

# Policy Briefing

## Improving Tanzania's dairy cattle



The AgriTT programme is an innovative trilateral initiative between the UK Department for International Development (DFID), the Chinese Government, the Governments of Malawi and Uganda and the Forum for Agricultural Research in Africa (FARA). The programme facilitates the sharing of successful experiences in agricultural development with developing countries to improve agricultural productivity and food security.

The AgriTT Research Challenge Fund supported two year research projects to generate new thinking and practice on technology transfer and value chain development. Each project had a Chinese, UK, and African or South-East Asian research partner.

### Raising productivity by matching crossbreeds to farming systems

**In Tanzania, most dairies and milk-processing facilities are running below capacity.** The country has a small population of improved dairy cattle (about 800,000) and the demand for milk currently outstrips supply. According to the World Health Organization this demand is set to increase over the next 5 years due to rapid population growth, urbanisation and increasing purchasing power.

**In a bid to improve productivity, farmers crossbreed their local, low-producing, indigenous cattle with more productive, exotic cattle.** But without formalised and pre-planned programmes, the resulting animals constitute a mixture of breeds of unknown composition, with cattle that require much more intensive management being managed in a similar way to those needing less attention. When a breed's genotype is not well matched with its production environment, milk yields tend to be low.

**This project aimed to identify the breed composition of dairy cattle in two regions of Tanzania and to associate this with the level of individual animal productivity.** The study was conducted in Rungwe (Mbeya region) and Lushoto (Tanga region), two highland dairy-production areas that vary in their market orientation and available feed resources. A participatory approach was used to obtain information on feeding strategies, milk yield, health and reproductive performance, as well as routine management practices, from 670 randomly selected households practising smallholder dairy farming.

These households were grouped into four newly classified management systems (see Table 1) based on factors including type of feed used, total off-farm income, land area owned, and milk productivity per cow per year. From these households, a total of 1,255 dairy animals that met specific criteria were included in the study. Whole blood, serum and hair samples were obtained for DNA extraction and bio-banked at ILRI to be available for further analyses. Single-nucleotide polymorphisms (SNP) were used to determine the proportion of genes in each animal that could be attributed to both known indigenous and exotic commercial breeds.

**From the analysis of breed composition, the dairy cattle in the two study sites were mainly crosses between indigenous Zebu and exotic Norwegian Red and Holstein Friesian breeds,** with a low contribution of other dairy breeds such as Jersey and Guernsey. The range of breed composition was quite extended in Lushoto, ranging from <20% to >85% exotic dairy breed genes. In Rungwe over 95% of all the cows had an exotic dairy breed composition of >50%.

**Milk yields depended on the management system applied,** even for the same breed type (see Table 1). Overall, the average milk yield was 5.90 litres per day, with Lushoto having a mean of 4.69 and Rungwe a mean of 6.61; this is similar to yields recorded in Kenya and Uganda. The table demonstrates the relative daily improvements in milk yield achieved by producing the appropriate genotypes in the specific production environments.

**Cattle were also screened for tick-borne and reproductive diseases to assess their fitness in the various production environments.** Prevalence of

both brucellosis and tick-borne diseases was quite low. The most commonly treated disease in Lushoto was mastitis; in Rungwe it was foot-and-mouth disease. However, the limited data available for disease traits did not allow these to be related to the different genotypes, and further work on this would be beneficial.

**The research skills transferred by the multilateral project team will be of great benefit**, especially in Tanzania where there are very few geneticists. Training of Tanzanian students in China is likely to continue through Chinese government scholarships. In addition, 47 extension and veterinary officers have been trained in field data and

sample collection techniques. The implementation of digital data capture, a useful innovation, is now being applied in Tanzania by another ILRI-led project, the Africa Dairy Genetic Gains project.

**Some of the project's outputs will be beneficial to private businesses**, for example through improvements in the provision of feed resources and breeding services such as artificial insemination (AI) and provision of clean bulls for service. Through links with the Public-Private Partnership for Artificial Insemination Delivery (PAID) programme, the project's outputs could be included in the curriculum for AI trainees, who will operate as independent private businesses.

**Table 1 The most appropriate breed combinations for the four herd-management systems identified by the project**

Herd-management system	Most appropriate cross	Optimum % exotic genes	Mean daily milk yield (litres)	Yield improvement through using appropriate genotype (litres)
1. Medium-feed-low-output subsistence	1st Norwegian Red-Zebu 2nd Norwegian Red-Guernsey	75-85	5.75	1.18
2. Feed-intensive commercially oriented	Norwegian Red-Holstein or Norwegian Red-Guernsey	≥75	7.50	0.96
3. Low-feed-low-output subsistence	Norwegian Red-Zebu	≤65	3.73	0.75
4. Maize germ-intensive semi-commercial	Norwegian Red-Holstein or Norwegian Red-Guernsey	≥75	6.68	1.22

## Policy recommendations

- **Establish a crossbreeding programme with guidelines to minimise indiscriminate crossbreeding.** As Tanzania gears up to increase the population of improved animals, it is important that a grading-up plan be put in place. This will ensure farmers obtain the appropriate animals that will maximise benefits for them, while also increasing milk production for the country as a whole. The knowledge gained will be of great value to the Tanzanian government in its ambition to increase the number of improved dairy cattle to 3 million head and annual milk production from 1.6 billion to 6 billion litres in the next 10 years.
- **Develop sustainable performance-recording and feedback systems.** Through receiving feedback on the performance of their animals, farmers can begin to make informed choices on what breed suits them best, given their individual resource base. This knowledge will also empower farmers to start asking the right questions of service providers such as AI providers.
- **Develop a platform for cross-agency and cross-project learning.** The project's results should be communicated to all actors in the value chain through the Tanzanian Dairy Development Forum, an apex body that brings together decision-makers in the dairy value chain.



The cooperation has been like an African three-legged stool, which has allowed the weight of project delivery to be equally distributed amongst the cooperating entities, facilitating effective delivery.

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## Partners

**China**  
China Agricultural University (CAU), Beijing

**Kenya**  
International Livestock Research Institute (ILRI), Nairobi

**Tanzania**  
The Nelson Mandela African Institute of Science and Technology (NM-AIST), Arusha

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