Supplementary Materials: Emerging Development Pathways of Urban Livestock Production in Rapidly Growing West Africa Cities

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Table S1. Potential classification variables for two-step cluster analysis (% for nominal, mean ± standard deviation for continuous variables).

Potential Variable	Ouagadougou (*n* = 157)	Tamale (*n* = 175)	Selected for catPCA[2]	Selected for Two-Step Cluster Analysis [3]
Location	Urban: 26.8 Peri-urban: 73.2	Urban: 57.1 Peri-urban: 42.9	OUA, TAM	OUA, TAM
Age of household head (years)	51.9 ± 12.01	50.4 ± 12.86	OUA, TAM	-
Education of household head	No education: 54.8 Primary school: 21.7 Secondary school: 14.7 Tertiary school: 8.9	No education: 54.3 Primary school: 8.6 Secondary school: 28.0 Tertiary school: 19.4	OUA, TAM	OUA
Household member (*n*)	9.8 ± 5.88	13.9 ± 8.51	OUA, TAM	-
Ethnicity of household head	Mossi: 71.3 Fulani: 24.2 Other: 4.4	Not considered (93.1% Dagomba, others ≤ 1%)	OUA	OUA
Migrated	Not migrated: 63.3 Migrated: 36.7	Not considered	OUA	OUA
Livestock main occupation	No: 86.6 Yes: 13.4	No: 92.5 Yes: 7.5	OUA, TAM	-
Crop production	No: 29.3 Yes: 70.7	No: 21.7 Yes: 78.3	OUA, TAM	TAM
Farm time (years)	14.5 ± 11.35	Not considered	OUA	
Labor use for livestock activities	Family labor only: 61.8 Hired labor only: 8.3 Family and hired labor: 29.9	No hired labor: 74.3 Hired labor: 25.7	OUA, TAM	OUA, TAM
Cows and heifers (*n*)	8.2 ± 12.32	Not considered	-	-

Table S1. *Cont.*

Potential Variable	Ouagadougou (*n* = 157)	Tamale (*n* = 175)	Selected for catPCA [2]	Selected for Two-Step Cluster Analysis [3]
Cattle (*n*)	Not considered	11.0 ± 19.72	TAM	TAM
Goats (*n*)	7.5 ± 10.60	7.1 ± 8.85	OUA, TAM	-
Sheep (*n*)	11.8 ± 14.41	10.6 ± 11.43	OUA, TAM	-
Pigs (*n*)	9.3 ± 18.84	0.8 ± 3.90	OUA, TAM	OUA
Local chickens, guinea fowl (*n*)	25.4 ± 27.69	21.0 ± 28.55	OUA	
Mating controlled (natural, AI)	No: 47.1 Yes: 52.9	Not considered	OUA	OUA
Animals confined (stall, shelter, fence)	No: 45.2 Yes: 54.8	No: 31.1 Yes: 68.9	OUA, TAM	-
Transhumance of cattle	No: 62.4 Yes: 37.5	Not applicable	OUA	OUA
Milk sales	No: 69.4 Yes: 30.6	No: 86.3 Yes: 13.7	OUA, TAM	OUA, TAM
Egg sales	No: 71.3 Yes: 28.7	No: 75.4 Yes: 24.6	OUA, TAM	
Average daily milk production in 2013 (kg/household)	7.9 ± 26.17	1.6 ± 3.83	TAM	TAM
Average daily milk sales in 2013 (kg/household)	6.7 ± 25.87	0.8 ± 2.50	OUA	-
Livestock sales in 2013 (TLU [1])	3.2 ± 3.84	1.6 ± 0.37	OUA, TAM	OUA

Table S1. *Cont.*

Potential Variable	Ouagadougou (*n* = 157)	Tamale (*n* = 175)	Selected for catPCA [2]	Selected for Two-Step Cluster Analysis [3]
Manure use	Manure thrown away: 7.0 Used on farm: 58.0 Manure sold: 17.8 Manure given away: 9.6 Multiple uses: 7.6	Manure thrown away: 12.6 Used on farm: 71.3 Manure exchanged: 9.2 Multiple uses: 6.9	TAM	TAM
Feeding method cattle	Stall-fed: 5.6 Pasture: 67.3 Tethered: 2.8 Stall-fed and pasture: 17.8 Stall-fed and tethered: 2.8 Pasture and tethered: 3.7	No feed purchased: 79.4 Feed purchased: 20.6	OUA, TAM	OUA, TAM
Feeding method goats	Stall-fed: 6.8 Pasture: 46.6 Tethered: 4.1 Stall-fed and pasture: 5.5 Stall-fed and tethered: 1.4 Pasture and tethered: 35.6	No feed purchased: 74.9 Feed purchased: 25.1	OUA, TAM	OUA, TAM
Feeding method sheep	Stall-fed: 9.3 Pasture: 67.4 Tethered: 1.2 Stall-fed and pasture: 12.8 Stall-fed and tethered: 0.0 Pasture and tethered: 9.3	No feed purchased: 57.1 Feed purchased: 42.9	-	-
Feeding method pigs	Stall: 57.4 Free range: 3.7 Stall and free range: 38.9	No feed purchased: 94.8 Feed purchased: 5.2	OUA, TAM	OUA

[1] Tropical livestock unit (equivalent to 250 kg body weight), conversion factors used: 0.8 TLU for cattle, 0.1 TLU for sheep and goats, 0.2 TLU for pigs, 0.01 TLU for local poultry; [2] catPCA: categorical principal component analysis. The number of potential variables was gradually reduced. Spearman correlation tests, η^2 statistics and Cramer's V were used to measure the association between variables, resulting in 20 (TAM) and 24 variables (OUA), respectively, that were selected for catPCA; [3] Through catPCA, the number of variables for the two-step cluster analysis was further reduced to 9 (TAM) and 13 (OUA), using a loading score ≥0.5 on one of the two components as selection criterion.

Table S2: Controlled mating in different livestock species by (peri-) urban households (HH) in Ouagadougou (OUA; *n* = 157) and Tamale (TAM; *n* = 172).

	HH with Cattle	Cattle [a]	HH with Sheep	Sheep	HH with Goats	Goats	HH with Pigs	Pigs	HH with Local Poultry	Local Poultry
Cluster	***n***	**% of HH**	**n**	**% of HH**	**n**	**% of HH**	**n**	**% of HH**	**n**	**% of HH**
OUA-1	0	NA	18	27.8	20	10.0	38	52.6	30	3.3
OUA-2	17	41.2	13	30.8	12	0.0	16	31.2	16	0.0
OUA-3	54	40.7	42	26.2	34	20.6	0	NA	48	2.1
OUA-4	36	63.9	29	34.5	24	25.0	0	NA	33	0.0
OUA	99	48.6	102	29.4	90	16.7	54	46.3	127	1.6
p-value (OUA)		0.089		0.890		0.203		0.232		0.802
TAM-1	29	10.3	48	4.2	33	0.0	0	NA	29	3.4
TAM-2	30	0.0	28	0.0	26	0.0	0	NA	21	0.0
TAM-3	19	0.0	32	3.1	22	0.0	0	NA	26	0.0
TAM-4	16	0.0	31	0.0	30	0.0	10	70.0	30	0.0
TAM	94	5.3	139	2.2	111	0.0	10	70.0	106	0.9
p-value (TAM)		0.160		0.698		-		-		0.717
Both cities	201	28.4	241	13.7	201	7.5	64	50.0	233	1.3
p-value (cities)		<0.001		<0.001		<0.001		0.302		1.000

[a] AI used by 12.7% of cattle keepers in OUA, of which 55% in OUA-3 and 35% in OUA-4. For definition of clusters see footnote of Table 1 and text.