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ASSESSMENT OF BEEF CATTLE DEVELOPMENT SCHEMES ON FARM PERFORMANCE IN BALI

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Abstract

Beef production in Bali is dominated by smallholders. Three different beef cattle development schemes have been introduced to encourage beef production, including the Beef NES scheme, the Food Safety Credit and the Food Safety Project. They differ in profit and cost sharing arrangements. The Beef NES scheme is conducted under a contract farming system between farmers and finance providers. The Food Safety Credit scheme provides subsidised credit to farmers, while the last scheme is a cooperative-type of arrangement under a Bali government grant. A gross margin analysis of these schemes is conducted to compare profitability of the schemes. The results show that the Food Safety Project provides the highest gross margin to farmer participants and can potentially improve the quality of Bali beef.

Key words: beef cattle development, policies, gross margin assessment.

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Background

Livestock product consumption in many developing countries has been increasing due to factors such as population growth, urbanisation and income growth. However, expansion of livestock food production resulted primarily from increased numbers of animals rather than higher carcass weight per animal or better quality meats. Hence, policies aiming at improving productivity and the quality of the livestock sector are required.

The importance of cattle in the livestock sector in Bali has been recognised by the local government, although there is no research regarding the contribution of the beef cattle industry to the regional agricultural GDP. The involvement of more than 150,000 households (counting for about 20 per cent of the total population) in cattle raising shows the importance of Bali cattle to the local economy (DGLS 1998). Beef production in Bali has grown at about 2.9 per cent per year during the last two decades (1980-2000). This expansion has come from smallholder producers each holding three to five cattle.

Cattle are maintained to produce meat for local demand and traded to the inter-island markets, especially to Jakarta. Although the land size of Bali accounts for only 0.29 per cent of the total area of Indonesia, Bali beef contributes 4.80 per cent of the total Indonesian beef production and 4.08 per cent of total beef consumption. Cattle are spread throughout the island that covers an area of 5,633 km² and the population in year 2000 was about 529,000 head. Cattle numbers show an increase at average growth rate of 2.54 per cent per annum (DPPB 2000). The cattle may be grazed on public land near the farm or hand-fed by a cut and carry system using fresh feed from field borders, road sides and other public land. There is no beef specialist or feedlot system in Bali. Households who own more than 10 cattle usually have their cattle maintained by other farmers under certain cost sharing agreement.

The island of Bali is also known for its extensive tourist sector. Frozen and chilled beef are imported to fulfil the tourist demand for higher quality beef. An average of 1,074 tonnes of frozen beef per year from 1994-97 has been imported into Bali. These imports were valued at approximately A\$ 4.20 million per year (DPPB 1998). The amount of imported beef increased substantially along with the growing tourist sector. Beef import activity in Bali, however, has been affected significantly by the financial crisis. As a result of changes in exchange rates, beef imports into Bali dropped by 91 per cent from 1997 to 1998. Although imported beef increased again at the end of 1998, the quantity was not as much as before financial crisis. In 2000 the amount of beef imported was 299.18 tonnes, only about 28 per cent of the quantity imported before the financial crisis (DPPB 2000).

Bali beef has the potential to enter the higher end of the local market such as hotels and restaurants. This is shown by the use of local beef at selected star-rated hotels in Bali. Although there is this potential for Bali cattle to fulfil the demand from the tourist market, only a small portion of Bali beef enters the higher end of the market. It is difficult to obtain accurate data of the shares of Bali beef in the tourist trade, but it is estimated to account for about 20 per cent of the total Bali beef production.

Unlike in developed countries, livestock such as cattle in developing countries are the focus of complex socio-cultural relationships in rural communities. Animals are often viewed as a repository of wealth, a risk insurance scheme (against market and policy failures), a symbol of social esteem and a way of life. Sociological constraints may partially explain the reluctance of many households to adopt innovations that would improve herd productivity such as regular culling of old stock and replacement with young animals. It is often the case that peasant farmers consider the productivity of livestock to be a function of number of animals rather than the output per animal unit.

In Bali and many other areas in Indonesia, cattle prices are relatively high compared to the annual income of the smallscale farmers who hold an average of 0.5 ha of land. Considering the small size of farmer's holdings which are used for income generation, their income obtained from land cultivation is very small compared to the price of cattle. If they want to borrow from commercial banks, the interest rates are between 22 and 25 per cent per annum. Loan repayments are likely to be too high relative to

income. Therefore, it is unlikely that smallfarmers will be able to enlarge their beef operations without assistance from governments and other agencies.

Notwithstanding the social role of livestock in rural communities, the Bali government has responded to the constraints of smallscale farmers in cattle development by implementing several policies. The most notable program is the Beef NES scheme which has been implemented since 1984/85. Two more recent schemes are the Food Safety Credit (*Kredit Ketahanan Pangan/KKP*) scheme and the Food Safety Project (*Proyek Ketahanan Pangan/PKP*) scheme. The objective of the schemes in general is to increase smallholder farmers' income by improving their productivity. In addition, the schemes are expected to support high quality beef production through the implementation of improved technology such as better nutrition, artificial insemination (AI) and better management.

This paper aims to assess the impact of different cattle development policies on farm performance. As expected, different policies have different returns that accrue from cattle development. Therefore a comparison of the returns is required to see which policy is preferable. Identification of constraints to and opportunities for improving the performance of smallholder beef production is discussed in line with the results. It is expected that this study will provide preliminary information for further assessment of cattle development in Bali and in Indonesia.

Beef Cattle Development Schemes in Bali

Description of the three schemes mentioned above is presented in this section. Similarities and differences of the schemes will also be discussed.

The Beef NES Scheme

Contract farming has been viewed by many governments and development agencies as a means to develop markets, to bring about the transfer of technical skill for smallscale producers and to raise their income. Eaton and Shepherd (2001) defined contract farming as an agreement between farmers and marketing firms (sometimes it

is called sponsors) for the production and supply of agricultural products under forward agreement. The basis of arrangements in contract farming in general is a commitment on the part of the farmer to provide a specific commodity in quantities and quality standard determined by the sponsors/companies and on the part of the companies to support the farmer's production and to purchase the commodity. In addition, the level of involvement of the company in the production can vary from a minimum where, perhaps, only a certain type of input is provided, to the opposite extreme where the company provides land preparation, seedlings, agrochemicals and harvesting services.

Critics of contract farming tend to emphasise the inequality of the stronger position of sponsors with respect to that of farmers. Contract farming is viewed as essentially benefiting sponsors by enabling them to obtain cheap labour and to transfer risk to farmers. However, this view contrasts with the increasing evidence in many countries that it represents a way of reducing uncertainty of both parties. Contract farming would appear to have considerable potential in countries where smallscale agriculture is widespread as in many cases smallholders can no longer be competitive without access to the service provided by contract farming companies (Eaton and Shepherd 2001).

The advantages and problems arising from contract farming have been reviewed by a number of authors such as Rusten and Key (1996), Coulter *et al.* (2001) and Eaton and Shepherd (2001). The main potential advantages for farmers are i) provision of inputs and production services; ii) access to credit; iii) introduction of appropriate technology; iv) skill transfer; v) guaranteed and fixed pricing structures; and vi) access to reliable markets. Meanwhile, the potential problems associated with contractual arrangements for farmers include: i) increase in production or market risks; ii) unsuitable technology and crop incompatibility; iii) manipulation of quotas and quality specifications; and iv) domination by monopolies.

The main potential advantages from the companies' perspective can be seen as: i) overcoming land constraints; ii) production reliability and shared risk; iii) quality consistency; and iv) promotion of farm inputs. Companies may also have problems arising from the contractual arrangements, such as i) land availability constraints; ii)

social and cultural constraints; iii) farmer discontent; iv) extra-contractual marketing; and v) input diversion.

Contract farming can be structured in a variety of ways depending on the crop, the objectives and resources of the sponsor and the experience of the farmers. Any crop or livestock product can theoretically be contracted out using any of the models, however, certain products favour specific approaches. Decisions by sponsors on the type of model to follow should be made on the basis on market demand, production and processing requirements and the economic and social viability of plantation versus smallholder production. A “nucleus estate” model is one of the contractual arrangement models. A common approach of this model is that the sponsor commences with a pilot estate then, after a trial period, introduces to farmers the technology and management techniques of the particular crop (Eaton and Shepherd 2001). This type of arrangement has been applied to many developing countries such as cotton growing in Zambia, sugar-cane production in Thailand and oil palm plantation in Papua New Guinea. In Indonesia, the NES scheme was introduced in late 1970s mainly for natural rubber and oil palm plantations. The scheme has expanded to the livestock sector such as poultry, dairy and beef cattle in the early 1980s.

The beef nucleus estate-smallholder (Beef NES) scheme has been introduced in Indonesia to coordinate and promote beef production and marketing. It is also aimed to help small farmers with access to a wide range of managerial, technical and extension services that otherwise may not unobtainable. The scheme has been used in many cattle producing areas such as East Java, South Sulawesi, Bali and East Nusa Tenggara. This policy has also been undertaken in connection with resettlement or transmigration schemes. In Bali, the Beef NES scheme was introduced to promote development of Bali cattle, an indigenous cattle breed that is kept pure on Bali island. It was also aimed to accommodate smallscale farmers with capital and transfer technology. The number of farmers involved under this scheme has fluctuated since it was introduced, however at least 1,000 farmers get involved in this scheme every year (Masudana 1997). Each farmer usually holds one animal for a certain time depending on the agreement with the nucleus. This type of scheme has been of interest by farmers to take the opportunity to diversify their activities from crop plantation. The

implementation of the Beef NES scheme in Bali was disturbed by the financial crisis in 1997. The number of cattle distributed through this system dropped to less than 100 cattle per year. Reluctance of the nucleus companies to invest in beef cattle due to price uncertainty of cattle raised in fattening is one of the reasons for this condition. Before the financial crisis, Rp 100 million invested in cattle held about 102 cattle, but for the same amount of money, only 40 animals could be obtained after the financial crisis.

Commitment in the Beef NES scheme is that the company provides the cattle while the farmer has the responsibility to feed and maintain the cattle. One of the good points of this scheme from the farmers' point of view is that they do not have to provide collateral. Farmers are organised into groups to participate in this scheme. Hence, it will be easier for the nucleus company to monitor the maintenance of the cattle as well as get help for cattle management. The initial weight of cattle to be raised is generally 250 kg and they will be maintained for one year. If the initial cattle weight is about 300 kg, then cattle will be maintained for eight to nine months to achieve a sale weight at about 400 kg. The feeding strategy and feed cost are fully borne by the farmers. The profit sharing agreement is 45%:55% from the value of the increase in weight. This means that the company will get 45 per cent from cattle sales after deducting repayment of the initial cost of the cattle and 55 per cent goes to farmers. Cattle repayment is calculated by multiplying the initial cattle weight by sales price, instead of the purchase price. This commitment is undertaken by the nucleus to reduce the price risk that might happen at the time of cattle selling. Frequently, the companies indicate in advance the price to be paid and this is specified in the agreement. However, some contracts are not based on fixed prices but are related to the market prices at the time of delivery. In this instance, both parties are clearly dependent on market volatility.

The main distinction between general contract farming and the beef NES scheme is that backward and forward linkages are likely to occur in place in contract farming. In contract farming, the company usually provides input and production services such as fertilisers, essential agrochemical as well as extension services and this is followed by processing of the product. In the beef NES scheme, however, cattle are the only input provided by the nucleus. Any other input such as grains to support better nutrition for

animals is fully borne by the farmers. Quality of the product is also a major concern in contract farming, while selling weight is the main concern from the nucleus company in the Beef NES scheme. There is no standard weight determined by the nucleus, but higher sale weight is preferable.

The Food Safety Credit (KKP) scheme

Credit provision has long been considered a key instrument for helping small farmers. The reasons include emerging ideas about efficiency, enhancing output potential with new technology, and assisting to overcome farmers' inability to borrow from commercial or informal credit resources. One of the most popular instruments of credit policy in developing countries has been to subsidise the rate of interest on loans to farmers (Ellis 1996).

This approach to credit policy is also applied to cattle development in Bali. The Food Safety Credit (KKP) scheme is a subsidised credit scheme aimed to help farmers to generate income through cattle fattening after the financial crisis in 1997. Up until the end of 2000, Rp 1,36 billion (A\$ 272,000) have been released as subsidised credit to 680 borrowers (DPPB 2000).

Any farmers' group can apply for this credit from the approved banks, however the loans are the responsibility of the individual farmers. A recommendation from the Regional Animal Husbandry Office is a prerequisite by the group before applying for the credit. The commercial banks charge 22 per cent per annum for the borrowing but under the KKP scheme the interest rate is 16 per cent per annum, a 6-per cent subsidy from the government. Another precondition to obtain this credit is the availability of security from the farmers. If the credit is approved, the loan is given in terms of money and farmers will purchase the cattle at Beringkit cattle market (the biggest cattle market in Bali). Repayment of this loan is paid when cattle are sold. The head of the farmers' group is responsible for monitoring the loan repayment from his members. Under this credit scheme, the farmers are only responsible for the loan repayment to the bank.

Loans under the KKP scheme have some advantages. Since the group takes joint responsibility for repayment, there would be less risk of default. Then it in turn will reduce administrative costs. At the same time, cooperation in production and marketing may be encouraged through group action in raising the loan.

Upton (1996) pointed out that at first sight subsidised credit appears straightforward method of assisting small farmers and promoting agricultural production at the same time. However, there are some possible disadvantages of the low interest rate. It may discourage farmers saving themselves. In addition, it cannot be self-supporting, which means that a continued subsidy is required.

The Food Safety Project (PKP) scheme

The PKP project was initiated at the beginning of 2000 and was conducted in three different farmers' groups in three regencies (*kabupaten*) in Bali. The main aim of this project is to encourage the development of breeding cattle through farmers' group. It is believed that transfer of technology such as feed supplementation and artificial insemination (AI) will be more easily implemented through group action. Hence, cattle productivity as well as their genetic improvement will be improved. Moreover, under better cattle management, the group is expected to provide qualified breeding cattle continually. Once the group is successful in breeding, it is expected to have a spill over effect to other farmers' groups to enhance breeding plan.

Each farmers group in the PKP scheme was given a grant of Rp. 300 million (A\$ 60,000) from the Government Yearly Spending Budget. The group has responsibility to manage this fund effectively. This fund was intended to cover the cost of building a paddock, to purchase cattle for the group members, and to purchase concentrate as feed supplementation and AI tool kits. Each member is given two heifers and one steer and they are responsible to maintain the cattle in the provided paddock and feed them. Paddock depreciation will be shared among the members. Profit sharing arrangements for the group members are decided under the group commitment.

A survey has been conducted recently on one of the PKP receivers, Kencana Group in Gianyar regency, to see how the PKP works. Kencana Group has 25 members and each member maintains two heifers and one steer. Heifers are for breeding while steers are for fattening. This policy is undertaken to help members with cash before gaining any profit from selling the calves from breeding cattle. All cattle are placed in a paddock where the land was rented for ten years. Under these circumstances, greater control is possible allowing better selection at the time of slaughter. To feed the cattle, members use cut and carry systems of elephant grass from the rented-pasture land. Cattle are also given feed supplements such as rice husk and molasses that are provided by the group that acts as a cooperative. Members purchase the supplements with later payment when the cattle are sold. Payment for loan under this scheme is decided by the members' commitment. For instance, farmers do not have to pay interest for loan but they should give up 5 per cent from cattle sales after deducting repayment of the initial cost of the cattle. In turn, this reserve will be used for capital formation of the group to expand its ability to buy more cattle. Under this management, it is expected that this group will produce 50 cattle for breeding and 25 cattle for slaughtering every year.

In summary, the above mentioned cattle development schemes differ in profit and cost sharing arrangements. So their financial implications need to be calculated and compared.

Performance Measures

There is a number of agricultural policies have been analysed with models specified at various levels. At the farm level, farm investment analysis is undertaken to determine the attractiveness of a proposed investment to farmers and other participants. It follows the principles of discounted cash flow analysis. The application of net present value (NPV), internal rate of return (IRR) and the benefit cost analysis (BCA) are commonly used to analyse decisions between the relative profitability of alternative investment. These methods have been applied to many agricultural projects such as in

the Indian Cashew Nut Project and Livestock Production in Paraguay (Gittinger 1994). Theoretically, discounting should be used for comparing all investment decisions where expenditures and revenues occur a period of time. In practice, many farm investments are evaluated on the basis of partial budgets and return to marginal capital (Perkins 1994).

Another performance measure on farm level is the use of gross margin. The gross margin (GM) is a common measure used in farm analysis and planning. This technique of analysis is widely used for comparative purposes of activities on one farm or between farms in similar environments. Calculation of GM is simple and is a direct technique used in the first step in any form of farm budgeting and planning. The gross margin of a farm activity is the difference between the gross income earned and the variable costs incurred (Makeham and Malcolm 1986). The GM analysis has been widely used in livestock activities such as in lamb and cattle production. However, some care needs to be taken into consideration when using GM as planning because the GM technique assumes a linear relationship as the activity expanded. While in many cases it is reasonable to assume a linear relationship, the possibility of diminishing returns should be kept in mind when the activity is widened (Makeham and Malcolm 1993).

Gross margin analysis is used in this study to assess profitability of different schemes in cattle raising. The method of calculation follows the definition stated by Makeham and Malcolm. The gross margin calculation under the Beef NES and the KKP schemes was based on the information given by the staff of Bangli Extension Services in May 2001. The information included the initial cattle weight, purchase price, daily weight gain and sale weight. Other relevant information such as sale price and interest rate was obtained from Bangli Regional Livestock Services. The initial cattle weight raised by farmers varied between 250 kg and 300 kg. In this case, an initial weight of 250 kg is assumed. With feed supplementation of rice husk, it is expected the daily weight gain is 0.4 kg. This figure is based on farmer's experience in feeding the cattle (Sanglah pers.com. 2001). On the other hand, farmers under the PKP scheme have higher cattle daily weight gain because of better feeding. With the use of molasses and probiotic, the weight gain is 0.5 kg/day (Suta pers. com. 2001). Other

studies suggest that weight gain could achieve 1.1 – 1.7 kg/day depending on the breeds, the stage of maturity and feeding strategies (Zinn and Shen 2002).

Table 1 shows the basic data for one animal maintained under the three different schemes. Similar initial cattle weight gain is assumed for comparison purposes. It is obvious that cattle with better feeding results in higher sale weight, as seen under the PKP scheme. The high increase in weight gain proves that the cattle respond to technology feed supplementation. In addition, the use of high input in cattle raising ends up in high output. Cattle are also priced higher by 9.10 % than those cattle under other schemes because of better quality of carcass.

Under the same production system, the Beef NES and the KKP schemes result in different gross margin. With the agreement of profit sharing of 55% from the cattle sales and cattle repayment, farmer's gross margin under the Beef NES scheme is Rp 372,300/cattle/year (A\$ 74.46), while farmers under the KKP scheme obtain Rp 945,000 (A\$ 189). Farmers under the PKP scheme receive Rp 1,311,750 (A\$ 262.35), the highest gross margin compared to two other schemes (Table 2).

A closer view to the component of variable cost, feed cost constitutes 58 per cent of the farmers' profit share under the Beef NES scheme. The nucleus receives Rp 972,700 for every Rp 2,500,000 investment on cattle. This means that the return on investment for nucleus is 38.91 per cent. To some farmers, this nucleus return is too high, almost three times higher than the farmers' gross margin. It could be reasonable for the nucleus to some extent to receive that amount counting on the price risk borne. The nucleus invests Rp 2,500,000 for one year, while the farmers do not have to provide security to obtain the loan. Meanwhile, the farmers under the KKP scheme do not have to share the margin after loan repayment and it is not surprising the gross margin is much higher than those under the Beef NES. However, the risk is fully borne by the farmers

Farmers under the PKP scheme spend the highest feed cost among the schemes. It includes payment for rice husk, molasses, probiotic. The feed cost account for about 80 per cent of the cost incurred. It is important to note the use of supplementary feed for fattening should consider the relationship between feed conversion rate and

profitability. Delgado *et al.* (1999) noted that higher feed efficiency (lower conversion ratio) tends to encourage increased use of cereals as feed and favour those countries where cereal supply is relatively cheap and cereal feeding practices are well-established.

Discussion

Comparison of gross margins for three different cattle development policies has shown that farmers under the PKP scheme enjoyed the highest benefit. It is not surprising because they benefited from the higher increase in daily weight gain and in turn higher sale weight. Although the cost of feed is more expensive, farmers still benefit from the high sale price due to better carcass quality. This finding suggests that the PKP scheme is a preferable option for farmers to participate the program. Knowledge of improved management practices such as feed supplementation can increase productivity and in turn increase income. In meeting the government objective, the PKP scheme has the potential to increase farmers' income as well as improve beef production through better carcass quality. Later on, it has the potential to produce beef that can compete with imported beef.

There are many advantages that accrue from applying the concept of the feedlot system under the PKP policy. The intensive feeding with high rate of liveweight gain is conducive to improve carcass quality in terms of reducing the age at slaughter. The higher quality of carcass produced under the program increases the chance of access to higher valued markets and makes it possible to replace beef import in the long run. There is an enormous potential for Bali beef production to compete with imported beef as long as it is tailored by processing and marketing facilities to achieve import standard quality. Another advantage is that marketing cost will be reduced as cattle are sold together to reduce transport cost.

In spite of the advantages, cattle fattening in a feedlot system is not always economic. In Mexico, a combination of high prices of cereal grains, low beef prices on local

market and genetic unsuitability of the cattle employed resulted in a number of feedlots failing. Technologies enhancing the productivity of livestock production and improving meat quality should result in communication improvement between producers and consumers, however this is not always the case in practice. One of the reasons is information asymmetry between cattle breeders and the meat processing chain (Silveira and Fonseca 1996). This phenomenon should be taken into consideration when suggesting a feedlot system for cattle development in Bali.

Although some increase may be possible through more intensive production practices such as in the current PKP scheme, decisions to increase output significantly require higher administrative cost for the government to provide grants. This in turn will be reflected in government ability to support. Hence, the constraints of entry may impede farmers to participate in cattle development under the PKP scheme.

The Beef NES scheme to some extent has successfully supported smallscale farmer's income. The absence of collateral requirement in the Beef NES scheme provide incentive for farmers to participate. At the industry level of beef production, the number of cattle turned off from this scheme accounts for about 7 per cent. This number could be expanded but there are several factors working to limit nucleus and farmers participation. On the nucleus side, the price risk involved in animal production may reduce company participation in livestock investment. Although the gross margin is not an exact estimate of the nucleus company in pricing strategy, it does give a good indication of financial health. On the farmer side, the arrangement of profit share may inhibit their participation in cattle raising. The current profit sharing arrangement (55% of the increase in liveweight gain) is considered unfair to some farmers because they feel more hardwork is done than by the nucleus. Some farmers suggest the profit sharing arrangement should be increased to 70 % of the increase in liveweight gain. If this was the case, using current data, farmer's gross margin will be Rp 613,200, an increase on 65 % from the current profit sharing arrangement. Although this scenario figure is still below the gross margins under the KKP and PKP schemes, it offers better option than the current cost sharing arrangement.

The KKP scheme is a good policy to accommodate farmers with security to increase their income. The lower interest rate reduces loan repayments. In addition, farmers do not have to share the profit like in the Beef NES scheme. However, their income could be greater if feeding strategies could be improved. The use of feed supplementation is one possible answer. Ellis (1996), however, argued that credit policy is likely to have more effect on replacing rural financial market represented by private moneylenders than assist them improving their productivity.

The initial analysis undertaken in this study indicates that with better feeding strategies such as in the PKP scheme the quality of meat can be improved. In addition, technologies enhancing productivity of livestock production such as animal genetics, nutrition, and health are likely to be implemented quickly in the future. If technical advice on feeding strategies at the farmer level can be improved, there is the potential to improve their productivity and to develop better meat quality. However, there are several factors that may prevent farmers from implementing better feeding plans. To follow the feeding strategy like in the PKP scheme, farmers require more information and management skills. Farmers may be inhibited by limited access to information and training. Constraints on input availability such as rice husk and molasses may also occur in some places. Other constraints such as transport cost might affect the cost of feed as well. Hence, the use of local by-product in agricultural systems might be a good start to improve feeding strategy. This strategy has actually been implemented in some areas in Bali, however the information on the economic return on this strategy is limited.

In terms of the government objective to increase farmers' income, the policy works well in the KKP and the PKP schemes. This is shown by high gross margins than that of the Beef NES scheme. However, these two policies only capture a small group of farmers in beef production. The KKP scheme is only beneficial to farmers with assets, while the PKP scheme only allows certain farmers to access the fund. Although peasants or landless farmers are unfortunately not eligible for those two schemes, they still enjoy benefit from the cattle development program under the Beef NES scheme.

In terms of increasing farmers' productivity, the Beef NES and the KKP schemes do not seem to do so effectively. As can be seen in Table 1, farmers under the both

schemes have the same level of skills in feeding strategy, reflected by the same amount of daily weight gain of the cattle. Farmers under the KKP scheme actually have a good opportunity to expand their productivity through better feeding plans. This is because they have more capability to purchase feed supplementation than that of the Beef NES scheme. The lack of incentive of farmers who are able to get loans to use credit productively when it is cheap as indicated by Upton (1996) might be relevant in this case. Productivity for farmers under the Beef NES scheme can be improved by providing inputs such as feed supplementation by the nucleus company. The cost of feed can be covered under the agreement like in the contract farming arrangement.

Conclusion

In this paper, assessment of three different cattle development schemes in Bali on farm performance has been conducted. These schemes include the Beef NES scheme, the Food Safety Credit (KKP) and the Food Safety Project (PKP). The objectives of the schemes are to increase smallholders income by improving their productivity and to support high quality beef production through improved technology. These schemes differ in condition of entry and in profit and cost sharing arrangements. As expected, the findings suggest that the policies achieve their objectives in different ways. All schemes have encouraged increase in farmers' income while the farmers under the PKP scheme enjoyed the highest benefit. In terms of the government goal to modernise beef production, the PKP scheme is a promising way to improve carcass quality. However, constraint to the expansion of the PKP scheme depends on the ability of the Bali government to provide grant for this scheme. Opportunity for improving meat quality such in the PKP scheme relies on the ability of farmers to follow better feeding strategy.

Considering a big difference in the gross margins, the KKP and the PKP provide incentives to farmers in beef production. Both schemes, however, only achieved a small group of farmers. There is still opportunity for farmers under the Beef NES

scheme to improve their productivity by the help of nucleus company to provide feed supplementation. In terms of productivity improvement, the PKP scheme has the potential to replace or compete with imported beef.

The results of GM analysis in this paper should be taken as a preliminary outcome of cattle development in Bali. The economic effect of the policies on cattle development at the beef industry level has not been further discussed. It requires more comprehensive analysis such as partial equilibrium analysis to measure welfare changes of producers and consumers.

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Table 1 Initial basic data for one animal maintained under three different cattle development schemes

Items	Unit	Beef NES & KKP schemes	PKP scheme
Initial cattle weight	kg	250	250
Cattle purchase price	Rp/kg	10,000	10,000
Daily weight gain	kg	0.4	0.5
Length of maintenance	days	365	365
Sale weight	kg	396	432.5
Sale price	Rp/kg	11,000	12,000

Table 2 Farmer's gross margin comparison under the three cattle development schemes

Items	Beef NES	KKP	PKP
1. Cattle sales (Rp)	4,356,000	4,356,000	5,190,000
2. Interest rate (% p.a)	-	16	-
3. Loan repayment (Rp)	2,750,000	2,500,000	2,500,000
4. Interest repayment	-	400,000	-
5. Profit share after loan repayment (%)	0.55	-	-
6. Profit share (Rp)	883,300	-	-
7. Feed cost (Rp)	511,000	511,000	1,183,750
8. Land rent for grass (Rp)	-	-	60,000
9. Reserved profit at farmers' group (Rp)	-	-	134,500
10. Gross margin/cattle (Rp)	372,300	945,000	1,311,750