

Early maturity

Breeding, management and molecular biology get cattle ready for slaughter in 15 months

Evanildo da Silveira

Steers that are ready for slaughter at a younger age than the national average and heifers that calve earlier are the main results of two research projects conducted at the start of the last decade, with funding from FAPESP. The two projects helped to improve cattle breeding in Brazil and consequently enhance its competitiveness in the international beef market. With 209 million head of cattle according to the Brazilian Institute of Geography and Statistics (IBGE), Brazil houses the world's largest commercial herd. Hence the importance of studies in this field.

The earlier of the two projects, *Breeding strategies, management practices and biotechniques for sustained intensification of beef production*, conducted between 1998 and 2002, engaged some twenty researchers from four institutions: the Brazilian Agricultural Research Corporation, Livestock Raising Division – Southeast (Embrapa Pecuária Sudeste), in São Carlos; the Luiz de Queiroz School of Agriculture, University of São Paulo (Esalq/USP), in Piracicaba; the School of Agrarian and Veterinary Sciences, São Paulo State University (FCAV/Unesp), in Jaboticabal; and the Sertãozinho and Nova Odessa branches of the Zootechny Institute of São Paulo.

Coordinated by Maurício Mello de Alencar, an agronomist at Embrapa Pecuária Sudeste, the project's main objective

Embrapa's Canchim Farm in São Carlos: experiments in European and zebu crossbreeding





was to assess the complete life cycle of cattle from birth to slaughter. A number of Brazilian researchers had already addressed the topic before, but usually focusing only on specific stages of the production system. The innovation brought by Alencar's work is that it simultaneously involved several aspects, including genetic improvement, reproduction, nutrition, health, pasturage, and molecular genetics. To achieve this, the research was divided into eight sub-projects.

The researchers examined offspring from Nelore cows bred with Nelore bulls or crossbred with Canchim, Angus or Simmental bulls, raised under non-intensive or intensive feeding and management systems. "During the pre-weaning stage, we analyzed five production systems," Alencar says. "Our reference was Nelore cattle raised non-intensively, with one animal per hectare. In this system, the most widely used in Brazil, Nelore or Nelore-crossbreed cows were bred with bulls of the same breed." The animals were studied in an intensive management system, with five head per hectare, food supplementation for cows during the winter, and pasture fertilization in the summer.

The Nelore (*Bos taurus indicus*), originally from India, was chosen because it is the predominant zebu breed in the Brazilian beef cattle industry (80% of the country's herd). Canchim is a mid-sized, composite breed created in Brazil, consisting of 5/8 Charolais and 3/8 zebu. Simmental is a large taurine breed (*Bos taurus taurus*) from continental Europe. The Angus is also European, but mid-sized and from Great Britain. The main distinguishing feature of Can-

chim and Simmental cattle is their weight gain capability, while the Angus stands out for early reproductive maturity. All three are used in commercial breeding.

According to Alencar, the five production systems were tested during two mating seasons, i.e. autumn-winter and spring-summer, in order to assess the offspring produced at different times of the year. "The cows and bulls resulting from the several systems, in other words the 'pure' Nelore and the Canchim x Nelore, Simmental x Nelore and Angus x Nelore crossbreeds, were assessed as to their growth characteristics, maternal ability, reproductive efficiency, nutritional requirements, behavior, resistance to parasites, and carcass and beef quality," he explains. In addition, during the post-weaning and reproductive stages of Nelore and Nelore-crossbreed cows, the researchers also studied feeding and management strategies for the reduction of age at first mating and improvement of reproductive efficiency. As regards the bulls, their growth, feed conversion, and carcass characteristics (quantitative and qualitative) were assessed.

The project's results showed that supplementation level did not influence the sexual precociousness (age at puberty) of cows, but the type of breeding system did. Crossbreed cows had their first calves earlier than pure Neloires. Age at first calving for Angus x Nelore crossbreed cows born in spring was less than 2 years – more precisely 709 days, or 23 months and 19 days. In Brazilian cattle farming, the standard age at first calving was 4

years. Among males born in autumn and marked for slaughter after confinement beginning at 12 months of age, Angus x Nelore animals were slaughtered weighing about 20 arrobas (300 kilograms of carcass; 1 arroba = 15 kg) at 16 months, much earlier than the average age at slaughter in Brazil at the time. Additional important results were obtained, including those relating to resistance to parasites, nutritional requirements of cows, animal behavior, molecular markers, and the effects of intensification in pasture usage.

The project evolved into a study of breeding options for adapted and non-adapted bovine breeds. The goal is to obtain animals that are productive under tropical conditions, precocious both in reproduction and finishing, and that give tender, high-quality beef. "The intent is to assess

It is now possible to know a steer's ideal age for slaughter

Early confinement and special feeding system: lower land usage



STEER NUMBERS

Performance of confined calves under the super-precocious system

1. No. of animals: 60 (3 feedlots/20 animals)
2. Average age at confinement: 8.93 months
3. Days of confinement: 152 (5.08 months)
4. Average weight at confinement: 245 kg = 8.16 arrobas
5. Average weight at slaughter: 483 kg = 18.29 arrobas
6. Average weight gain/day: 1.57 kg
7. Average yield of carcass: 56.8%
8. Average weight gain in arrobas during the period: 10.13 arrobas
9. Average age at slaughter: 14 months

Production costs

10. Animal feed/day: R\$3.88
11. Operational/day: R\$0.30
12. Total cost/day: R\$4.18
13. Total cost/period (item 12x3): R\$635.36
14. Cost per arroba produced (item 13/8): R\$62.72
15. Initial cost of calf: R\$900.00
16. Total cost of confinement (items 13+15): R\$1,535.36

System profitability

17. Selling price per arroba: R\$105.00
 18. Gross total income (items 5x17): R\$1,920.45
 19. Net annual income (item 18 – 16): R\$385.09
 20. Monthly net income (item 19/3): R\$75.81
 21. Profitability (item 19/16): 25.12%
 22. Monthly profitability (item 21/3): 4.94%
- SOURCE: Antonio C. Silveira, Luís Artur Chardulo and Cynthia Ludovico Martins (Unesp)

SOURCE: ANTONIO C. SILVEIRA, LUÍS ARTUR CHARDULO E CYNTHIA LUDOVICO MARTINS/UNESP

the possibility of producing animals with a high proportion of *Bos taurus taurus*, while maintaining a high potential for adaptation to tropical regions,” Alencar explains.

SUPERPRECOCIOUS BIOLOGICAL MODEL

Precociousness was also the main result of the project *Growth of beef cattle under the superprecocious biological model*, carried out from 2000 to 2006 at the Unesp School of Veterinary Medicine and Zootechny in Botucatu. Coordinated by professor Antônio Carlos Silveira from the school’s animal improvement and nutrition department, and with the participation of 30 researchers, the work resulted in a cattle-raising system that can reduce age at slaughter to 15 months. By that age, these so-called superprecocious steers have reached 450 kilograms. They are the offspring of Nelore crossed with European breeds including

Angus, Hereford, Simmental, Braunvieh, Charolais, Limousin, and Brown Swiss.

This work makes it possible to eliminate stages in the cattle raising process. Calves now skip the post-weaning grazing period, which can take two to three years. They are weaned at seven months of age, weighing about 230 kilograms, and immediately confined for fattening. In addition to early slaughter, this method produces carcasses with a layer of subcutaneous fat thicker than 3.5 millimeters, leading to higher-quality beef and beef products.

To achieve these results, the researchers monitored the skeletal muscle growth of steers from birth to weaning and from weaning to finishing (maturity for slaughter). Feed and supplement quality were also studied, to provide diet management guidelines. In the field of molecular biology, they characterized the genes involved in carcass growth and composition, in order to identify genetically superior individuals and potentially earmark them for reproduction.

Silveira mentions four other important results of the projects. The first is the technology for real-time carcass assessment via ultrasound. “With this, we can detect the ideal moment to slaughter an animal,” he says. “This also makes it possible to select bulls for greater muscle growth and fat deposition in the beef, and also to separate animals into confinement feedlots for better development and performance within the finishing system.” A second result was the identification of molecular markers for beef tenderness and fat deposition, particularly in Nelore cattle, whose meat is tougher than that of European breeds.

The introduction of creep feeding, a feeding system exclusively for calves using pre-cast feeding troughs, was an additional outcome of the project. The troughs are placed in the pasture where only the calves – still unweaned – can reach them. This leads to a higher weight at weaning – roughly 30 to 45 kilograms higher. Silveira and his team’s work also resulted in the production of wet-grain silage as a processing technique for corn used in bovine feed. “During the research, we purchased a machine that produces silage in bags,” he reveals. “It’s an alternative way of preserving feed.”

All of the methods and technologies developed during the project were disseminated to cattle raisers and have now spread throughout Brazil, helping to improve the country’s beef industry. “The main result of our work was this consolidation of the system called superprecocious, for production of beef from young animals,” says Silveira. “It is already applied by raisers of confined cattle as a way of producing standardized, high-quality beef.” ■

PROJECTS

1. *Breeding strategies, management practices and biotechniques for sustained intensification of beef production* – No. 1998/03761-0 (1998-2002)
2. *Beef cattle growth under the superprecocious biological model* – No. 1999/05195-5 (2000-2006)

GRANT MECHANISM

Thematic project

COORDINATORS

1. Maurício Mello de Alencar (Embrapa Pecuária Sudeste)
2. Antônio Carlos Silveira (FMVZ/Unesp, Botucatu)

INVESTMENT

1. R\$374,840.67
2. R\$773,318.74

SCIENTIFIC ARTICLE

BIANCHINI, W. *et al.*
Crescimento e características de carcaça de bovinos superprecoces nelore, simental e mestiços.
Rev. Bras. Saúde Prod. An.
v. 9, n. 3, p. 554-64, 2008.

FROM OUR ARCHIVES

Well-handled herd
Issue No. 102 – August 2004

The advance of the cattle herds
Issue No. 88 – June 2003

Young, good-looking and with the weight of a bull
Issue No. 60 – December 2000