Chapter

15

José Alexandre Agiova da Costa
Carmen Iara Mazzoni Gonzalez

SHEEP FARMING IN BRAZIL

Brazil is among the seventeen countries with the largest sheep flock in the world, totaling 17.4 million head. It accounts for 1.4% of world production, with China (134 million), India (74 million), Australia (68 million), Iran (54 million) and Sudan (52 million) being the world's largest producers, representing 35.4% of the global flock (FAO, 2012).

International trade of sheep products is estimated at 11 billion dollars a year, mainly comprising mutton and wool, although the share of the latter has gradually decreased over the years, while mutton sales has increased (MDIC, 2010). Mutton sales totaled US$2 billion in 1990 and exceeded US$4 billion in 2008. Other products, including hides, milk, cheese, offal and livestock, although less representative, should see a growth in sales in the coming years (SORIO et al., 2010).

In Brazil, sheep farming for mutton production has also been expanding continuously, having reached a growth rate of 3.86% per year between 2007 and 2010 (IBGE, 2012), led by the South region (Paraná State), Southeast (São Paulo State) and Midwest (Mato Grosso, Mato Grosso do Sul States and the Federal District) regions. Rio Grande do Sul State has the largest sheep flock, with 3.98 million head, which is mainly managed for mutton production (IBGE, 2012). The Northeast region, however, recorded the largest increase in the flock, representing 53% of the Brazilian flock, concentrated in Bahia and Ceará States, which together exceed 5 million head. The Midwest region accounts for about 6.7% of the flock, with 1.26 million head. (IBGE, 2012; ANUALPEC, 2011).

The Southeast region concentrates a significant share of the mutton consumers market, while the Midwest has a solid potential to supply this demand (SORIO, 2009), given its suitable soil and climate conditions for sheep farming. The advantages of grazing systems, the possibility of scaling up production during the year and easy sanitary control due to the dry period favor the expansion of local sheep farming. However, the main competitive advantage of sheep farming in the region is the possibility of integration with beef and dairy cattle farming.

Sheep farming can encompass the full production cycle or farms can have specific purposes, such as finishing for slaughtering, ewe rearing to replace breeding ewes, and genetic selection and breeding for flock improvement.

SHEEP PRODUCTION SYSTEMS

Farmers-entrepreneurs who wish to invest in the sheep industry should adopt the technological and management alternatives that enable greater technical and financial feasibility for each situation in order to produce high quality mutton. Herd yields will depend on prolificacy (number of lambs born per ewe), mating season and consequently lamb delivery, adjustments in feeding, reproductive and health management to be adopted in each production system.

Thus, choosing production models that promote higher weight gains, reduced breeding periods and shorter lambing intervals is a basic pillar for the development and expansion of commercial sheep farming as a successful agribusiness activity (CUNHA et al., 2005). The use of polyestrous breeds, i.e. breeds that present various estrous during the year, further increases production, as it is possible to obtain up to three deliveries in two years. The selection of sheep with two or three deliveries is a goal to be pursued, provided that they have good weaning ability.

In a Brachiaria pasture with proper management but low nutrient replacement, the average annual cattle load is 450 kg live weight (LW) per hectare (1 AU/ha), while sheep stocking rate is 300 kg/ha. However, the stocking rate is one animal per hectare for cattle and five animals per hectare for sheep, with an average weight of 60 kg.

Cow productivity in a year, measured by calf weaning and growth in the same period, is 180 kg LW/ha. In the case of sheep, lamb yield is 222 kg LW/ha (prolificacy of 1.2, totaling six weaned lambs) in less than six months, while a steer cannot be finished under these conditions, lambs are ready for slaughter.

With a finishing cycle of around five months on pasture using supplementary feeding, the system increases farm turnover, as it eliminates the lack of finished animals on interseason.

INTEGRATED SHEEP AND CATTLE GRAZING WITH A FOCUS ON SUSTAINABILITY

Sheep and cattle integrated grazing optimizes pasture use. This is possible by different grazing behavior of herbivores on the same forage, which results in a more efficient use of forage available (CARVALHO, 2010). Mixed grazing can be done simultaneously or in a rotational system, depending on the objectives and forage species used (SILVA SOBRINHO, 2007) (Figures 15.1 A and B).

Thus, two basic principles guide integrated sheep and cattle grazing: their complementary grazing habits and lower pasture contamination with worms. Sheep are more selective in terms of leaves they eat, while cattle grazing are more homogeneous as they eat forages as a whole (leaves and culms).

In relation to pasture management, preference of cattle for the upper stratum and of sheep for the lower stratum increases grazing efficiency (ARAÚJO FILHO; CRISPIM, 2002) and makes pasture more homogeneous. This is particularly important when using tall species, such as *Panicum* forages. The cattle-sheep ratio of 5:1 (AU = 450 kg of live weight) makes forage use more efficient (CARVALHO et al., 2005).

It is important to remark that plant growth structures should not be damaged and the remaining pasture must be sufficient to maintain animal productivity. Integrated grazing has

Two basic principles guide integrated sheep and cattle grazing: their complementary grazing habits and lower pasture contamination with worms.

Figures 15.1 A and B

Silvopastoral systems with integrated sheep and cattle grazing on a *Brachiaria decumbens* pasture with eucalyptus forest. *Photos: Fernando Alvarenga Reis.*

increased meat production by 24% compared to exclusive cattle grazing and by 9% compared to exclusive sheep grazing (REIS, 2009).

However, there are certain limitations on integrated sheep and cattle grazing:

- Specialized labor is required, with additional skills, especially in terms of health management of small ruminants;
- Higher costs with fences and other necessary structures;
- Potential logistics issues in the allocation of duties among those directly involved in cattle and/or sheep management;
- More complex product sale.

CONTROL OF SHEEP INTERNAL PARASITE INFESTATIONS IN INTEGRATED PRODUCTION SYSTEMS

Although internal parasite infestations have no major impact on direct production costs related to the purchase of drugs, if not properly managed, it becomes a limiting factor in sheep management in tropical conditions and may substantially limit pasture-based mutton production. The degree of infection in sheep varies according to the management conditions and intensity of pastures contamination (AMARANTE, 2010).

Illnesses caused by gastrointestinal nematode infestation are closely related to the following factors:

- Birth and weaning seasons;
- Age and nutritional conditions, which affect immune defense;
- Management of grazing animals.

Endoparasite proliferation requires strict sanitary control of grazing sheep. It is essential to adopt management techniques that mitigate pasture infestation, as well as routine prophylactic measures, such as frequent water troughs cleaning and careful pen cleaning in feedlot operations.

Usually, until reaching puberty animals are more susceptible to increased helminths infestations. Other important factors for nematode infestations are the physiological conditions and breed. In the periparturient period, comprising the period from late pregnancy until early lactation, ewes become more susceptible to endoparasitic diseases and eliminate more eggs through the faeces, consequently increasing pasture contamination. In this period, adult helminth fertility increases, besides hypobiotic larvae and new infective larvae development. The intensity of these occurrences depends also on animal breed, being lighter in sheep breeds that are resistant to nematodes (KATIKI et al., 2008; ROCHA et al., 2004; BUENO et al., 2002).

It is essential to adopt management techniques that mitigate pasture infestation.

The lowest parasite load was observed on pastures with integrated sheep and cattle grazing.

Rotational grazing systems interspersed with adult cattle grazing significantly helps to control internal parasite infections in sheep (FERNANDES et al., 2004). These authors observed a reduction in the number of anthelmintic treatments in sheep throughout the year, whereas from a total of 115 treatments, 77 were applied in sheep under rotational grazing without integrating with cattle while only 38 treatments were necessary for sheep under integrated grazing with cattle. This result shows that integrated grazing systems are an important tool to prevent gastrointestinal helminthes in sheep.

Pasture decontamination or reduction of endoparasite infestation in sheep and cattle occurs because the most common gastrointestinal nematodes are species-specific (BIANCHIN; CATTO, 2008) and due to the lower presence of infective larvae (L3) in the lower pasture profile (POLI et al., 2008). It is worth noting that improper use of anthelmintics promotes parasite resistance to active ingredients available in the market.

Climate conditions, such as temperature and relative humidity, influence pasture contamination by helminths. The optimum temperature for maximum development of larvae within the shortest period possible is in the range of 18° to 26° C and humidity of 60% or more. At higher temperatures, development is faster, but larvae death rates are higher, with a consequent reduced number of larvae reaching the infective stage (L3). The same occurs during prolonged droughts. In addition, heavy rains often cause the release of large numbers of larvae from the fecal matter, increasing chances of major infections in animals within a short period (PINHEIRO et al., 2005).

One way of favorably using rotational grazing is forming different lots of sheep and cattle that sequentially graze the area, with a minimum rest period of 60 days for the animal species and 30 days for the forage fallow. This results in forages with higher nutritional value, as they grow back within 30 days, while sheep benefits from its return only after 60 days, mitigating specific gastrointestinal parasitic infestation. Amarante (2010) states that pasture used in rotational grazing systems that rest for 20 to 40 days are not decontaminated, while Souza et al. (2005) concluded that a 60 day rest period in temperate climate conditions were sufficient to at least reduce pasture contamination.

In the *Cerrado* region of the Federal District, an experiment was carried out during the rainy season related to L3 larvae recovery in sheep grazing a *Panicum maximum* cv. Tanzania pasture and subjected to three grazing systems: (1) combined sheep and cattle grazing on the same pasture; (2) alternate grazing, first with cattle and subsequently sheep; (3) sheep grazing. Five areas were used, which were grazed for seven days each with a 21 days rest period. Cattle remained on pasture all the time and the sheep were kept in closed shelters overnight. The largest L3 recovery was for *Haemonchus* sp., with the following averages: integrated grazing: 40; pasture alternating: 89; exclusive sheep grazing: 82. Therefore, the lowest parasite load was observed on pastures with integrated sheep and cattle grazing. It is important to remember that this endoparasite is one of the main causes of anemia in ruminants in the region.

Sheep farming in integrated production systems particularly combined with cattle farming, along with selection of more endoparasite-resistant sheep are relevant research subjects in the parasitology field, as these systems have presented positive results in the control of sheep gastrointestinal parasites and improved forage quality.

SHEEP FARMING IN INTEGRATED SYSTEMS

In the case of sheep on pastures with a tree component, animals can benefit from the thermal comfort due to the natural shade provided by trees. In given situations, animal grazing in a silvipastoral system (Figures 15.2 A and B) helps to reduce costs related to the regular afforestation, with revenue return anticipated by animal production in a shorter period than revenue from forest products.

Lamb finishing in integrated crop-livestock systems has been tested at the Mid-Western Regional Sheep and Goats Center, in Campo Grande-MS. Tests followed the steps listed below:

1. Young lambs supplemented through creep-feeding are weaned at 70 to 80 days and finished in grazing systems or feedlot with ad libitum diets;
2. Pastures are implemented intercropped with maize or sorghum, and animals are introduced after grain or silage harvest.
3. Grazing lambs are supplemented with a balanced energy-protein concentrate (TDN 80% and CP 16%);

These systems have been showing satisfactory results, presenting no difference on finishing parameters for lambs kept in feedlot or pastures. Average daily gains were 200g and 70% of animals reached slaughtering marbling and dressing scores at 152 days (Costa et al., 2012 – unpublished data). Lambs received deworming treatment before entering the fresh implemented pastures and no other dose was administered until slaughter because of ILP breaking parasites cycle.

Integrated crop-livestock systems have been showing satisfactory results, presenting no difference on finishing parameters for lambs kept in feedlot or pastures.

Forages produced in integrated crop-livestock (ILP) systems usually have higher nutritional value due to better soil fertility, which helps to improve sheep nutrition, a high demanding category in terms of feeding. The system also eliminates infective helminth larvae on pasture, due to the crop period with no animal grazing.

In ILP areas with rotation of grasses and legumes, such as summer and winter crops (soybeans, maize, sorghum and oats) and continuous single crop or intercropped with forages, a number of sheep finishing systems are possible. Pastures established after soybeans harvest contribute to proper sheep nutrition which are at the last third of pregnancy and during lactation. In ILP systems, ewes mated in October/November (non-seasonal sheep breeds) giving birth in March/April

Figures 15.2 A and B

Sheep farming in an integrated crop-livestock-forestry system (ILPF). *Photos: Fernando Alvarenga Reis.*

will have favorable nutritional conditions. Areas cultivated with interseasonal crops (safrinha) as intercropping maize/Brachiaria or sorghum/Brachiaria seeded after soybean harvest can be used in sheep weaning in July and August, after harvesting maize for silage or grain. These lambs are finished by the end of September in areas with no animal grazing for about 8 months. Therefore this area will be free for a new crop or to receive ewes in the new breeding season. However, supplementary feeding is necessary to ensure higher weight gains, (POLI et al., 2008), though the entire cycle is held on pasture, reducing production costs and demand for labor.

Stocking rates can be high in pastures under ILP, thanks to better soil fertility and conditioning. Proper pasture management enables high animal gain while forage residues left on the field are sufficient for subsequent no-tillage seeding. Experiences reported by farmers in Mato Grosso do Sul State indicate that, farm's beef herd does not have to be reduced when incorporating new pasture areas into ILP systems because higher forage yields from cropping areas returned to grazing provide higher stocking rates. For instance, in a farm in Mato Grosso do Sul, originally used only for beef cattle farming, the ILP system was initially implemented in ¼ of the area, being expanded to ¾ of it over time, with constant animal production while now it is using most of the area to grow grain crops in spring and summer.

CLOSING REMARKS

Sheep farming for mutton production is expanding in Brazil thanks to the different possibilities of integrating it into existing production systems. Cattle farming is still the main animal production activity in large-scale integrated systems in Brazil, though sheep farming, supported by cattle farming know-how, tends to rapidly overcome some technological barriers that limit its development as a local agribusiness option.

Integrated systems substantially reduce use of deworming products in sheep farming, due to annual crops and integrated grazing with cattle. Moreover, these systems promote animal welfare by improving ambience through tree shading and increased forage nutritional value.

Compared to traditional cattle farming, sheep farming results in higher meat yields in short production cycles, which, coupled with a promising market would increase and diversify farmers' income, optimizing inputs and natural resources efficiency.

Integrated systems substantially reduce use of deworming products in sheep farming, due to annual crops and integrated grazing with cattle.