

Nuclear Techniques in Australian Animal Production

Report on a Study Tour
conducted from
10 November to 5 December 1975
in Australia



Tour participants take a first-hand look at a study on the digestion of feed marked with isotopes at the Lansdown Pastoral Research Station near Townsville. Photo: IAEA/Schultze-Kraft

In tropical and sub-tropical regions, the production of domestic animals is frequently depressed by the climatic and ecological conditions. These negative effects can be overcome to a great extent by improved methods of animal and land management. In animal research, nuclear techniques are playing an important role in the study of different aspects of nutrition, metabolism, reproduction and health of domestic animals.

In response to the need expressed by Member States for more information on these techniques, the Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture and the IAEA's Division of Technical Assistance organized a study tour to Australia, a country which has developed considerable expertise in agricultural and animal research. The purpose of the study tour was to enable veterinary and animal scientists and administrators from developing countries in Asia and the Far East to observe at first hand the ways in which animal production, particularly meat, milk and wool, can be increased in tropical and sub-tropical areas. Fourteen senior scientists and research directors from seven Asian countries (Bangladesh, India, Republic of Korea, Malaysia, Philippines, Sri Lanka and Thailand) participated. The counterpart organizations in Australia were the Australian Development Assistance Agency (ADAA) and the Commonwealth Scientific and Industrial Research Organization (CSIRO). The chief programmer and co-ordinator of the study tour was John E. Vercoe, officer-in-charge of CSIRO's Tropical Cattle Research Centre in Rockhampton, and a former IAEA staff member. The tour was financed by the United Nations Development Programme.

The participants visited research facilities of universities, national and state laboratories and commercial cattle producers. The tour started at Sydney and proceeded north along the east coast of Australia to Townsville. On the way, major stops were made in Armidale, Grafton, Wollongbar, Brisbane and Rockhampton. In Rockhampton, a seminar on nuclear techniques in animal production was held with the participation of a number of Australian scientists.

Considerable progress has been made in the field of cattle research, particularly in rumen metabolism, heat tolerance, tick resistance and pasture management. Of major interest to the study tour participants were the cattle crossbreeding experiments with Zebus (*Bos indicus*). These crossbreeds are a potential source of breeding animals for the tropical regions of Asia and the Pacific. Various characteristics of the reproduction rate, growth under environmental stress, tick and worm resistance, as well as nutritional and metabolic features of the crossbreeds were described. The *Bos indicus* crossbreeds have a marked heritability against tick infestation, and Australia has undertaken an extensive breeding programme to overcome production losses and growth depression in cattle due to tick infestation. These crossbreeding experiments have resulted in a selected Africander and Brahman cross line known as "Belmont Red", which has 50 per cent Zebu, 25 per cent Hereford and 25 per cent Shorthorn parental blood.

Another outstanding success in the Australian breeding programme was the Australian Milking Zebu (AMZ) with Sahiwal as the *Bos indicus* parent and the Jersey as the *Bos taurus* parent. The AMZ has a lower decline in milk yield under adverse climatic conditions. The goal is to develop a dairy animal with *Bos indicus* blood composition of between 3/8 and 1/2, and selected for high milk production, heat tolerance and tick resistance.

Applications of radioisotopes to study pathophysiologic conditions in domestic animals caused by parasites, such as protozoa and worms, were reviewed. The quantity and turnover of blood taken by the various blood-ingesting parasites is being measured by labelling blood plasma with iodine-125, and red cells with chromium-51. In addition, iron-59 is being used to study the anaemic conditions caused by parasites in livestock. Some research is also being carried on radiation-attenuated vaccines against parasitic diseases.

Various Australian research institutions have developed specific tracer techniques to elucidate digestive and metabolic functions in ruminants. Isotopes are used in rumen fermentation studies to follow enzymatic activities and incorporation rates into rumen microbial cells. Tritium and deuterium are used as tracers in studies of water consumption and turnover, and also in studies of the course of lactation under various physiological and environmental circumstances.

Although the study tour concentrated on cattle and beef industries, various aspects of sheep and wool production as well as poultry production were also discussed.

One of the central problems of tropical pastures is that they generally have a low productivity and stock-carrying capacity. Investigations into the soil-plant ecosystems and their impact on sheep and cattle grazing have led to improved forms of land management.

As their contribution to the study tour, the participants gave papers, accompanied by slides, on the status of animal production and health in their respective countries. In discussions with both extension officers and farmers, the study tour participants indicated that the tour had provided them with information that would be useful in their future work in their home countries.