

Improving Livestock Productivity while Conserving the Environment

Livestock farming is of the utmost importance to most developing countries as a source of food and of income for the rural population. However, the productivity of the livestock in most of the developing countries is much below its potential due to malnutrition, reproductive mismanagement, infectious diseases, and a lack of effective support services, such as Artificial Insemination (AI). Also improving current management practices has the potential to reduce the environmental effects of livestock farming by reducing the emissions of greenhouse gases that contribute to global warming, such as methane and carbon dioxide, as well as reducing the release of other by-products into the environment.

As a result of the RCA projects on animal production it has been possible for the RCA Member States to improve nutrition and develop reproduction strategies using nuclear and nuclear-related techniques. These strategies have made it possible to increase the weight gain and the milk production of farm animals while reducing methane emissions, and to achieve genetic improvement of the livestock. In developing nutrition strategies, isotopes of carbon, hydrogen, sulphur, phosphorous or nitrogen were used to study the conversion and uptake of feed nutrients, and to evaluate the role of microbes in digestion in the rumen of livestock. Ruminant animals like cows and goats rely on these microorganisms in their digestive tract to convert feed components into useable sources of energy and protein.

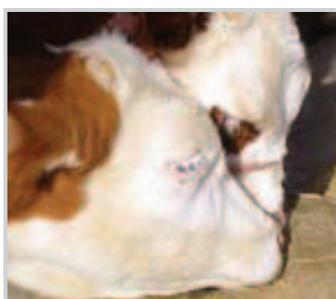
A formulation for feed supplementation, called Urea Molasses Multi-nutrient Blocks (UMMB), was developed from locally available feed resources using the knowledge gained through the application of above-mentioned techniques, under a regional project implemented from 1995 to 1999. Through a follow-up RCA project implemented from 1999 to 2004, these UMMBs were used to deliver the medication required to control internal parasites, thus ensuring better nutrition as well as improved health of the animals. Participants in this project also engaged in enhancing the efficient use of locally available feed resources by evaluating their nutritional value using stable isotope and radioisotope techniques and by developing improved feeding strategies. Medicated blocks and herbal remedies offered cost effective means of worm control in farm animals in almost all the participating Member States. Out of the 47 new feeds evaluated by participants in this project, 39 feeds had been identified as having a good potential to be used as animal feeds. The new feeds had been introduced to farmers in 5 Member States.

UMMB

The urea molasses multi nutrient blocks (UMMB) are lick-blocks containing urea, molasses, vitamins, minerals and other nutrients. UMMB is a convenient and inexpensive method of providing a range of nutrients required by both the rumen microbes and animals, which may be deficient in the main feed. This technology was developed through a research project and transferred to the Member States through a regional TC project.



Urea-Molasses Multinutrient Blocks



Cattle licking a UMM block which gives slow release of nutrients.

The second RCA Project was implemented from 2005 to 2008 and focused on conserving the environment by reducing emissions of greenhouse gases (methane, carbon dioxide) and releases of certain nutrients (nitrogen and phosphorous) into the environment. The participants were trained on better feeding strategies, improved manure management practices and methane reduction methodologies. Various activities were carried out such as field trials on different feed supplements, rumen manipulation (e.g. with coconut oil, plant saponins, medicated UMMB, concentrates, herbal extracts, etc), and different practices of manure management. The project also produced guidelines on manure management for the use by the Member States.

These strategies resulted in increased milk production and weight gain in dairy animals. Increased milk yields by approximately 25% were

observed in Bangladesh and the Philippines. Bangladesh, China, Indonesia and Myanmar reported increases ranging from 15 to 70% in the average daily weight gain of animals. The feeding strategies, like the use of medicated UMMBs and herbal remedies, enhanced income levels for farmers with the reported increase of income per animal ranging from 33% to 445%. In Bangladesh, China, Indonesia, Pakistan and Thailand, the reduction in methane emissions due to adoption of the new feeding strategies ranged from 15 to 70%. Bangladesh, Indonesia, Pakistan and Sri Lanka reported on improved manure management practices that increased the utilization of nitrogen and phosphorous in the manure for crop production, which resulted in increased yields of rice and fodder ranging from 25-40%. Most of the participating countries disseminated the knowledge gained for supplementary feeding and for efficient manure management to the end users. Selected farmers (lead farmers) were trained in the new feeding strategies.

The RCA Projects also focused on breeding and reproductive management of livestock. Artificial Insemination (AI), with diagnostic support in the form of radioimmunoassay (RIA) technology, was used to improve the reproductive efficiency of cattle. The isotope-based RIA technique enables the measurement of reproductive and other hormones in milk, serum or plasma, and this gives a better understanding of the reproductive status of livestock. It is an important tool for: determining when animals are ready for breeding; diagnosing non-pregnancy at an early stage so that animals can be re-bred; and diagnosing reproductive disorders in order to respond with appropriate treatment. These measures contribute to an overall improvement in the success rate of AI.

Through the RCA project implemented from 1999 to 2004, participants



The reproductive efficiency of cattle subjected to Artificial Insemination was improved with diagnostic support using radioimmunoassay (RIA) technology for measuring progesterone.

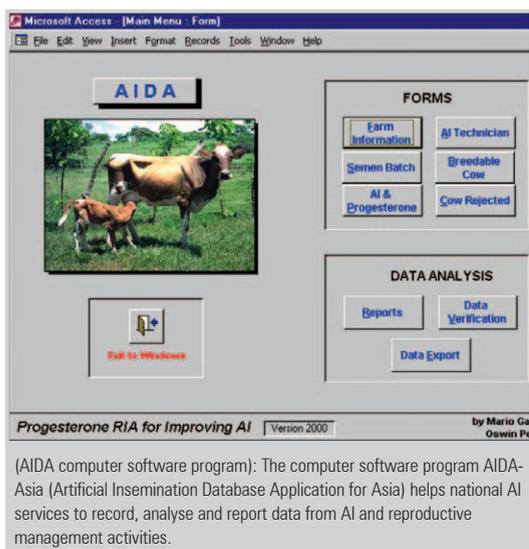
developed the capability of using RIA to measure progesterone for improving the AI services used by farmers. They also developed the capability of using two databases termed AIDA-Asia (Artificial Insemination Database Application for Asia) and SPeRM (Semen Processing Records Management), for data management by national AI services. These databases, which had been developed under an FAO/IAEA coordinated research project, were subsequently refined under the framework of this project for the use by national AI services in the region, for recording, analyzing and reporting data from AI and reproductive management activities.

As a result of this project, China, India, Malaysia, Mongolia, Myanmar, Pakistan, Sri Lanka, Thailand and Vietnam consolidated their ability to sustain the use of RIA by making the standards and quality control samples in national laboratories. The RCA Project implemented from 2005 to 2008 focused on identifying and adopting better breeding strategies that would improve animal productivity through: the use of better selection criteria for offspring from cross-breeding programs; the optimum utilization of appropriate indigenous cows; benchmarking for growth and reproduction; and, improving procedures for management, nutrition and healthcare programs in dairy farms. It provided regional training on selective breeding and potential applications of molecular genetic techniques, as well as guidelines on the selection of breeding heifers.

Almost all the participating Member States achieved genetic improvement in their livestock through different reproductive techniques. For example, India and Sri Lanka achieved this through the use of synchronization programmes, insemination with genetically superior semen and embryo transfer (ET); while Bangladesh used in-vitro fertilization (IVF) and ET programmes; and Myanmar, the Philippines, Indonesia and Thailand used cross-breeding programmes.



(Cross-bred buffaloes): A group of cross-bred buffaloes in Sri Lanka, produced through AI on indigenous cows using semen from improved Murrah bulls.



Most of the Member States designed and applied standardized criteria for selection of better breeding heifers, based on the recording of performance of their parents. In the Philippines, additional parameters like milk composition, were taken into consideration. Laboratory protocols for in-vitro maturation (IVM) and IVF of oocytes, semen preservation and cryobanking of gametes have been established by Bangladesh, Sri Lanka and Indonesia.

All the participating Member States have included improved reproductive techniques and nutritional supplementation to improve the production and the reproduction of local and cross-bred cattle and buffaloes. Most of the Member States have disseminated the knowledge gained to end-users, including farmers, extension workers and livestock professionals.



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