STRATEGIES TO IMPROVE BALI CATTLE IN EASTERN INDONESIA

STRATEGIES TO IMPROVE BALI CATTLE IN EASTERN INDONESIA ACIAR

ACIAR PROCEEDINGS No. 110

ACIAR
The Australian Centre for International Agricultural Research

www.aciar.gov.au

Implementation of a Breeding Program for Bali Cattle
Technical issues at national and regional levels

C. Talib[1], A.R. Siregar[1], S. Budiarti-Turner[2] and K. Diwyanto[1]

Abstract

Bali cattle are reared in Indonesia under both extensive and intensive management systems. Under both systems, the expansion of communal grazing and communal housing is recommended in order to set up a solid base for breeding programs. Some breeding programs have been attempted, but they have had little success and almost no impact. This may mean the establishment of better-focused village breeding centres or breeding associations under the guidance of regional or national government institutions.

Introduction

CATTLE productivity is dependent on two primary factors, namely genetics and environment, and cattle can reach their genetic potential only if the environment provides optimum conditions. Breeds of cattle are adapted to different environments and may have special characteristics, including their adaptability to certain locations. Consequently, even in the same locality, the same breed of cattle managed in different herds could vary in their level of productivity.

Selection aims at increasing the frequency of favourable alleles and concomitantly decreasing the frequency of unfavourable alleles at genetic loci influencing the traits of interest. In this way, offspring from the next generation could be expected to have better genetic potential than their parents. In a selected herd the performance of animals is likely to be similar, with less variation in genotype than in an unselected herd. For an unselected herd, manipulation of environmental factors such as nutrition may alter productivity in the short term, but for the longer term, a combination of improvements in the genotype as well as in the environment is likely to be the best way to raise productivity.

Farmers in tropical regions consistently diversify the use of their resources to provide food for family consumption and to maximise family income. The number of animals on a farm usually depends on farm size, the availability of family labour, the sources and availability of feed, and the amount and distribution of rainfall. Most animal production in the South East Asian tropics is associated with smallholder production systems. These systems are complex, and vary greatly depending on the local culture and management practices. Bali cattle, which are well adapted to Indonesia, are run under two environments and management systems: at pasture under extensive management, or under a more intensive system involving housing with cut and carry forages. Because of these management differences, they also have different performance and behavioural attributes.

To improve Bali cattle production, some breeding programs have been applied nationally and regionally, though evaluation of existing breeding planning is needed. There is also a need to examine alternative improvement programs that would be suitable at national and regional levels. Furthermore, affecting the implementation of improvements to breeding programs have also to be considered.

Existing Bali Cattle Management

Under extensive management, Bali cattle graze on pastoral land all day and consume only available

[1] Central Research Institute of Animal Science, Bogar, Indonesia
[2] Directorate General of Livestock Services, Jakarta, Indonesia

Strategies to Improve Bali Cattle in Eastern Indonesia
edited by K. Entwistle and D.R. Lindsay
ACIAR Proceedings No. 110
(printed version published in 2003)

roughages, generally without any supplements, though water is supplied. The productivity of most unimproved tropical pasture is low, and both quality and availability fluctuate widely between rainy and dry seasons (Wirdahayati 1994; Hidayati et al. 2001). For security cattle are housed at night in some herds.

Under intensive management, Bali cattle are supplied with most of their nutritional needs through cut and carry forages, but sometimes also receive supplements.

There are some variations in these two systems between sites: for example, in the extensive system, grazing in natural pasture areas, paddy fields, plantation areas or the forest with or without a 'cattle boy' in the intensive system; and 'paron' arrangement (tethered cattled) in East Nusa Tenggara (NTT), caging in some places, communal caged housing in West Nusa Tenggara (NTB) for intensive rearing, and fattening in communal housing on plantation farms.

Because of these wide variations in management systems and diets between and within the two rearing systems, the performance of cattle also varies widely. Therefore the performance traits recorded by research teams do not directly indicate the genetic quality or genetic potential of Bali cattle, but reflect general production levels influenced by specific management and nutrition at individual locations.

Existing Bali Cattle Breeding Programs and Supporting Institutions

As the primary resource for Bali cattle in Indonesia, the island of Bali is closed to the introduction of other cattle breeds in order to maintain the genetic resource base and germplasm of the breed. Conversely the export of cattle from Bali to other locations is now limited because of disease risks, particularly of Jembrana disease.

In contrast to commercial beef cattle farms, productivity of Bali cattle that graze under pastoral management is based on their adaptive and survival abilities without any feed supplementation. Usually each herd of 10–100 head has one cattle boy, who follows the movements of the cattle on natural pasture all day for security reasons. The boy will record in his mind information about calving, mortalities and injured animals. In Thailand some farmers create a schedule for grazing communal livestock, so that cattle are observed by a larger number of people.

The status of the pasture in communal pastoral areas is of concern, since no single individual is the owner or has responsibilities for the sustainability of the pasture. As a result there is no responsibility for management to sustain pasture productivity and maintain carrying capacity. In fact, the production and quality of these pastures fluctuates widely during the year (Talib 2002). In some areas weeds are increasingly significant, placing further pressure on pastures already suffering overgrazing (Litik 2001; Hidayati et al. 2001). Under these harsh conditions the grazing cattle do not receive any feed supplements, so cows experience severe body weight loss (up to 30–40%) in the dry season, and calves manage only to maintain their weight in the same period (Talib et al. 1999).

Breeding management for cattle in extensive systems almost always involves natural mating using bulls available in the herd. In intensive rearing systems, even though natural mating is still predominant, around 20–30% of offspring are crossbreds. Usually all of the best bulls in a locality are assigned to a fattening program in caged housing for export and slaughter without being used for mating, and almost all females are kept by farmers. The remaining bulls in the herd, used for breeding, are the younger and inferior ones in terms of growth rates and size, and few bulls are introduced to the herd from outside. In cases where there is a need for ready money, productive cows will also be sold for slaughter. Under these conditions, calving rates of herds in NTT, NTB, Bali and South Sulawesi varied between and within provinces in a range from 40% to 70% (Wirdahayati 1994; Siregar et al. 2001; Entwistle et al. 2001). Mature body weight for females is 110–300 kg (Wirdahayati 1994; Wirdahayati and Bamualim 1990; Talib 2002; Siregar et al. 2001; Entwistle et al. 2001).

Cattle under intensive management are often mated through AI to produce commercial crossbred stock. In some circumstances, if AI is unsuccessful farmers use natural mating as the alternative. Farmers rear all females to breeding age, including pure Bali and crossbreds. In NTB, an intensive management system has developed involving a communal animal housing system of 100–300 cows per housing group, with 50–100 owners. Even though housing was initially adapted for reasons of security, because of the many advantages of this management system many farmers accept and use it. The breeding practice for heifers is that at the first breeding they will be mated to pure Bali bulls or inseminated with Bali semen to minimise calving difficulties, while protecting the purebred population. This practice is also followed for cows of small mature body size regardless of age. The inseminator has an office close to the communal housing, so it is easy for him to inseminate animals at the appropriate time and also easy to control animal health problems. This model of management could be usefully introduced into other provinces.

Strategies to Improve Bali Cattle in Eastern Indonesia
edited by K. Entwistle and D.R. Lindsay
ACIAR Proceedings No. 110
(printed version published in 2003)

Martojo (1988) indicated that the genetic potential of Bali cattle may be declining because of inbreeding. Siregar et al. (2001) observed very light cows (110–120 kg) in South Sulawesi rearing very light calves. Talib (2002) reported that in NTT, calves of light birth weight (<10 kg) frequently die soon after birth. The ACIAR-INDONESIA survey team observed some possibly inbred Bali cattle in NTT, NTB, Bali and South Sulawesi that were still called Bali cattle by farmers but whose colour was significantly different from that of standard Bali cattle. All available information indicates that breeding systems currently practised by farmers should be re-evaluated and improved.

The Indonesian Government, through the Directorate General of Livestock Services (DGLS/Ditjenak), has developed some breeding programs to improve beef cattle production, including Bali cattle. Those programs are outlined in Table 1.

The CBI and P3Bali programs record the performance of cattle, including herd population dynamics, but only P3Bali at Bali has applied selection in the herd and produced proven bulls for improving the basic population and for supply to breeding centre herds. Ideally, proven bulls should be sent to the AI centre for producing semen. Only one bull was sent to the Singosari AI centre from P3Bali for producing frozen semen to be distributed to the Eastern Islands. Evaluation of P3Bali selection activities for the past 20 years also suggests that the process applied, and the consequent selection pressure, have been ineffective, based on estimated breeding values (Table 2) (Sukmasari et al. 2002).

Table 1. Activities carried out under existing breeding programs for Bali cattle.

Province	Activity		
	Conservation	Purebreeding	Crossbreeding
NTT	✓ Lili (VBC, CBU)	✓ Lili (CBU)	✓ CS
NTB	✓ Sarading (CBU)	✓ Sarading (CBU)	✓
Bali	✓ (whole Island)	✓ Pulukan etc. (P3B)	—
South Sulawesi	✓ Bone	✓ Bone (P3B)	✓ CS
Lampung	—	✓ (P3B)	✓ CS

VBC = village breeding centre; CBU = cattle breeding unit — UPT; CS = commercial stock; P3B = special breeding project for Bali cattle — P3Bali

The flow chart of the breeding scheme for P3Bali is good (Pane 1990), so the ineffective selection practised has to be evaluated carefully and in depth to detect the causes and to avoid such problems in the future.

Table 2. Estimated breeding value (EBV) of Bali cattle at P3Bali in Bali.

Year	Weaning weight	Yearling weight	Daily weight gain
1983	–1.49	–3.46	–12.36
1984	–1.2	–2.47	–7.93
1985	0.02	–0.55	–3.58
1986	1.07	0.64	–2.72
1987	NA	NA	NA
1988	1.41	2.42	6.34
1989	0.66	2.28	10.21
1990	–2.96	–1.62	8.35
1991	–2.4	–2.44	–0.36
1992	–2.61	–2.85	–1.55
1993	–1.95	–2.03	–0.55
1994	–0.63	1.24	11.69
1995	–0.54	0.18	4.48
1996	0.81	0.97	1.04
1997	1.78	2.07	1.84
1998	1.92	2.36	2.72
1999	1.21	1.31	0.59

In addition to the CBU and P3Bali programs, in some areas there are selected herds belonging to the government and distributed under contract. If these selected herds could constitute the basic cattle population of a village breeding centre or unit and be integrated with one of the breeding institutions, Bali cattle programs could be implemented more easily in the villages.

Technical Issues for Improvement of the Breeding Program

Following are some technical issues and suggestions from related institutes and farmers for improvement of the breeding program:

- The number of Bali cattle protected under the Indonesian germplasm program in Bali and at other breeding institutes is around 600 000, which is too many. The positive side of this situation, however, is that Indonesia requires a lot of beef for its domestic consumption; if cows in Bali could be used in crossbreeding programs for producing final stock, this would provide a significant contribution to beef production. Moreover crossbred animals, because of their larger size, could command higher prices than purebred Bali cattle, thus increasing a farmer's income. However if a crossbreeding program is permitted on Bali, there is no guarantee that Indonesia could preserve the genetic resource of purebred Bali cattle in the future.

Strategies to Improve Bali Cattle in Eastern Indonesia
edited by K. Entwistle and D.R. Lindsay
ACIAR Proceedings No. 110
(printed version published in 2003)

- Some Bali cattle resource areas should develop their own Bali cattle breeding institutes, because distribution of cattle from P3Bali in Bali to other provinces as part of a national breeding program is restricted by disease constraints.
- Some districts should develop their own laws for the export of animals, as well as some policies under district rules to develop cattle production locally in terms of quantity and quality.
- Under conditions of district autonomy, some districts should develop their own AI office to fulfil requirements for semen. It appears that the National Artificial Insemination Centre (Singosari) cannot satisfy regional needs in terms of semen quality, quantity and price. District governments could increase their income by sale of the semen and proven bulls.
- Under pastoral management, farmers as the users of the communal pastures should be expected to manage and control pastures through a farmers' association. The communal animal grazing system used in Thailand could be introduced into the Indonesian pastoral lands under the control of such associations.
- The model of communal animal housing in NTB could be introduced into other districts for producing commercial crossbreds as well as raising the productivity of purebreds.

References

Entwistle, K., Talib, C., Siregar, A.R. and Lindsay, D. 2001. Bali cattle performance: current population dynamics and performance and some strategies for improvement (a preliminary report). Seminar Nasional Teknologi Peternakan dan Veteriner, 17–18 September, Bogor, Indonesia. Proceedings of National Livestock Meeting. CRIAS, Puslitbangnak. 32.

Hidayati, N., Talib, C. and Pohan, A. 2001. Produktivitas padang penggembalaan rumput alam untuk menghasilkan sapi bibit di Kupang Timur, Nusa Tenggara Timur. Seminar Nasional Teknologi Peternakan dan Veteriner. 17–18 September, Bogor, Indonesia. Proceedings of National Livestock Meeting. CRIAS, Puslitbangnak. 345.

Litik, A. 2001. Special communication (Director of Livestock Services Office, NTT province, Indonesia).

Martojo, H. 1988. (A review) Productivity of Bali Cattle and their crossbred (Productivitas sapi Bali dan Persilangannya). In: Proceedings of Seminar Ekspor Ternak Potong (Animal Products as exported commodity) 2–3 September. Jakarta. A35.

Pane, I. 1990. Improving the genetic quality of Bali cattle (Upaya Peningkatan mutu genetic sapi Bali). In: Proceedings of a Bali cattle meeting Sept. UNUD. Denpasar. A42.

Siregar, A.R., Talib, C., Sariubang, M., Purba and Priadi, I. 2001. Increasing survival and growth rates of Bali calves through breeding system. Proceedings of Ruminant Meeting, University of Diponegoro. 192.

Talib, C. 2002. Productivity and reproductivity of Bali cattle. PhD thesis, University of New England, Australia.

Talib, C., Pohan, A. and Bamualim, A. 1999. Problematika pengembangan sapi Bali dalam pemeliharaan di padang penggembalaan. Prosiding Seminar nasional peternakan dan veteriner 1–2 Desember 1998. Jilid 1. Proceedings of Livestock Meeting. CRIAS, Puslitbangnak. 248.

Wirdahayati, R.B. 1994. Reproductivity of Bali cattle in Nusa Tenggara Islands — Indonesia. PhD thesis, The University of Qld, Brisbane, Australia.

Wirdahayati, R.B. and Bamualim, A. 1990. Performance production and population structure of Bali cattle in Timor, East Nusa Tenggara (Penampilan produksi dan struktur ternak sapi Bali di Pulau Timor, Nusa Tenggara Timur). In: Proceedings of Bali Cattle Meeting, 20–23 September, Denpasar. C1.