

Diversity on the exterior performance of crossbred cattle kept by farmers in Central Java

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ABSTRACT: In Java, starting in the 1980's, exotic germplasms have been used to increase the productivity of Ongole Grade cattle, which is considered as native cattle. However, due to uncontrolled breeding system and poor pedigree record by the farmers, nowadays, many different types of cattle exist in Indonesia. This study was aimed to investigate the diversity on the exterior performance and body size of crossbred cattle. This study was carried out in Central Java and Yogyakarta Provinces. In total 160 heads of female Simmental crossbred female cattle, with age more than 2 years were observed for their exterior performances. Survey and direct measurement on the exterior performances of cattle were applied to collect all parameters required. The results indicated that most predominant body colour was brown-red (59.38 %), followed by red and white (14.38% and 11.88%), respectively. The colour of the head were mostly white (72.50%), some were brown (17.50%). The noses were varied from black (53.75 %) and pink (41.25 %). Most of the cattle have small and medium dewlap (46.25 % and 43.13% respectively). The shape of horns are mostly curved inward (35.00 %) and slightly upward (32.50%). The cattle are mostly humpless (72.50%) and few of them have small hump (25%). The colour of tails' hair is varied from brown (66%) and black (48%). The colour of the vulva was mostly pink (55.00%) and blackish pink (23.13%). The heterogeneity of Simmental crossbred cattle is caused by unplanned crossbreeding systems, yet, their genotypes are not well identified. There is a need to plan an appropriate crossbreeding program.

Key words: diversity, crossbred cattle, exterior performance, uncontrolled breeding system

INTRODUCTION

Indonesia is a country with a growing human population and a developing economy, drive to increasing the demand of meat, especially beef meat. To fulfill the increase in demand for beef in Indonesia, the government has been promoting the crossing between exotic breed cattle with local / indigenous cattle. From the 1980's onwards, the government has been promoting artificial insemination, using exotic breeds from temperate regions, such as Simmental, Limousine and Aberdeen Angus, to improve the local beef cattle performance. As a result, domestic beef production comes from various distinct beef cattle populations, which were formed from the native and imported genetic resources. As other tropics countries, upgrading with temperate breeds in crossbreeding is a main attempt to improve livestock.

The genotype and performances of crossbred cattle were not well identified. Beside of poor recording system, there is lack of plans on how to maintain a sustainable level of 'upgrading' or how to maintain the pure breeds for future use in crossbreeding, contribute to non-sustainability (Philipsson *et.al.*2006). Phenotypic variation within breeds can be large, moreover in composite breeds and indiscriminate crossbreds.

Currently, beef cattle population in Indonesia is around 12.5 million heads, comprised of local cattle such as Bali, Madura, Ongole Grade (OG), Brahman Grade, Hissar, Pesisir and Javanese; crossbreds and imported cattle from Australia. There is no exact data of the number of crossbreds cattle, but it is increasing year by year.

This study was aimed to investigate the diversity on the exterior performance and body size of crossbred cattle.

History of Crossbreeding

Martojo (2005) stated that in the 19th century, local breeds were upgraded using Ongole bulls from India. Then Ongole bulls and small sized local Java-breeds were crossed in East Java. Further importation of the Indian *Bos indicus* such as Ongole, Hissar and other zebu cattle occurred in early 20th century. The purpose of the importation was to provide Java with strong draught cattle to pull carts for the sugar industry. According to Barwegen (2004), East Javanese initially disliked the Ongole breed, because they could not work in forests as the Javanese cattle could.

The male and female Ongole cattle were bought from areas surrounding Madras India. The pure Ongole was brought to Sumba Island and became the Sumba-Ongole. In Java, the Sumba-Ongole were crossed with Javanese cattle (*Bos javanicus*) and formed the Ongole-grade (in Indonesia called Peranakan Ongole). As mentioned by Maule (1990), that Ongole cattle in Indonesia become established on a large scale, after its introduction in 1906 until around 1980's. The characteristics of the Ongole and OG cattle are: a big body, strong power, docile and a quiet temperament, good heat tolerance and ability to live at minimum feed conditions. This makes them good animals for draught.

The coat colour of Ongole is glossy white but some males have a grey markings on the back quarters have grey markings on their hump. Ongole cattle grows faster than Madura or Bali cattle and have a better feed conversion ratio and less fat in the carcass. However, they are less fertile than original Javanese cattle (Barwegen, 2002), and Madura and Bali cattle as well (Maule, 1990). Widi *et al.* (2006) showed that the reproduction performance of Javanese cattle was higher than that of the OG. In 2003, the population was estimated at about 4.4 million or 41 % of total cattle population in Indonesia. About 90 % of them are on Java (Directorate General of Livestock Service, 2003). Their numbers are, however, rapidly decreasing.

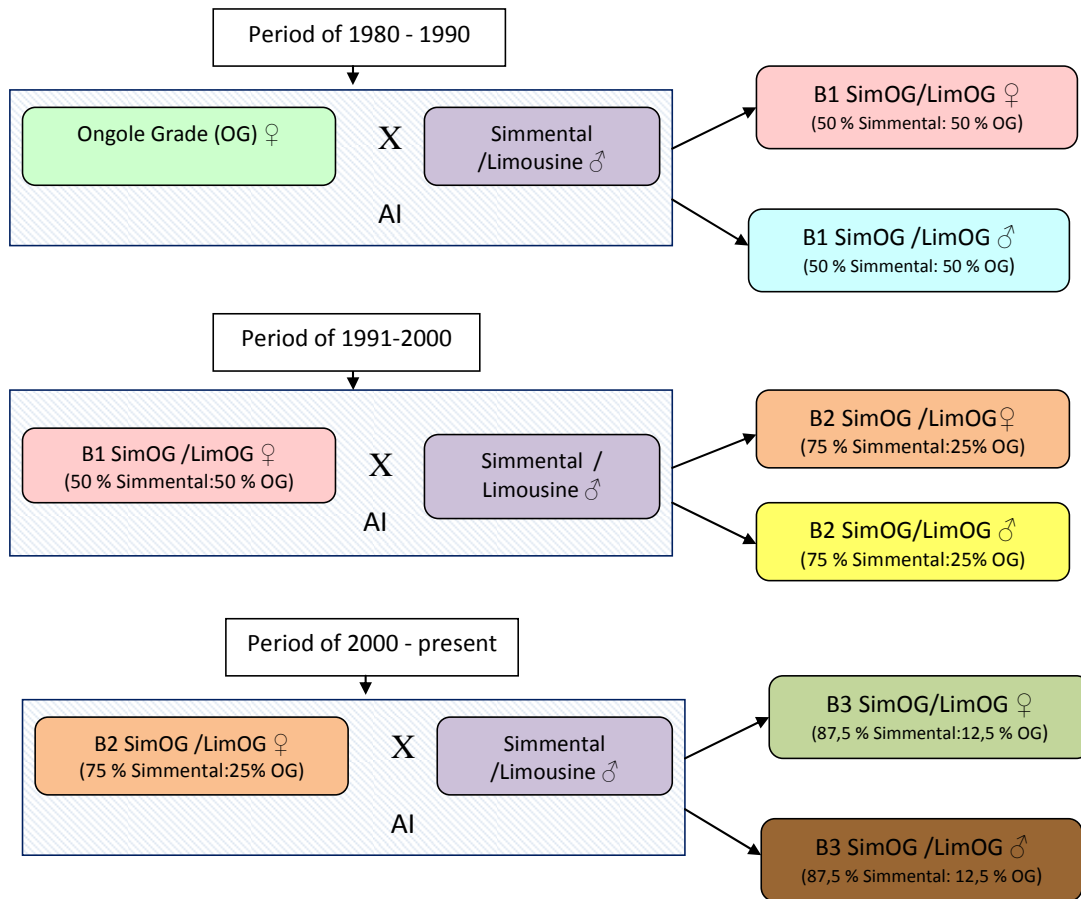


Figure 1. Crossbreeding in beef cattle by farmers through artificial insemination (Source : Widi *et al.* 2008)

In 1980's, the government introduced exotic breeds such as Simmental, Limousine, and Aberdeen Angus through artificial insemination. The purpose of this program was to increase the productivity of local cattle in terms of their growth to fulfil the national meat demand. Figure 1 shows how in Yogyakarta Province crossbreeding with exotic breeds has been implemented. Currently, more than 80 % of the cattle in this province are exotic crossbreds (Widi *et al.* 2008).

Simmental is the most favourite breed for farmers in Central Java and Yogyakarta Provinces. For example, in 2007, in a district of Yogyakarta Province, the utilization of Simmental semen reached 71 %, compared to other breeds like Limousine and Ongole Grade / Brahman, which were only 6 and 23 % respectively (Widi *et al.*, 2008).

Simmental. The ancestor of today's Simmental was the Brenese, a local breed found in the Simme Valley . Its colours included black-and- white or red-and –white pied and sometimes solid red. Until the middle of the nineteenth century the cattle were often run in mixed herds, though the red-and-whites (which were usually blond-and- white) substantially outnumbered the taller, more robust black-and-whites which were kept mainly in the Frinbourg canton. After about 1870, however the establishment of 'pure' breeds became the fashion and the two types were separated according to colour (Porter, 1991). Furthermore Porter (1991) stated that the red –and – white type Simmental was carefully bred as a triple – purpose breed and selected for a yellowish-red and white coat with a white face, legs, and tail. In crossbreeding all around the world, the Simmental is highly preferred, since it provides good growth, a large frame and thus a better beef yield to its crossbred progeny. It improves the quality of the meat with white fat and excellent marbling. It improves the milk yield, resulting in strong development of the calves in suckler herds.

Limousine. The Limousine is a heavily muscled animal renewed for its excellent carcass qualities, the yield of meat being exceptionally high, with a minimum of fat. The limousine is a rich gold colour, with lighter circles around the eye and muzzle, and shading to a lighter colour on the legs. The majority of animals are horned although a poled strain has been developed. (Anonimus,2000).

MATERIAL AND METHODS

Study Areas

This study was conducted in the Central Java and Yogyakarta Province which are sources of beef cattle in Java Island. Three Districts with 6 sub districts within, represent 3 agro ecological zones, namely dry upland, wet upland and wet lowland, were used in this study. Dry upland areas were located in Gunung Kidul District. Wet upland areas were located in Sleman District, and wet lowland areas were located in Sleman and Kebumen Districts.

Methods

In total 160 heads of female Simmental crossbred female cattle, with age more than 2 years were observed and measured for their exterior performances. Age of cattle was measured by determining their teeth. The exterior characteristics observed were colour of body, face, nose, leg, around eyes, tail's hair and vulva; size of dewlap and hump, existence of back line, shapes of horn, thickness of body's and head's hair. While, body size measured are girth of chest, height at withers, length of body, height at the hip, wide of hip, length of head, wide of head, head index, body weight and body score condition (BSC). Body size were measured using a tape FH brand with 1 cm precision figures and the measuring ruler FHK brand with 0.2 cm accuracy.

Exterior characteristics were calculated by using percentage of their existence. While vital statistics were calculated for their means and standard deviation.

RESULTS AND DISCUSSION

Most of farmers in Central Java and Yogyakarta provinces keep cattle for breeding purposes, producing calves and usually selling them after weaning or pre-yearling period. Female / cows cattle are dominated the cattle population. The farmers applied artificial insemination to mate their cattle,

Table 1. The exterior characteristics of crossbred cattle

Exterior characteristics (%)	Percentage based on age group (%)			Average (%) (N=160)
	2-3 year (N=57)	3-5 year (N=42)	5 year (N=61)	
Body colour				
White	19.30	14.29	3.28	11.88
Cream	7.02	7.14	11.48	8.75
Brown-red	52.63	54.76	68.85	59.38
Red	15.79	19.05	9.84	14.38
Grey	1.75	0.00	0.00	0.63
Black	1.75	2.38	6.56	3.75
Undefined (mixed)	1.75	2.38	0.00	1.25
Face colour				
White	80.70	73.81	63.93	72.50
Cream	0.00	0.00	4.29	1.88
Brown	7.02	16.67	27.87	17.50
Red	7.02	7.14	0.00	4.38
Black	5.26	2.38	3.28	3.75
Nose colour				
White	0.00	0.00	3.28	1.25
Cream	1.75	0.00	1.64	1.25
Pink	43.86	40.48	39.34	41.25
Black	50.88	57.14	54.10	53.75
Spotted	3.51	2.38	1.64	2.5
Leg colour				
White	40.35	47.62	47.54	45.00
Brown	45.61	40.48	42.62	43.13
Red	14.04	11.90	9.84	11.88
Size of dewlap				
Small	61.40	42.86	34.43	46.25
Medium	31.58	47.62	50.82	43.13
Big	7.02	9.52	14.75	10.63
Back line				
Exist	5.26	14.29	6.56	8.13
Not exist	94.74	85.71	93.44	91.88
Horn shapes				
Not exist	1.75	7.14	4.92	4.38
Straight up	10.53	16.67	9.84	11.88
Slightly upward	26.32	30.95	39.34	32.50
Curve inward	43.86	23.81	34.43	35.00
Curve outward	3.51	9.52	1.64	4.38
Hanging down	5.26	2.38	8.20	5.63
Small	8.77	9.52	0.00	5.63
Asymmetries	0.00	0.00	1.64	0.63
Hump size				
Not exist	77.19	66.67	72.13	72.50
Small	21.05	30.95	24.59	25.00
Medium	0.00	2.38	3.28	1.88
Big	1.75	0.00	0.00	0.63
Colour around eyes				
Cream	5.26	2.38	3.28	3.75
Brown	5.26	9.52	3.28	5.63
Red	40.35	30.95	37.50	37.50
Black	49.12	57.14	53.13	53.13
Thickness of head's hair				
Low	70.18	76.19	65.57	70.00
Medium	28.07	19.05	27.87	25.63
High	1.75	4.76	6.56	4.38

Table 1. The exterior characteristics of crossbred cattle (continuation)

Exterior characteristics	Percentage based on age group (%)			Average (%) (N=160)
	2-3 year (N=57)	3-5 year (N=42)	5 year (N=61)	
Thickness of body's hair				
Low	84.21	92.86	78.69	84.38
Medium	15.79	2.38	19.67	13.75
High	0.00	4.76	1.64	1.88
Colour of tail's hair				
Creamy white	7.02	21.43	9.84	12.76
Brown	35.09	42.86	45.90	41.28
Red	28.07	4.76	14.75	15.86
Black	29.82	30.95	29.51	30.10
Colour of vulva				
Pink	56.14	66.67	45.90	55.00
Pinky brown	5.26	0.00	4.92	3.75
Pinky black	17.54	21.43	29.51	23.13
Black	21.08	11.90	19.67	18.13

using the most preferred exotic breeds semen, Simmental and Limousine. They only use OG / Brahman semen for OG or Brahman heifer which are in the first mating.

Some farmers still believe that the reproductive performance of F1 of Sim-OG or Lim-OG cows are better compared to the further backcross generation crossbreds cows, so that they prefer to keep the F1 crossbreds cows to be bred (personal communication, 2009) and this fact was proved by Putro (2009), who said that the reproductive performances of further backcross generation of crossbreds cows were slightly decreasing compared to F1. However currently, farmers also breed further backcross generation cattle, which resulted cattle with composition of *Bos Taurus* blood until 87.5 %, even more. The exterior characteristics of crossbreds cattle were shown in Table 1.

Exterior Characteristics

Exterior characteristic should be known for the introduction of cattle breed are colour of body, tail's hair, the shape of horns, hump, dewlap, specific colours on the body, characteristic of the head, ears and neck (Supiyono, 1998).

Seven and five pattern variations on body and face colour have been observed in this study. The dominant body colour was brown-red, while colour of face was white. The dominant colour of legs were white and brown. As mentioned by Porter (1991), pure Simmental with colour of yellowish-red with white face and legs were preferred to be bred. Besides the dominant colours, there were some other colours existing on those crossbred cattle. Since there were no sufficient recording system done by farmers, so the breed of the cattle progeny could not be certainly known. However, in Central Java, the most preferred exotic cattle breed are Simmental. Limousine is only famous in few areas.

Based on the colour of the coat, face and legs, performed by observed cattle, the crossbreds cattle in Central Java were Simmental crossed. However, they might be results of crossing with other breeds like Limousine, Angus, OG or Brahman. The exploration of genetic introgression of exotic to local / indigenous breeds cattle can be done by molecular work, but it is expensive, and yet, the level of upgrading is still missing.

Uncontrolled crossbreeding, unplanned breeding program and poor recording systems done by farmers, resulted various phenotypic performances and unknown upgrading level. Low awareness among farmers about benefit of recording is a limiting factor in many developing countries.

Body Vital Statistics

Body vital statistics of crossbred cattle were shown in Table 2.

Table 2. Body vital statistic of crossbred cattle

Body vital statistics	Average based on groups (%)		
	2-3 year (N=57)	3-5 year (N=42)	5 year (N=61)
Girth of chest (cm)	172.89 ± 13.56	171.96 ± 12.80	175.52 ± 12.16
Height at the withers (cm)	126.28 ± 6.08	128.44 ± 6.70	128.44 ± 6.70
Length of the body (cm)	119.60 ± 14.54	118.29 ± 11.16	118.41 ± 8.77
Height at the hip (cm)	132.63 ± 6.20	131.83 ± 8.41	131.98 ± 16.48
Wide of hip (cm)	47.25 ± 5.03	47.47 ± 4.43	50.04 ± 10.29
Length of head (cm)	50.05 ± 4.12	50.55 ± 3.27	51.11 ± 4.03
Wide of head (cm)	21.98 ± 1.83	21.67 ± 1.93	22.48 ± 2.29
Head Index	44.08 ± 3.36	42.91 ± 3.34	44.08 ± 4.11
Body Weight estimation (kg)	402.05 ± 95.12	399.19 ± 65.99	417.09 ± 75.37
BSC	3.29 ± 0.55	3.13 ± 0.46	3.15 ± 0.46

Comparing to the results of Widi *et al* (2006), the girth of chest, height at withers, length of the body and estimation of body weight of female OG with age of over 4 years, in Central Java, were 154.69 ± 1.12 cms; 123.56 ± 1.36 cms; 130.19 ± 1.91 cms; 298.75 ± 5.79 kg, respectively, so that crossbred cattle were much bigger than Ongole Grade.

According to Sudardjat and Pambudy (2003), the average of height at wither of male Ongole Grade was 140-160 cms and that of female OG was 130-140 cms and their body weight can reach until 400 – 600 kg. It means that in the past, when the population of OG was still high, the body size of those cattle were more less similar with crossbreds cattle. However, since the preference of farmers was shifted to crossbreds cattle, the population of OG cattle decreased rapidly. During colonialist period, OG were strongly used for draught animals, and the breeding and selection program at that time resulted big animals which were appropriate to pull carts or plough lands. However, due to the demand of meat which has been increasing, following the increasing of human population, OG, including the big ones, shifted to meat producers. Nowadays, the remaining OG are smaller and the reason for small number of farmers to stay keeping OG was less capital needed (Widi *et al.*, 2006).

The average of cattle ownership is 4.6 heads / farmer and the average of cows ownership is 1-2 heads / farmer (Widi *et al.*, 2008). With the small number of cattle ownership, farmers are not be able to select and retain keeping the good cattle / cows. Urgent need drives farmers to sell their cattle without any selection for breeding.

CONCLUSIONS

A lot of variation in exterior performances, found in crossbreds cattle in Central Java. It was resulted from indiscriminate crossbreeding with exotic breeds. Uncontrolled crossbreeding, unplanned breeding program and poor recording systems done by farmers, resulted various phenotypic performances and unknown upgrading level.

It is strongly recommended to plan an appropriate breeding program which emphasising on selection scheme, recording and evaluation of the cattle.

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