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Breeding schemes integrating health, nutrition and reproduction services boosts small ruminants’ productivity across African landscapes

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Abstract

Multifunctional landscapes (MFLs) are designed to support diverse land uses while sustaining ecological functions generating social and economic benefits. Small ruminants are an important commodity across various African landscapes and Community-Based Breeding Programs (CBBPs) offer a framework for sustainable preservation of local genetic resources and productivity improvement while aligning with MFL principles e.g. harnessing local production objectives and ecosystem sustainability. The benefits from CBBPs are further amplified by the adoption of smart practices in health, nutrition and reproduction, and this framework guides the work of ICARDA and its partners in Ethiopia, Tunisia, and Mali. The practical implementation of CBBP is facilitated by two pillars. The first is the digitalisation of pedigrees and performances using “Dtreo” platform to generate a productivity dashboard and breeding values, that may consider methane emissions, for selection of next-generation animals. In Ethiopia, annual reproductive rates of 2.1, 2.2 and 2.5 were respectively achieved in Bonga, Horro and Doyogena sheep breeds; this gain was associated with 22.2% reduction in methane emissions. The second pillar focuses on the dissemination of genetic gain while ensuring farmers have access to health, reproduction and nutrition services. In Ethiopia, the widespread use of certified rams yielded annual genetic gains in six-months weight of 0.14, 0.18 and 0.21 kg in Menz, Washera and Bonga breeds, respectively. In Tunisia, best-to-best mating schemes using artificial insemination in the local goat achieved a 34.7% conception rate; further adoption of non-invasive ultrasound pregnancy diagnosis yielded a 7.6% improvement in fertility. Additionally, circular practices using mixed forages to flush ewes increased litter size by 23%. Furthermore, preventive health practices over 3 years lessened morbidity in Ethiopian highlands from 6.3% to 3.02% while in Mali, a similar scheme reduced the prevalence of gastrointestinal

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parasites and improved flocks' productivity. In Tunisia, ongoing health interventions are informed by baseline assessments of sheep welfare and antimicrobial resistance (AMR) levels, revealing that 51.5% of animals had depressed body condition and that AMR levels reached alarming 32% for streptomycin and 26% for tetracycline. These findings, across various African Landscapes, underscore the necessity for integrated innovations to improve small ruminant productivity within an MFL approach.

Keywords: Africa, community-based breeding program, goat, multifunctional landscapes, sheep