

Ultrasound diagnosis as low-tech tool for sheep and goat production systems

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Ultrasound machines can help provide opportunities for re-mating and birth planning

Productivity and profitability of meat and milk production from small ruminants are geared by reproductive performance. Females that fail to reproduce are only negatively impacting the environment. A major setback here is infertility but other reproductive-related problems are also important like delayed puberty and first conception, extended postpartum anestrus, and postnatal mortality. The means for enhancing reproductive performance have not changed since the era when sheep and goats have become an important pillar of the food security of communities all over the world; control over reproductive events to match demanding physiological stages with feed abundance, maximization of females giving birth and ensuring survival of new born lambs and kids.

Ultrasound machines may not seem to fit with preconceived ideas for use in extensive, low input systems, but the technology has become cheaper and more accessible. Ultrasound machines do not contravene environmental priorities, but they are non-invasive and non-hormonal. A whole generation of easy-use, high resolution, portable machines is now available with a high reliability of diagnosis as early as 30 days of pregnancy—even less in sheep and goats. Skilled operators can provide different levels of information which will translate into concrete management strategies.

Implicitly, ultrasound for pregnancy diagnosis has become a very common service provided for dairy farmers even in developing countries. In countries where sheep and goats industry is highly market-oriented, managers have started to adopt the technology at a large scale. Scanning will identify

pregnant and non-pregnant females after completion of the mating season when most females have had several chances of getting pregnant. This information is very valuable because it offers: i) an opportunity for re-mating; ii) culling of non-fertile females; and iii) timely planning of conditions for birth.

A more advanced use of commercial, field-applicable ultrasound scanners is to determine number of fetuses (litter size) and their age. It is expected that the rapid development and adoption of the technology for animal farming will accomplish in a foreseeable future the needed expertise and equipment to further narrow the window for fetus age estimation and viability. Under this advanced regime of reproductive management, trained operators can identify zero, single-bearing and multiple-bearing females. The non-pregnant females can be culled for profit and to improve flock fertility as exactly in the basic regime. Pregnant females can be sorted out into groups carrying single or multiple fetuses. This is important as farmers can rationalize the use of feed supplements by adjusting the extra quantities distributed at the end of pregnancy according to litter size. Survival rates for well-grown in utero fetuses are higher and multiple litters can benefit from a better preparation of the birth environment.

Second, the regime can better assess the age of the fetus to increase the precision of strategic feeding for colostrum production and appropriate mammary growth preparing for optimal milk synthesis and suckling. This is of uttermost importance under extensive production systems to ensure proper live weight and maturity of lambs and kids at birth.

Where and how has ICARDA promoted field solutions for sheep and goats ultrasound pregnancy diagnosis?

Within its activities linked to CRP Dryland Systems and CRP Livestock and Fish aiming at improved small ruminants' productivity, ICARDA facilitated introduction of field solutions for ultrasound pregnancy diagnosis to reduce reproductive losses and increase lambing rates in sheep and goat flocks. ICARDA first started screening the international market for cost-effective, user-friendly ultrasound machines and purchased machines to be used in the target locations. Targeted systems and breeds are Awassi sheep in agro-pastoral systems of Jordan, Karakul sheep in Aral Sea, Angora goats in Fergana Valley and Menz sheep in Ethiopian highlands.

So far, core teams of national technical staff (veterinarians and animal production specialists) were trained on machine use, interpretation of ultrasound images, and data valorization in Jordan and Ethiopia. The outcomes of the diagnosis are shared and discussed with farmers to advise on culling of unproductive animals or to develop supplementation strategies to match requirements of animals (barren animals – single fetus bearing females – multi-bearing females).

In Jordan, conception rates in farmers' sheep flocks are relatively low, between 70 and 80 percent as a result of physiological events and poor management. Intervention by a joint team between ICARDA and NCARE (National Centre for Agricultural Research and Extension in Jordan) allowed identifying all barren animals in early October after the mating has ended. The individual data permitted to farmers to decide whether to give the ewe another chance of getting pregnant using a hormonal treatment or to cull the sheep based on their own knowledge of the individual history of their animals.

Resource literature:

Martin, G.B. 2013. An Australasian Perspective on the Role of Reproductive Technologies in World Food Production. In (G. Cliff Lamb and Nicolas DiLorenzo, eds.) "Current and Future Reproductive Technologies and World Food Production". *Advances in Experimental Medicine and Biology*, 752: 181-197

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