

Supplement to:

Journal of Agriculture and Rural Development in the Tropics and
Subtropics

Vol. 125 No. 2 (2024) 209–218 | <https://doi.org/10.17170/kobra-2024093010896>



**Determinants of smallholder farmers' satisfaction with agricultural
extension services in Embu County, Kenya**

Caroline Mukami Miriti, Wilckyster Nyateko Nyarindo, Kirema Nkanata Mburugu
and Daniel Nthiwa

Supplementary file 1: Distribution of farmers' satisfaction with Agricultural extension services by categorical variables.

Variable	Category	Very dissatisfied		Moderately dissatisfied		Moderately satisfied		Very satisfied		χ^2 P-value
		N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)	
Gender	Male	21	10.40 (3.47-17.97)	78	38.61 (31.68-46.19)	81	40.10 (33.68-46.19)	22	10.89 (3.96-18.47)	0.157
	Female	11	5.67 (0.00-13.12)	93	47.94 (40.72-55.39)	72	37.11 (2.06-16.73)	18	9.27 (2.06-16.73)	
Household family size	≤ 4 members	21	7.87 (1.87-14.52)	114	42.70 (36.70-49.35)	109	40.82 (34.83-47.48)	23	8.61 (2.62-15.27)	0.407
	≥ 5 members	11	8.53 (0.00-17.95)	57	44.19 (35.66-53.61)	44	34.11 (25.58-43.54)	17	13.18 (4.65-22.61)	
Age in years	>35	6	11.11 (0.00-25.27)	19	35.19 (22.22-49.34)	24	44.44 (31.48-58.60)	5	9.26 (0.00-23.41)	0.016
	36-50	11	6.71 (0.00-14.67)	58	35.37 (27.44-43.33)	77	46.95 (39.02-54.91)	18	10.97 (3.05-18.94)	
	<50	50	8.43 (1.12-16.08)	94	52.81 (45.51-60.46)	52	29.21 (21.91-36.87)	17	9.55 (2.24-17.20)	
Years of farming experience	≤ 10	15	11.03 (2.94-20.45)	56	41.18 (33.09-50.59)	49	36.03 (27.94-45.45)	16	11.76 (3.68-21.18)	0.012
	11-20	3	4.00 (0.00-15.89)	22	29.33 (18.67-41.22)	41	54.67 (44.00-66.56)	9	12.00 (1.33-23.89)	
	≥21	14	7.57 (0.54-15.43)	93	50.27 (43.24-58.13)	63	34.05 (27.03-41.92)	15	8.11 (1.08-15.97)	
Marital status	Married	26	8.39 (2.58-14.35)	130	41.94 (36.12-47.90)	122	39.35 (33.54-45.32)	32	10.32 (4.51-16.29)	0.472
	Single	2	5.26 (0.00-21.30)	15	39.47 (23.68-55.14)	16	42.1 (26.3-58.1)	5	13.16 (0.00-29.20)	
	Widow	2	4.88 (0.00-19.66)	23	56.20 (41.46-70.88)	13	31.70 (0.00-22.09)	3	7.32 (0.00-22.09)	
	Widower	2	28.57 (0.00-68.36)	3	42.86 (14.29-82.64)	2	28.57 (0.00-68.36)	0	0.00 (0.00-39.79)	
Education level	No formal	8	16.33 (4.08-31.11)	28	57.14 (44.90-71.	11	22.45 (10.20-37.24)	2	4.08 (0.00-18.86)	0.021
	Primary	14	8.75 (1.25-17.43)	68	42.50 (35.00-51.18)	63	39.37 (31.88-48.05)	15	9.36 (1.88-18.06)	
	Secondary	10	7.30 (0.00-16.70)	52	37.96 (29.93-47.35)	60	43.80 (35.80-53.19)	15	10.94 (2.92-20.34)	
	Tertiary	0	0.00 (0.00-14.16)	23	46.00 (32-60.16)	19	38.00 (24-52.16)	8	16.00 (2-30.16)	
Occupation	Farming only	26	8.81 (3.05-15.07)	134	45.42(39.66-51.68)	109	36.95 (31.18-43.20)	26	8.81 (3.05-15.07)	0.633
	Farming-business	6	6.74 (0.00-18.21)	33	37.08 (26.97-48.54)	37	41.57 (31.46-53.04)	13	14.61 (4.49-26.07)	
	Farming-salaried	0	0.00 (0-34.72)	3	30.00 (10-64.72)	6	60.00 (40-94.72)	1	10.00 (0-44.72)	
	Farming-salaried-business	0	0.00 (0-95.78)	1	50.00 (50-100.0)	1	50.00 (50-100.0)	0	0.00 (0-95.78)	
	<1	8	5.97 (0.00-15.36)	61	45.52 (37.31-54.91)	54	40.30 (32.09-49.70)	11	8.21 (0.00-17.60)	0.892

Farm size in hectares (ha)	1-2	18	9.23 (2.05-16.80)	82	42.05 (34.90-49.62)	73	37.44 (30.26-45.00)	22	11.28 (4.10-18.84)	
	>2	5	8.06 (30.64-22.19)	26	41.94 (30.65-56.06)	25	40.32 (29.03-54.45)	6	9.68 (0.00-23.80)	
Land tenure system	Owned no title deed	12	9.09 (0.76-18.38)	65	49.24 (40.91-58.53)	48	36.36 (28.03-45.64)	7	5.30 (0.00-14.59)	0.013
	Owned title deed	20	8.10 (1.62-14.77)	103	41.70 (35.22-48.34)	96	38.87 (32.39-45.54)	28	11.34 (4.86-18.01)	
	Rented in	0	0.00 (0.00-27.45)	3	17.65 (0.00-45.10)	9	52.94 (35.29-80.39)	5	29.41 (11.76-56.86)	
Decision maker of livestock production	Male	11	6.29 (0.00-14.40)	67	38.29 (30.86-46.40)	77	44.00 (36.57-52.11)	20	11.43 (4.00-19.54)	0.118
	Female	21	9.50 (2.71-16.47)	104	47.06 (40.27-54.03)	76	34.39 (27.60-41.36)	20	9.05 (2.26-16.02)	
Decision maker of crop production	Male	15	8.24 (1.10-16.36)	72	39.56 (32.42-47.67)	72	39.56 (32.42-47.67)	23	12.64 (5.49-20.75)	0.354
	Female	17	7.94 (1.40-15.41)	99	46.26 (39.72-53.73)	81	37.85 (31.31-45.31)	17	7.94 (1.40-15.41)	
Incur labour cost	No	24	8.79 (2.56-15.03)	124	45.42 (39.19-51.66)	102	37.36 (31.14-43.60)	23	8.42 (2.20-14.66)	0.137
	Yes	7	5.93 (0.00-15.41)	44	37.29 (27.97-46.76)	50	42.37 (33.05-51.84)	17	14.41 (5.08-23.88)	
Labour sources	Family	28	9.59 (3.77-15.84)	133	45.55 (39.72-51.80)	108	36.99 (31.16-43.24)	23	7.88 (2.05– 43.24)	0.013
	Hired	4	3.85 (0.00-14.33)	38	36.54 (26.92-53.75)	45	43.27 (33.65-53.75)	17	16.35 (6.73-26.83)	
Off-farm income	Yes	3	2.19 (0.00-11.68)	58	42.34 (34.31-51.82)	57	41.60 (33.58-51.09)	19	13.87 (5.84-23.36)	0.004
	No	28	10.85 (4.65-17.51)	113	43.80 (37.60-50.46)	96	37.21 (31.00-43.87)	21	8.14 (1.94-14.80)	
Consult extension agents	No	28	14.43 (7.22-22.03)	76	39.17 (31.96-46.78)	71	36.60 (29.38-44.20)	19	9.79 (2.57-17.39)	<0.001
	Yes	4	1.98 (0.00-9.50)	95	47.03 (40.10-54.55)	82	40.59 (33.66-48.11)	21	10.40 (3.47-17.92)	
Frequency of receiving AES	1 time per year	4	6.90 (0.00-20.26)	32	55.17 (43.10-68.54)	19	32.76 (20.69-46.12)	3	5.17 (0.00-18.53)	<0.001
	2 times per year	7	6.30 (0.00-15.74)	72	64.86 (56.76-74.30)	31	27.93 (19.82-37.36)	1	0.90 (0.00-10.34)	
	3 times per year	4	6.67 (0.00-20.91)	25	41.67 (30.00-55.90)	24	40.00 (28.33-54.24)	7	11.67 (0.00-25.91)	
	4 times per year	17	10.18 (2.40-17.99)	42	25.15 (17.37-32.96)	79	47.31 (39.52-55.11)	29	17.36 (9.58-25.17)	
Access to credit	No	28	10.85(4.65-17.40)	121	46.90(40.70-53.44)	83	32.17(25.97-38.72)	26	10.08(3.88-16.62)	<0.001
	Yes	4	2.90(0.00-12.10)	50	36.23(28.26-45.44)	70	50.72(42.75-59.93)	14	10.14(2.17-19.35)	
Farmer belong to a group/organization	No	28	10.04 (3.94-16.34)	116	41.58 (35.48-47.88)	110	39.43 (33.33-45.73)	25	8.96 (2.87-15.26)	0.094
	Yes	4	3.42 (0.00-13.62)	55	47.01 (38.46-57.21)	43	36.75 (28.21-46.96)	15	12.82 (4.27-23.02)	

Supplementary file 2: Results of variables found to be significantly associated with farmers' satisfaction with AES based on the univariable CLMs.

Variable	Category	Estimate (SE)	Odds ratio (95% CI)	*P-value
Fixed effects				
Education level	Non-formal education		Ref.	
	Primary education	0.90 (0.32)	2.46 (1.33-4.60)	0.004
	Secondary education	1.13 (0.32)	3.09 (1.65-5.86)	<0.001
	Tertiary education	1.32 (1.32)	3.73 (1.77-7.98)	<0.001
Years of farming experience	≤10 years		Ref.	
	11–20	0.65 (0.27)	1.92 (1.13-3.26)	0.016
	>21	-0.16 (0.21)	0.85 (0.56-1.30)	0.461
Off-farm income	No		Ref.	
	Yes	0.54(0.20)	1.72 (1.17-2.53)	0.006
Land tenure system	Owned no title deed		Ref.	
	Owned title deed	0.36 (0.20)	1.44 (0.97-2.14)	0.072
	Rented in	1.76 (0.49)	5.83 (2.26-15.3)	<0.001
Decision maker for livestock production	Male		Ref.	
	Female	-0.44 (0.19)	0.64 (0.44-0.93)	0.020
Incur labour cost	No		Ref.	
	Yes	0.47 (0.21)	1.60 (1.07-2.41)	0.023
Sources of labour	Family		Ref.	
	Hired	0.68 (0.22)	1.96 (1.29-3.01)	0.002
Consult extension agents*	No		Ref.	
	Yes	0.37 (0.19)	1.44 (1.00-2.09)	0.052
Frequency of receiving AES	1 time per year		Ref.	
	2 times per year	-0.30 (0.30)	0.74 (0.41-1.34)	0.323
	3 times per year	0.51 (0.35)	1.67 (0.85-3.30)	0.137
	4 times per year	0.98 (0.29)	2.65 (1.51-4.71)	0.001
Distance to AES**	-	0.49 (0.14)	1.64 (1.13 -2.19)	<0.001
Access to credit	No		Ref.	
	Yes	0.67 (0.20)	1.95 (1.33-2.87)	0.001

Notes: * This variable was not statistically significant by CLM unlike in the univariable CLMM analysis. All the other factors were significant by both CLM and CLMM univariable analyses.

**Distance to AES was included as a log transformed variable hence there are no categories for this variable.

Supplementary file 3: Results of variables found to be significantly associated with farmers’ satisfaction with AES based on the multivariable CLM analysis.

Variable	Category	Estimate (SE)	Odds ratio (95% CI)	*P-value
Fixed effects				
Education level*				
	No formal education		Ref.	
	Primary education	0.76 (0.33)	2.14 (1.11-4.14)	0.023
	Secondary education	0.67 (0.35)	1.95 (0.99.-3.87)	0.054
	Tertiary education	0.99 (0.41)	2.70 (1.21-6.09)	0.015
Off-farm income				
	No		Ref.	
	Yes	0.62 (0.21)	1.86 (1.23-2.82)	0.003
Land tenure system				
	Owned no title deed		1.00 (Ref.)	
	Owned title deed	0.17 (0.22)	1.18 (0.78-1.81)	0.432
	Rented in	1.244 (0.551)	3.47 (1.27-9.62)	0.015
Frequency of receiving AES				
	1 time per year		Ref.	
	2 times per year	-0.21 (0.32)	0.81 (0.44-1.50)	0.502
	3 times per year	0.47 (0.36)	1.60 (0.78-3.27)	0.198
	4 times per year	1.15 (0.31)	3.15 (1.73-5.79)	<0.001
Access to credit				
	No		Ref.	
	Yes	0.61 (0.22)	1.84 (1.21-2.83)	0.005
Distance to AES**				
	–	0.49 (0.15)	1.64 (1.22-2.23)	0.001

Notes: * For education level, the secondary education category was not statistically significant by CLM unlike in the multivariable CLMM analysis.

**Distance to AES was included as a log transformed variable hence there are no categories for this variable.