STRATEGIES TO IMPROVE BALI CATTLE IN EASTERN INDONESIA

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Options for Genetic Improvement of Bali Cattle — Assessing the Strengths and Weaknesses of Alternative Strategies

Option 2. Expensive technologies deleted, AI still included

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Abstract

A proposal is presented in this paper for the widespread use of artificial insemination as a tool to assist breeding of Bali cattle while ignoring most of the other reproductive and molecular techniques that *could* be used. It is recommended that small farmers in both extensive and intensive production regimes should be encouraged to unite to form larger breeding units. These units would then act as breeding centres using artificial insemination and modern techniques for data collection. Regional government institutions would then carry out computerised data analysis to determine estimated breeding values as a basis for selection within the breeding unit on the one hand and sale of breeding stock on the other.

Introduction

BALI cattle are produced under a wide range of different environmental and management conditions. Generally these can be divided into three management systems: grazing on open land; grazing within plantations; and intensive cut and carry management with animals held in separated individual farmer housing or in communal cattle housing. The first two systems could be regarded as extensive management, the third as intensive management. Strategies for genetic improvement will differ according to the management system they are applied in. Efficient production is dependent on traits influencing growth rate, feed efficiency, reproduction and survival rate, and on farm size. Improvements in genetics, although slow, do however have permanent effects. Traits with different heritabilities and expressions could be included in different strategies for genetic improvement (Politiek 1987).

The genetic improvement of Bali cattle should be carried out in sire evaluation programs that include performance testing (when necessary) and progeny testing. For dams, if there is a possibility for recording such data they could be included in dam evaluation; however if no dam records are available it is enough that the dams have an average mature weight in line with Indonesian standards for Bali cattle (Ditjenak unpublished), along with good reproduction and mothering abilities. There are many techniques for genetic improvement in beef cattle such as molecular genetic manipulation, sperm selection, sex determination, multiple ovulation and embryo transfer (MOET), artificial insemination (AI) and natural mating, which — combined with quantitative genetic analysis techniques (BLUP) — raised many expectations. Indonesia has problems with the recording of beef cattle, including Bali cattle (an exception is the P3 Bali project). A sophisticated model should therefore be developed for integrating the data of related institutions to record cattle, to collect records and to analyse such data partially and simultaneously. In this way it could be expected that in some provinces Indonesia would be able to produce selected cattle from proven bulls and cows.

Selection attempts to increase the frequency of favourable alleles, and concomitantly to decrease the frequency of unfavourable alleles at genetic loci influencing the traits of interest. In a selected herd

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the performance of the animals is likely to be similar, with less variety in genotype than for a herd of unselected cattle. Application of selection in smallholder farmers is not easy because of small numbers of animals (2–4 head/farmer), a priority for rearing females, high rates of animal movement, and a trend to sell the best bulls for fattening. The number of animals on a farm usually depends on the availability of family labour and feed sources. To increase cattle production efficiency, raising the number of animals per farm is an important factor. The techniques for genetic improvement that could be applied for smallholders in Indonesia include technologies such as AI, which has been used in almost all provinces for producing stock for slaughter.

Existing Breeding Systems with AI Technologies

AI has been use din Indonesian beef cattle since the 1970s. From the beginning, at least 11 breeds of imported taurine and zebu breeds were used as sources of semen. In the period 1990–2000 farmers showed a preference for choosing only four taurine breeds and two zebu breeds; in fact in each province usually only two taurine breeds and one zebu breed were chosen (Talib 1989; Talib and Siregar 1999; Bestari et al. 1999; Talib 2001; Ditjenak 2001). There are two AI centres that produce all of the frozen semen for smallholders — Lembang and Singosari. In 2000 they produced 1.5 million doses of distributed frozen semen, including 50 000 doses of Bali cattle semen. In the past ten years the centres distributed 19 million doses of frozen semen, and predicted calving rate was 30% (Ditjenak 2001). Although that prediction should be re-evaluated, the centres' records have been a major achievement.

AI techniques provide many advantages for cattle development such as control of certain venereal diseases, the need for fewer bulls on farms, the recording of information on reproduction, the harvesting of fertile sperm, and the efficiency of using proven bulls. In Indonesia, AI is also used for crossing to produce commercial crossbred stock for smallholders. Its impact has been on farmers with small farms, rearing females only and highly dependent on an inseminator. Calving difficulties increased and calving rates fell, but the price per calf increased. Most farmers with female crossbreds kept the females as dams for the next generation and to reduce the calving difficulties, but the amount of roughage required per head increased, and in future generations the rates of adaptation or survival may decline, especially for crosses with taurine breeds.

The success of AI depends on numbers of inseminators per area, cattle density, transport infrastructure and the experience of the inseminator. Semen quality at the time of insemination and the reproductive status of the female are also important. Usually, in country areas one inseminator would serve only one cow per day, though in communal animal housing the rate would be higher because of easier access to the cattle. Litik (2001) reported that inseminators do not work in insemination alone but also have other roles such as pregnancy detection, the care of calving nurseries and vaccination; these responsibilities could have an impact of the success of their AI work. In addition, AI is easier to introduce in cases of intensive management because the cows are housed and more tame; in pastoral areas it is very difficult to apply because of untamed animals.

In males, crosses between Bali and taurine or indicus cattle are infertile; however the female cattle are fertile (Kirby 1979; Bestari et al. 1999). Calving difficulties as a result of crossing between small and large breeds are quite common for Bali cattle (Talib 1989). To reduce the risks, farmers in East Nusa Tenggara (NTT) and West Nusa Tenggara (NTB) use crossing only for large cows and do not crossbreed heifers and small cows, both of which are bred to Bali bulls or inseminated with Bali semen.

Previous papers have called attention to the many kinds of breeding institutions that exist in Indonesia, but the effectiveness of these institutions needs to be evaluated. Their location, their programs (and the effectiveness of those programs), the target of their operations and the extent of integration between them have to be looked at carefully. It would be advantageous if all institutions working together to improve the productivity of Bali cattle were to create a good recording system for their breeding cattle.

Recording Organisations and Selection Applied

The model of P3Bali (Pane 1990), an open nucleus breeding scheme, could be introduced to other breeding institutions, but the selection criteria, together with the performance and progeny tests, should be applied carefully to achieve success in such a program. In Bali one of the weaknesses of P3Bali is the problem of disease within the area. As a result the products of its breeding program could be used only in Bali itself. Another factor is the application of the program in the operational sense. It would be difficult for any institution to build up a good sustained program like the Bali cattle breeding program in P3Bali. Such an institution needs autonomy for using funds at the right time and the right place to run the program properly. It should have a commercial management orientation, with a view to becoming self-supporting or with a minimum subsidy. As

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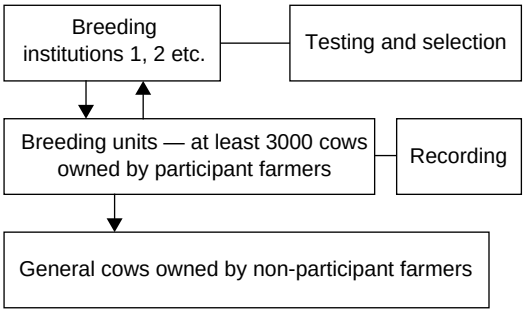
members of the program farmers should develop their own association, and through it could easily obtain bank credit to increase their farm size. It would be very useful if some breeding units were developed in certain locations, especially in areas with at least 3000 cows. An outline of the suggested program is presented below.



In each unit cattle have to be recorded and weighed once or twice yearly, the data including pedigree information from a breeding institution. All data could be collected for computerised analyses with BLUP models, depending on the complexity of the data. Estimated breeding values (EBVs) would be calculated as a basis of selection to identify superior bulls and heifers and to determine genetic trends of the population from selection over time. The model should also include all the environmental factors and site effects that could influence productivity. Since the results need to be applied in cattle herds, integration between institutions should be built up, as well as a direct relationship between institutions and the smallholder farmers who use their products. In addition, farm size should be increased to allow at least five cows per farmer so that farmers can live off the products of their farm. The breeding institution would be a source of quality bulls and heifers for farmers, helping them to raise their cattle product and their incomes.

Performance Test

Such a breeding program could run properly without a performance test if the selection is based on individual EBVs. However, in cases of doubt, or for demonstrating to the farmer how good the superior selected cattle are, the performance test could be applied in some breeding units/institutions with a similar standard of nutrition and management. The best performing cattle (those with the best EBVs) would be distributed among the breeding units and institutions. Others with a medium performance could be distributed to herds that do not participate in a breeding program. The selected bulls could also be placed across the provinces in a rotation system, while semen collection for producing frozen and chilled semen from proven bulls could be continued. Both AI and natural mating could be used in the genetic improvement program.

Future Expectations

It would be expected that distributing bulls, semen and heifers to the breeding units and to pastoral farmers, and distributing semen to participating farmers and general farmers in areas of intensive production, would be a mechanism that would work well to improve Bali cattle production in Indonesia.

Another expectation is that cattle could be sold on the basis of not only their body weight but also their EBVs. High quality cattle should be certified. Through their association, farmers would get some additional income from semen and high quality bulls and heifers sold to increase the efficiency of cattle breeding programs, as well as from animal breeding strategies.

Conclusions

1. Bali cattle are run under two major management systems, namely extensive and intensive, distributed through pastoral, plantation and cropping areas.
2. Farmers should be stimulated and helped to develop their farm size under their own association/institution, and a breeding program could be applied in the participating farmer areas in the form of breeding units.
3. Government could develop a cattle breeding institution or broaden the function of existing research institutions, to undertake computerised data collection and analysis in order to select cattle based on their EBVs.
4. High quality bulls and cows should be certified and distributed to the breeding units to improve genetic potential.

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