Yes	No
Post	-0.099	-0.056	0.007	0.106	0.662	1.878	-17.879	64.576
	[0.016]***	[0.033]	[0.005]	[0.042]**	[1.547]	[0.875]**	[31.020]	[48.646]
Post x Treatment	-0.020	0.090	-0.007	-0.033	-3.902	4.885	488.962	338.619
	[0.030]	[0.040]**	[0.007]	[0.044]	[2.055]*	[2.085]**	[128.038]***	[104.411]***
# Observations	818	909	822	947	894	1027	894	1027
R-squared	0.18	0.14	0.03	0.11	0.46	0.19	0.1	0.08

Table 5. Impact of DrumNet (Prior Exporters versus New Adopters)  
OLS

	Value of harvested produce (in Khs 1,000)		Total spent in marketing (in Khs 1,000)		Logarithm of HH Income		Loan from Formal Institutions		Deposit in Formal Institutions	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Grows export crops at baseline										
Post	-13.365 [10.010]	3.393 [5.047]	4.981 [3.343]	2.535 [2.153]	-0.129 [0.094]	-0.132 [0.176]	-0.068 [0.016]***	-0.030 [0.017]*	0.096 [0.026]***	0.149 [0.041]***
Post x Treatment	5.194 [12.658]	4.163 [6.633]	-6.495 [3.318]*	-1.494 [1.914]	-0.032 [0.120]	0.319 [0.182]*	0.055 [0.022]**	0.025 [0.022]	0.072 [0.045]	0.075 [0.051]
# Observations	774	770	800	793	764	744	802	799	802	799
R-squared	0.37	0.23	0.03	0.1	0.2	0.19	0.08	0.07	0.17	0.23

# Changes in Social Network due to DrumNet (separate paper)

Panel A: Treatment			
	Number of relatives in SHG	Number of farming contacts in SHG	Number of trusted members in SHG
Post	-0.57 [0.186]***	-0.514 [0.128]***	-0.579 [0.167]***
Post x Treatment	0.347 [0.299]	0.707 [0.206]***	0.987 [0.267]***
Num. Observations	1813	1813	1813
R-squared	0.22	0.08	0.11
Panel B: Credit vs. No Credit			
	Number of relatives in SHG	Number of farming contacts in SHG	Number of trusted members in SHG
Post	-0.563 [0.182]***	-0.509 [0.126]***	-0.575 [0.165]***
Post x Credit	0.787 [0.250]***	1.01 [0.199]***	1.211 [0.223]***
Post x No Credit	-0.086 [0.561]	0.409 [0.321]	0.767 [0.461]
Num. Observations	1813	1813	1813
R-squared	0.23	0.09	0.11
Mean dep. variable	1.175	0.872	1.108
<i>P-value of Test Post x Credit = Post x No credit</i>			
	0.213	0.129	0.401

# Summary of Impact

- DrumNet has led to an increase in cultivation of cash crops, increased usage of financial services and reduction in overall marketing costs.
- These gains translate into a significant increase in overall income for first-time growers but not for everyone.

# Epilogue

- One year after the introduction of EurepGap requirements, exporters refused to purchase the produce since none of the SHGs were certified.
- This resulted in DrumNet's collapse; angry farmers revert back to growing crops for local markets.
- Bitter irony: Trust was a big motivation for DrumNet's creation.

Table 1a  
Pre-Intervention Self-Help Group Characteristics from Filter Survey  
Means and Standard Deviations

	N. of	Means			p-value	Means		p-value
	Obs.	All	Control	Treatment		Credit	No credit	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Current number of members	36	28.7 (17.5)	31.4 (19.6)	27.3 (16.6)	0.51	24.2 (11.3)	31.0 (21.3)	0.52
Age of SHG (months)	36	4.77 (4.89)	4.99 (3.9)	4.66 (5.39)	0.85	5.24 (6.24)	3.97 (4.37)	0.81
SHG has social activities (1 = yes)	36	0.53 (0.51)	0.75 (0.45)	0.42 (0.5)	0.06*	0.46 (0.52)	0.36 (0.5)	0.16
Fee contribution to the SHG per member	36	103 (106)	87.5 (56.9)	111 (124)	0.55	111 (128)	110 (126)	0.83
SHG has an account in the bank (1=yes)	36	0.64 (0.49)	0.67 (0.49)	0.63 (0.49)	0.81	0.62 (0.51)	0.64 (0.5)	0.97
Main road paved (1 = yes)	36	0.86 (0.35)	1.00 (0)	0.79 (0.41)	0.09*	0.69 (0.48)	0.91 (0.3)	0.07*
Km to main market	36	5.82 (3.6)	5.08 (3.2)	6.19 (3.79)	0.39	5.42 (3.09)	7.09 (4.46)	0.37
Time to the main market (minutes)	36	41.5 (47.1)	22.5 (16)	51.0 (54.6)	0.09*	65.0 (68.6)	34.5 (25.3)	0.06*

Table 1b  
Pre-Intervention Individual and Household Characteristics from Baseline Survey  
Means and Standard Deviations

	Means			p-value on t-test of difference: (2) - (3)	Means		p-value on F-test for (5) and (6)
	All	Control	Treatment		Credit	No Credit	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Member</i>							
Age of member	41.2 (12.2)	39.3 (11.9)	42.2 (12.2)	0.17	42.3 (12.3)	42.0 (12.2)	0.37
Literacy	0.90 (0.30)	0.89 (0.30)	0.90 (0.29)	0.79	0.92 (0.27)	0.88 (0.32)	0.55
Risk tolerance	0.38 (0.42)	0.39 (0.42)	0.38 (0.42)	0.89	0.36 (0.42)	0.39 (0.42)	0.81
Months as member in SHG	52.51 (39.7)	57.2 (44.4)	49.8 (36.5)	0.51	49.0 (33.2)	50.6 (39.2)	0.76
Member of SHG is an officer (1=yes)	0.16 (0.37)	0.16 (0.36)	0.16 (0.37)	0.92	0.14 (0.35)	0.18 (0.38)	0.54
Deposit in a formal bank (1=yes)	0.69 (0.46)	0.70 (0.46)	0.69 (0.46)	0.77	0.71 (0.45)	0.66 (0.47)	0.66
Loan from formal institutions (1=yes)	0.04 (0.19)	0.06 (0.23)	0.03 (0.17)	0.03**	0.05 (0.22)	0.01 (0.09)	0.00***
Logarithm of total annual household income	3.49 (1.20)	3.59 (1.19)	3.44 (1.20)	0.30	3.67 (1.17)	3.23 (1.20)	0.02**
Number of Household members	4.59 (2.09)	4.55 (2.12)	4.61 (2.08)	0.79	4.71 (2.23)	4.52 (1.94)	0.73

Table 1b  
Pre-Intervention Individual and Household Characteristics from Baseline Survey  
Means and Standard Deviations

	Means		p-value on t-test of difference: (2) - (3)	Means		p-value on F-test for (5) and (6)
	All	Control	Treatment	Credit	No Credit	
	(1)	(2)	(3)	(4)	(5)	(6)
	(0.31)	(0.29)	(0.32)		(0.32)	(0.32)
Total landholdings (Acres)	1.80	1.90	1.75	0.56	1.77	1.74
	(2.05)	(2.36)	(1.89)		(1.81)	(1.96)
Proportion of land devoted to cash crops	0.58	0.59	0.57	0.54	0.58	0.55
	(0.25)	(0.24)	(0.26)		(0.24)	(0.28)
<i>Production</i>						
Grows export crops (1=yes)	0.46	0.55	0.41	0.15	0.48	0.35
	(0.50)	(0.50)	(0.49)		(0.50)	(0.48)
Sells to market (1=yes)	0.39	0.41	0.38	0.54	0.36	0.40
	(0.49)	(0.49)	(0.49)		(0.48)	(0.49)
Uses hired labor (1=yes)	0.34	0.34	0.34	0.99	0.36	0.31
	(0.45)	(0.44)	(0.46)		(0.47)	(0.45)
Uses Machinery and/or animal force (1=yes)	0.06	0.09	0.04	0.06*	0.04	0.04
	(0.23)	(0.28)	(0.19)		(0.18)	(0.20)
Value of harvested produce (in Ksh 1,000)	44.27	48.1	42.1	0.37	47.1	37.7
	(72.7)	(73.1)	(72.6)		(77.9)	(67.4)
Production of french beans (in 1,000 Kg.)	3.40	2.89	3.65	0.61	4.54	2.76
	(14.3)	(13.1)	(14.9)		(17.0)	(12.5)
Production of baby corn (in Kg.)	13.3	21.0	9.48	0.34	11.9	7.06
	(114.1)	(162.1)	(80.6)		(107.8)	(38.1)
Total spent in marketing (in Khs 1,000)	1.00	0.36	1.36	0.06*	2.02	0.78
	(8.18)	(2.13)	(10.1)		(13.8)	(4.91)
Use of inputs	0.95	0.95	0.95	0.89	0.95	0.94
	(0.23)	(0.22)	(0.23)		(0.21)	(0.24)