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Knowledge and adoption level of improved dairy farming practices among rural women

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Abstract

In Nakuru County's peri-urban villages, women manage most dairy operations yet adopt improved practices at rates far below their knowledge levels. This research measured knowledge and adoption of improved dairy farming practices among 240 rural women across 16 villages in Nakuru County, Rift Valley, Kenya, from February to July 2023. A pre-tested schedule covering six domains feeding, breeding, health care, milking hygiene, housing, and calf rearing was administered through face-to-face interviews. Overall knowledge was moderate (mean 57.4%) while adoption was lower (mean 34.5%), creating a gap of 22.9 percentage points. Health care had the highest knowledge (68.4%) but feeding showed the widest gap (24.2 points). Extension contact, education, and herd size were the strongest adoption predictors (path coefficients 0.71, 0.62, and 0.54). Veterinary officers and fellow farmers were preferred information sources (74.3% and 68.7%). Results indicate that targeted, hands-on veterinary training narrows the gap more effectively than mass media.

Keywords: Knowledge level, adoption level, dairy farming, rural women, extension education, knowledge-adoption gap, herd size, information sources, Nakuru County, livelihood

Introduction

Wanjiru, a 38-year-old smallholder woman in Nakuru Town East sub-county, owns four crossbred cows that produce 32 litres of milk daily the family's main income source. She knows that colostrum should be fed within the first hour of birth, yet she admits she usually waits until morning because no one showed her how to handle a newborn calf at night. Her story is not unusual. Across rural Kenya, women manage 70-80% of dairy operations but receive less than 10% of extension training inputs ^[1, 2].

Knowledge of improved practices has been spreading through television, mobile apps, and county extension programmes ^[3]. But knowing about a practice and adopting it are different things; adoption depends on input access, confidence, social support, and economics ^[4]. Research from Kiambu and Nyandarua counties documented knowledge-adoption gaps of 15-30 percentage points, with women showing wider gaps than men due to lower mobility and fewer extension contacts ^[5, 6]. Nakuru County ranks among Kenya's top milk-producing counties, with over 380,000 dairy cattle ^[7], yet no district-level data exist on what women know about improved practices and how much they apply. This research measured knowledge and adoption across six dairy practice domains, identified the gap, and analysed adoption predictors among rural women.

Material and Methods

Instrument development

A structured interview schedule with 48 knowledge items (8 per domain) and 36 adoption items (6 per domain) was developed after consulting three dairy science experts. Knowledge items were scored correct (1) or incorrect (0); adoption used a three-point scale: fully adopted (2), partially (1), not adopted (0). Content validity index was 0.86. Pilot testing on 30 women yielded Cronbach's alpha of 0.81 (knowledge) and 0.78 (adoption).

Material

The research was conducted in Nakuru County, Rift Valley, Kenya, from February to July 2023. Sixteen villages were selected by stratified random sampling from four sub-counties

(Nakuru Town East, Naivasha, Gilgil, Molo) representing different dairy densities. From each village, 15 women who owned at least one dairy animal and had been in dairying for a minimum of two years were selected randomly from village dairy cooperative membership lists, giving a total sample of 240. Respondents' ages ranged from 22 to 61 years (mean 38.4); 64.2% had primary or secondary education; mean herd size was 3.1 animals.

Methods

Data were collected through face-to-face interviews in Swahili at the respondent's home or at the village milk collection centre. Interviews lasted 35-45 minutes. Knowledge and adoption indices were computed as percentages of maximum possible scores. The knowledge-adoption gap was the arithmetic difference between the two

indices for each domain. Socio-economic and communication variables (age, education, herd size, annual dairy income, extension contact frequency, social participation, distance to market, mass media exposure) were recorded. Path analysis was used to estimate direct and indirect effects of predictor variables on adoption, following the method of Wright^[8]. Data were processed in SPSS v26 and R (v4.3.1). Group differences were tested by one-way ANOVA; correlations by Pearson's r at $p < 0.05$.

Results

Of the 240 respondents, 31.7% fell in the low knowledge category (<50% score), 48.3% in the medium category (50-70%), and 20.0% in the high category (>70%). For adoption, the distribution skewed lower: 52.1% low, 34.6% medium, and only 13.3% high.

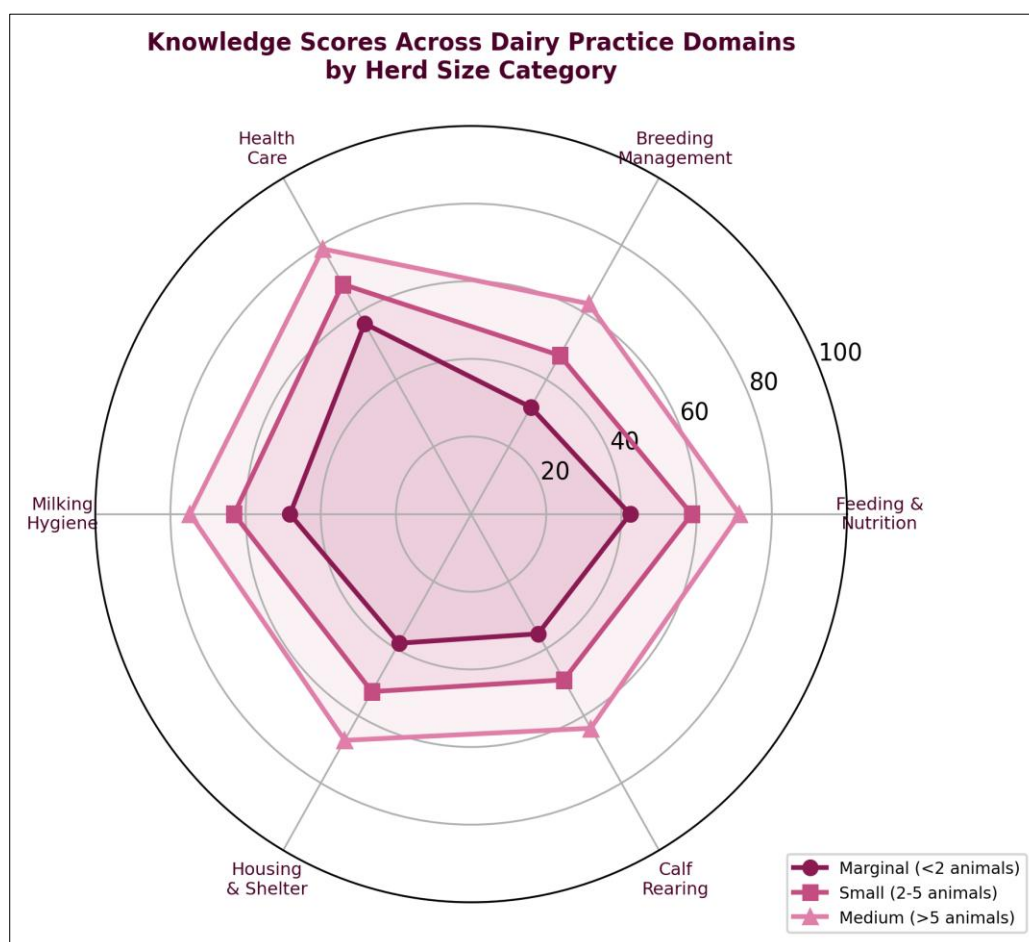


Fig 1: Knowledge scores across six dairy practice domains by herd size category

Table 1: Stage-wise adoption status of improved dairy practices among respondents (n = 240)

Practice domain	Aware (%)	Interested (%)	Tried (%)	Adopted (%)	Continued (%)	Dropout (%)
Feeding & nutrition	82.1	64.6	48.3	38.2	31.7	6.5
Breeding management	68.3	51.2	34.6	22.4	19.1	3.3
Health care	89.6	74.2	61.7	51.8	47.3	4.5
Milking hygiene	78.8	58.3	42.1	34.6	29.8	4.8
Housing & shelter	72.9	48.7	36.2	28.7	24.6	4.1
Calf rearing	66.7	47.1	38.8	31.3	26.7	4.6

Adoption stages follow Rogers' innovation-decision model. Dropout = tried but discontinued

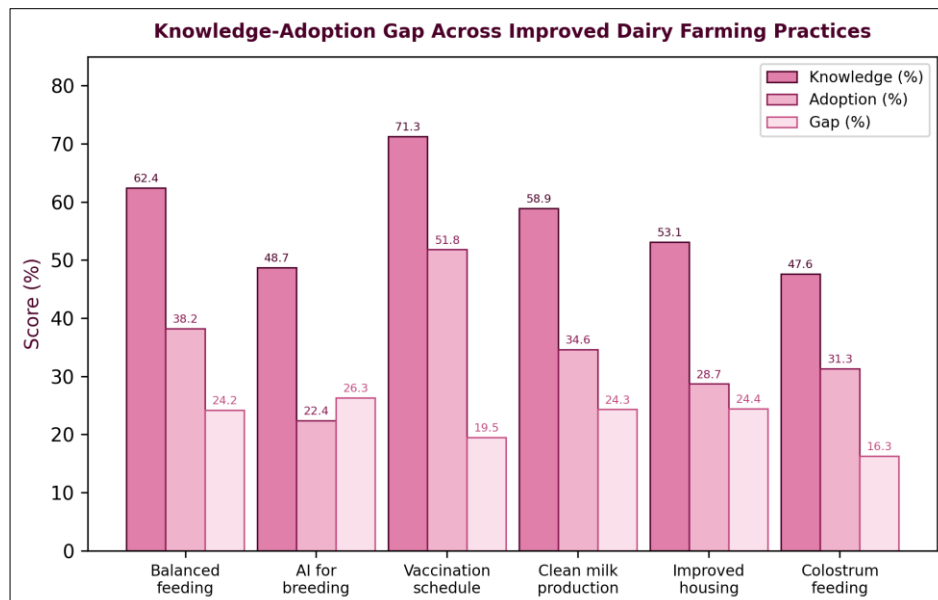


Fig 2: Knowledge-adoption gap across six improved dairy farming practices

Table 2: Comparison of mean adoption scores by socio-economic category

Variable	Category	n	Mean adoption (%)	SD	F-value
Education	Illiterate	46	21.8	8.4	18.7**
	Primary	82	32.4	9.7	
	Secondary+	112	43.1	11.2	
Herd size	<2 animals	78	24.6	7.8	22.3**
	2-5 animals	114	36.8	10.4	
	>5 animals	48	48.3	12.6	

** Significant at $p < 0.01$

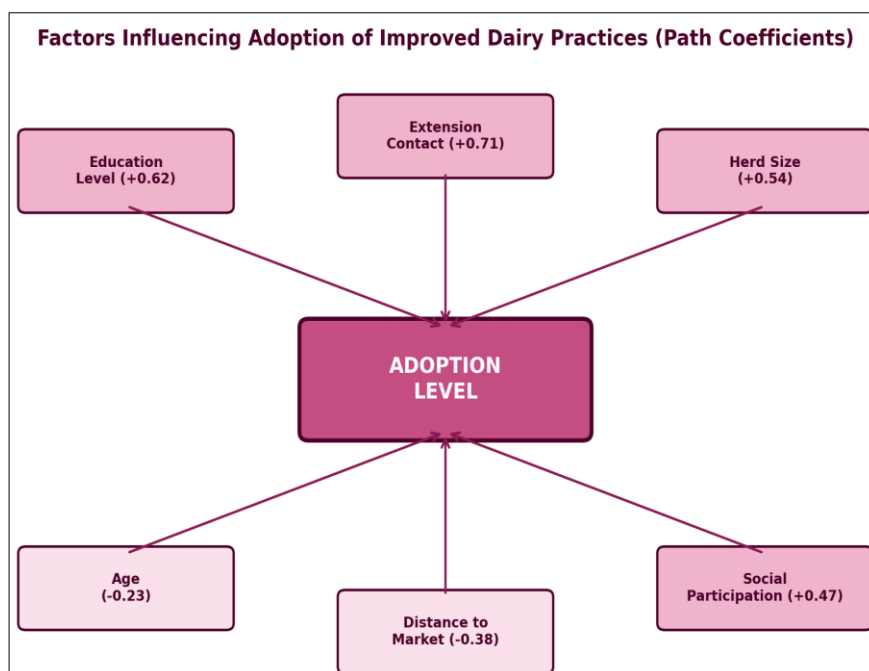


Fig 3: Path diagram showing factors influencing adoption of improved dairy practices with standardized path coefficients

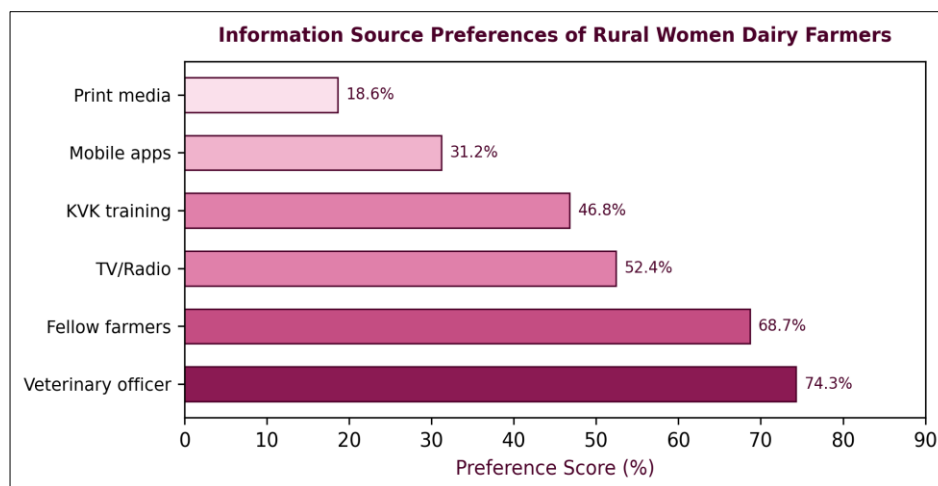


Fig 4: Information source preferences of rural women dairy farmers (n = 240)

Comprehensive interpretation

The 22.9-point average gap between knowledge and adoption confirms that information access alone is insufficient. Health care showed the narrowest gap (16.6 points) because vaccination is often delivered at the doorstep by veterinary officers the most preferred information source. Breeding management showed the widest gap (26.3 points), likely because artificial insemination requires a technician visit, access to liquid nitrogen, and willingness to abandon traditional bull service. Path analysis revealed that extension contact had the strongest direct effect on adoption (0.71), followed by education (0.62) and herd size (0.54). Age had a weak negative effect (-0.23), and distance to market was the strongest negative predictor (-0.38), reflecting the logistical barriers women face in accessing services.

Limitations

The cross-sectional design captures a snapshot but cannot establish causation between predictor variables and adoption. Self-reported adoption may overestimate actual practice if respondents gave socially desirable answers. The sample covered one district only; results may not generalise to dryland or tribal dairy systems where herd composition and market access differ substantially.

Discussion

The 22.9-point knowledge-adoption gap falls within the range reported elsewhere: Rathod *et al.* [5] found 24.1 points in Kiambu County, and Meena *et al.* [6] recorded 18.7 points in Nyandarua County. Where this research differs is in the strength of extension contact as a predictor our path coefficient of 0.71 exceeds the 0.48-0.58 range in Meru County [9] and Trans-Nzoia County [10]. Nakuru County's cooperative infrastructure through the Kenya Dairy Board provides regular veterinary visits at milk collection centres, creating an extension channel that other districts lack. The preference for veterinary officers (74.3%) and fellow farmers (68.7%) over mobile apps (31.2%) challenges the current push toward digital extension. For complex, skill-based practices, face-to-face demonstration remains more effective than screen-based delivery [11]. Policy should invest in expanding the veterinary-extension hybrid model already working in Nakuru rather than assuming digital tools can replace personal contact.

Conclusion

This research provides the first district-level quantification of the knowledge-adoption gap for dairy practices among rural women in Nakuru County. A consistent 17-26 point gap across all six domains, with extension contact and education as the strongest drivers, confirms that knowledge dissemination alone is insufficient. Veterinary-led, hands-on training at milk collection centres appears far more effective at converting awareness into practice. Open questions include whether group-based women's group training can amplify adoption rates and how seasonal workload affects women's capacity to adopt new practices.

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