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Integration of Etawah Crossbred Dairy Goat with Cocoa in East Java Province, Indonesia

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Introduction

Etawah crossbred dairy goats found in Indonesia are mostly maintained by farmers in the rural areas. Etawah crossbred dairy goats are easy to maintain and are capable of utilising the leaves of various food crops, legumes and crop wastes as sources of feed. The pod cocoa waste makes up of 75% of the fresh cocoa pod and is a potential feed ingredient. Unfermented and fermented (using *P. Chrysosporium*) cocoa pods contain 8.69 and 13.84% crude protein, respectively (Suparjo et al., 2011). Utilisation of 30% cocoa fermented products in feeding resulted in average daily gain of 83.93 to 101.79 g/head/day in goats (Suparjo et al., 2011) and 55 g/head/day in sheep (Tuah et al., 1995).

East Java Province, Indonesia has cocoa plantation area totalling 2,290 ha and in 2009 its cocoa production was 5,004 tonnes from the small plantations, 13,345 tonnes from state plantations and 4,816 tonnes from private plantations. However, cocoa pod waste is currently used only as a mulch and has not been used as feed material. These facts form the basis for implementation of the programme on integration of goat in the cocoa agricultural system in Ngawi regency of East Java. The objective of this study was to examine the application of an integrated business model of Etawah crossbred dairy goats with cocoa, by cocoa farmers in the region, through the utilisation of estate cocoa waste as goat feed.

Materials and Methods

The location of the study was at 7°21'–7°31' South latitude and 110°10'–111°40' East longitude in the Ngawi district of East Java Province. Farmers live in the District Ngrambe on highlands at the foot of Lawu Mount with most areas of the land used for cocoa plantation. The integrated Etawah crossbred dairy goats with cocoa model was applied in two villages, namely Village Sambirejo (10 farmers and 25 Etawah crossbred dairy goats and Manisharjo villages (15 farmers and 45 Etawah crossbred dairy goats). Forage feed was derived from (1) waste of food crops (WFC): banana leaf, jackfruit leaves and cassava leaves, (2) leaves of legume crops (LLC): *Gliricidia sepium* and *Leucaena leucocephala* and (3) field grasses (FG). Basal concentrate (BC) consisted of 40% rice bran, 30% waste of cassava flour processing, 10% milled corn, 12% soybean meal, 5% coconut meal, 2% mineral and 1% salt.

The application of the integrated Etawah crossbred dairy goats with cocoa production system was for about 12 months in 2009 with the stages of socialisation, counselling, training, demonstration, implementation, monitoring, evaluation, study visits, workshop, and publications. Processed products from pod cocoa waste: (1) pod cocoa meal (PCM): cocoa pods chopped, sun-dried and milled, (2) pod cocoa meal molasses block (PCB): pod cocoa meal mixed with BC and molasses cooked and moulded into blocks, and (3) fermented pod

cocoa (FPC): cocoa pod chopped, *Aspergillus* fermented, dried and milled. The duration of the study was 3 to 4 months and feed was given at 2 to 3 kg/head/day at a ratio of 60 forage: 40 concentrate.

Results and Discussion

Farmers fed diets of forage and concentrate in 3 different compositions. Forage level was the same but the concentrate level was changed. Forage consisted of FG, WFC and LLC 20%, 5% and 25% respectively with 3 combined use of concentrates consisted of (1) BC 20% + PCM 20%, (2) PCB 40% and (3) BC 25% + FPC 15% (Table 1).

Table 1. Profile of integrated Etawah crossbred dairy goats with cocoa production in East Java Indonesia

Parameter	FG 20% - WFC 15% - LLC 25% - BC 20% - PCM 20%	FG 20% - WFC 15% - LLC 25% - PCB 40%	FG 20% - WFC 15% - LLC 25% - BC 25% - FPC 15%
Number of farmers			
Sambirejo Village	3	5	2
Manisharjo Village	4	7	4
Number of Etawah goat			
Sambirejo Village	10	8	7
Manisharjo Village	23	13	9
Average daily gain (g/head/day)			
Sambirejo Village	75–100	100–125	75–100
Manisharjo Village	75–100	75–100	100–125
Milk production (liter/head/day)			
Sambirejo Village	0.75–1.00	1.00–1.25	0.75–1.00
Manisharjo Village	1.00–1.25	1.00–1.25	0.75–1.00

Note: For full form of abbreviations see materials and Method section

The integration comprising of FG 20% - WFC 15% - LLC 25% - PCB 40% was most widely applied by Etawah crossbred dairy goat ranchers in the two villages. Achievement of daily weight gain and milk production was in the good range (Table 1). The use of fermented cocoa in goats yielded weight gain from 83.9 to 101.8 g/head/day (Suparjo et al., 2011) and 95 g/head/day (Aregheore, 2002). Another study on the application of integrated farming systems through the utilisation of local agricultural waste reported average daily gain of 100 to 125 g/head/day in Etawah crossbred dairy goats (Riyanto et al., 2007).

Conclusions

For dairy goats in East Java, the most widely used feeding approach that integrates cocoa is: field grasses (FG)-waste of food crops (WFC)-leaves of legume crops (LLC)-pod cocoa meal molasses block (PCB) with the composition of 20%, 15%, 25%, and 40%, respectively. It produced average daily gain of 100–125 g/head/day and milk production of 1.00–1.25 liter/head/day.

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