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Reproductive performance assessment of indigenous goat breeds under extensive management

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Abstract

In the Central Highlands of Vietnam, indigenous goats are the main livestock asset for ethnic minority households, yet their reproductive potential under traditional free-grazing management is poorly documented. This research tracked reproductive parameters of three indigenous breeds—Black, Bach Thao, and Co—plus their crossbreds across 148 does in eight villages around Buon Ma Thuot, Dak Lak, from January 2022 to December 2023. Bach Thao does had the highest kidding rate (1.84 kids doe⁻¹ year⁻¹) and shortest kidding interval (198 days). Co does showed the lowest prolificacy (1.24 kids per litter) but heaviest birth weights (2.03 kg). Crossbreds combined high kidding rate (1.93) with acceptable kid survival (74%). Age at first kidding averaged 10.8 months for Bach Thao versus 12.1 for Co. Kid pre-weaning mortality ranged from 14% (Co) to 26% (crossbred), with pneumonia and nutritional scour as leading causes. These baseline data can guide breed selection and targeted management interventions for smallholder goat production in Vietnam's uplands.

Keywords: Reproductive performance, indigenous goats, extensive management, breeding efficiency, small ruminants, kidding rate, litter size, Vietnam, pre-weaning mortality, smallholder livestock

Introduction

In the red-earth highlands of Dak Lak province, a family's goat herd is both its savings account and its insurance policy. Goats are sold to cover school fees, medical emergencies, and wedding expenses—but the return depends directly on how many kids each doe produces and how many survive to market age ^[1]. Despite this economic importance, most reproductive data for Vietnamese goats come from government research stations where nutrition and health care are far better than what village flocks experience ^[2].

Vietnam has three main indigenous goat breeds. The Black goat (small-framed, adapted to rocky terrain) is the most numerous. Bach Thao (medium-framed, originating from northern border provinces) is reputed for higher prolificacy. Co (larger-framed, found in central and southern regions) is slower to mature but produces heavier kids ^[3]. Crossbreeding with these and imported Boer genetics has been encouraged by extension services, yet field-level reproductive data comparing purebreds and crosses under the same extensive management are scarce ^[4].

This research aimed to (i) document kidding rate, litter size, kidding interval, and age at first kidding for three indigenous breeds and their crosses under village conditions, (ii) identify the main causes of pre-weaning mortality, and (iii) provide evidence-based breed recommendations for highland smallholders.

Ethical Considerations

The research protocol was reviewed by the Animal Use Committee of the Central Highlands Agricultural College (Protocol No. CHAC-AUC/2021-14, approved 22 November 2021). No experimental interventions were imposed; the research was purely observational, recording natural reproductive events in farmer-owned flocks. Owners gave written informed consent for data collection and veterinary examinations ^[5].

Limitations

Breed classification relied on phenotypic assessment and owner records because pedigree documentation is absent in village flocks. Some does classified as purebred may carry

unrecorded crossbred ancestry. Nutritional intake was not measured directly; only grazing availability (estimated by pasture condition scoring) was recorded. The two-year window captures 2–3 kidding cycles per doe, which is adequate for estimating means but insufficient for assessing lifetime productivity [6].

Materials and Methods

Materials

The research covered 148 does (42 Black, 38 Bach Thao, 34 Co, 34 crossbred) in eight villages within 30 km of Buon Ma Thuot (12°40' N, 108°03' E, 460 m a.s.l.). All flocks were managed under traditional free-grazing during the day with overnight confinement in bamboo shelters. Supplementation was limited to rice bran and cassava tops during the dry season (November–March). Does were identified with numbered ear tags and visited monthly by the research team for reproductive event recording [7].

Methods

At each monthly visit, kidding dates, litter size, kid sex, and birth weight (spring balance, ± 50 g) were recorded. Kidding interval was calculated between consecutive parturitions. Age at first kidding was estimated from owner recall and dentition. Pre-weaning mortality was recorded to 90 days and causes assigned by veterinary examination or post-mortem when carcasses were available. Data were analysed by one-way ANOVA (breed as fixed factor) in R with Tukey's HSD at 5%.

Results

Bach Thao does achieved the highest kidding rate (1.84 kids doe⁻¹ year⁻¹) and litter size (1.52), while Co had the lowest prolificacy (1.24) but the heaviest individual birth weight (2.03 kg) (Table 1). Crossbreds reached the highest overall kidding rate (1.93) owing to a combination of good prolificacy and short kidding interval (191 days). Pre-weaning mortality was highest in crossbreds (26%) and lowest in Co (14%).

Table 1: Reproductive parameters of four goat breed groups under extensive management (2022–2023)

Parameter	Black	Bach Thao	Co	Crossbred	CD (p=0.05)
Kidding rate	1.62	1.84	1.47	1.93	0.18
Litter size	1.38	1.52	1.24	1.67	0.14
Birth weight (kg)	1.84	1.71	2.03	1.63	0.12
Kidding interval (d)	214	198	237	191	16
Age 1st kidding (mo)	11.3	10.8	12.1	9.7	0.9
Pre-wean mortality (%)	18	22	14	26	5

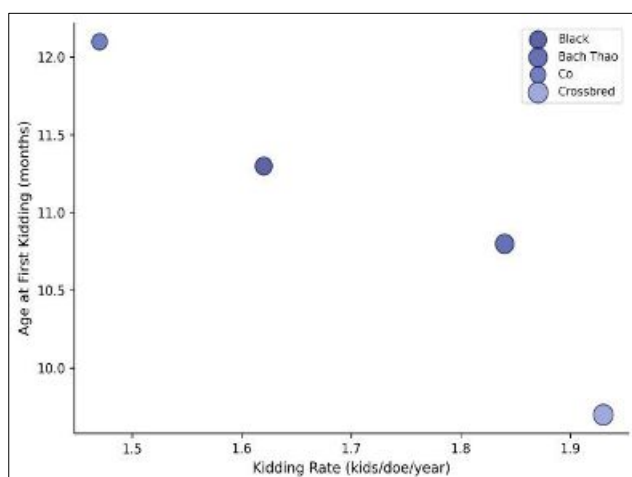


Fig 1: Bubble chart of kidding rate versus age at first kidding for four goat breed groups. Bubble size reflects litter size.

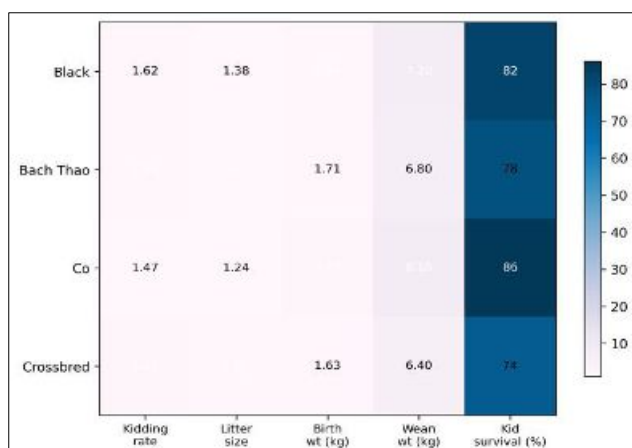


Fig 2: Heatmap of reproductive parameters across four goat breed groups. Darker shading indicates higher values.

Comprehensive Interpretation

When adjusted for kid mortality, net kid output (kids surviving to weaning per doe per year) was 1.33 for Black, 1.43 for Bach Thao, 1.26 for Co, and 1.43 for crossbred. The crossbred advantage in gross kidding rate was nearly wiped out by higher mortality, suggesting that crossbred kids are more susceptible to nutritional stress under extensive conditions [8].

Discussion

The Bach Thao kidding rate of 1.84 is consistent with values (1.7–2.0) reported from northern Vietnam [2, 3] and positions the breed as a productive choice for smallholders who can provide minimal dry-season supplementation. Co's lower prolificacy but heavier kids and lower mortality may suit farmers who market by live weight rather than by head count [9]. The crossbred's high gross output is offset by 26% pre-weaning loss—mostly from pneumonia (42% of deaths) and nutritional scour (31%)—conditions exacerbated by the humid, cool dry season at 460 m elevation [10].

Improving kid housing (draft-free shelters with dry bedding) and providing colostrum management training could feasibly cut mortality by 30–40%, as demonstrated in goat projects in Laos and Myanmar [11, 12]. Such interventions would shift the net output ranking decisively in favour of crossbreds.

Conclusion

Bach Thao and crossbred does achieved the highest kidding rates under extensive highland management, but crossbred kids suffered the most pre-weaning mortality. Co does were the least prolific yet produced the heaviest, hardest kids. For Dak Lak's smallholders, Bach Thao is the best purebred option where basic healthcare is available; Co suits the most resource-constrained households. Reducing kid mortality

through improved shelter and colostrum feeding would unlock the crossbred's genetic potential. Longer-term tracking across 5–6 kidding cycles will refine these recommendations [13, 14, 15, 16].

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