Farmer's profile and exterior characteristics of female Moa buffaloes in Moa Island, Maluku Province, Indonesia

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ABSTRACT: Moa buffalo is one of buffalo germ plasm kept by farmers in Moa Island, Maluku Province. Its productivity, exterior characteristics and farmers profile have not been explored; therefore this research was conducted to identify the profile of farmers and the exterior characteristics of female Moa buffalo at various ages. This research was conducted at 5 villages. Research materials included 96 farmers as respondents, 222 female buffaloes (1 to 5 yr old). Survey method and descriptive analysis were applied to collect all of information required. Farmers' identity and population structures were collected by direct interviews with the farmers using structural questionnaires. Body measurement was done by direct measurement on the body, consisted of body length, withers height, chest depth, heart girth, rump height, rump width and ages of buffaloes. The results showed that the average age of the farmers was about 41.92 yr and experience on keeping buffaloes was 16.92 yr. The average numbers of buffaloes owned by farmers was 37.63 heads. Exterior characteristics of female buffaloes at 2-3 yr old were body length 88.92 ± 9.94 cm, heart girth 136.69 ± 21.05 cm, withers height 94.77 ± 7.23 cm, rump height 44.77 ± 5.54 cm and body weight 192.46 ± 29.12 kg. At 3-4 yr old of female buffaloes, the body length, heart girth, withers height, rump height, chest depth, rump width and body weight were 163.61 ± 16.40 cm, 110.03 ± 6.14 cm; 109.08 ±5.88 cm, 65.58 ± 6.69 cm, 46.82 ± 4.62 cm and 253.45 ± 30.79 kg, respectively. At 4-5 yr old, the body length, heart girth, withers height, rump height, chest depth, rump width and body weight of females buffaloes were 116.14 ± 10.98 cm, 174.04 ± 12.12 cm, 115.07 ± 3.23 cm, 113.07 ± 3.74 cm, 67.36 ± 7.44 cm, 48.07 ± 3.74 cm and 270,42 ± 27,24 kg, respectively, while for female buffaloes under more than 5 yr old, it was 121.44 ± 12.22 cm, 180.01 ± 16.63 cm, 120.19 ± 3.76, 119.49 ± 13.74 cm, 79.40 ± 5.52 cm, 58.72 ± 4.88 cm and 292.09 ± 29.76 kg. It is concluded that the exterior characteristics of female Moa buffaloes were depended on the ages, the older buffaloes, the higher exterior characteristics.

Key words: exterior characteristics, female buffaloes, Moa buffaloes

INTRODUCTION

Buffalo is one of ruminant animals that physiologically and nutritional aspect is closed to cattle, so it can be utilized to substitute beef meat in order to fulfill the national meat demand. However, the population growth of buffalo is not as good as that of cattle. One factor affecting low productivity of buffalo could be related to the government policy. Low attention have been paid to the development of buffalo compared to cattle, however, buffaloes offer a great opportunity to be developed from genetic and environmental aspect point of views.

Productivity of buffalo in one area has to be studied to maintain supply and demand ratio, so the population of buffalo in the future will not be over explored. The increase of productivity and its efficiency on keeping animal at famers' level requires more attention so that livestock sector can be improved in line with the dynamics of society need. The decrease of buffalo numbers in Indonesia are usually caused by high slaughter rate, mortality and demand which is much more than natural increase. The increase in buffalo numbers can be achieved through strong control on slaughtering, diseases prevention, good feed quantity and quality, good breeding program and improve housing system (Toelihere, 1985).

There are many local breeds of buffaloes available in Indonesia. One of them is Moa buffalo. Moa buffalo is swam buffalo and mostly kept by farmers in Moa Island, Maluku Province, under harsh

agro-ecosystems condition. Contribution of Moa buffalo into farmers' income and their livelihood is relatively high. From social value, keeping Moa buffalo means that farmers are in wealth condition. In addition, by keeping Moa buffalo, farmers can also gained manure to fertilize land, improve meat consumption and selling meat or live buffaloes. Dynamic mobilization of buffalo will affect buffalo population in Moa Island.

The superiority of local animal germ plasms, including buffalo has not been explored. This condition worries us because it may result in the extinction of some germ plasms (Astuti et al., 2007). Therefore, conservation, development and utilization of animal germ plasms must be supported by the rule and methods so that the potency of indigenous animal genes or local animals and their genetic relationship can be protected, either for the animal which has been recently developed or still kept under sub-system. As the initial step to support animal germ plasm conservation in Indonesia, therefore this research was conducted to explore the exterior characteristics of Moa buffalo kept by farmers at Moa island, Maluku Province.

MATERIALS AND METHODS

The research was conducted for three months, starting from June up to August 2009, at Moa Island, South-west Maluku district, Maluku Province. Ninety six farmers were involved in this research and 122 buffaloes at various ages were directly measured on its exterior characteristics. Farmers who participated in this research were selected based on the criteria having minimum of 1 buffalo at least at 3-yr old and having minimum of 3-yr experience on keeping buffaloes. The farmers represented five villages as presented on Table 1. Livestock ruler, bandage tape were used to collect the exterior characteristics. In addition, detailed questionnaire were used to interview the farmers on their background and buffaloes daily management. The parameters were consisted of farmers' background and the exterior characteristics of Moa buffaloes, including body length, withers height, chest depth, heart girth, rump height, rump width and ages of buffaloes. Survey and direct measurement were applied to collect all parameters required.

Table 1. Numbers of farmers involved in the research and name of villages

Villages	Number of respondents
Patti	29
Werwaru	13
Kaiwatu	20
Nyiama	19
Weet	15
Total	96

Heart girth was measured on the breast at the 3rd and 4th-*costae* behind the legs using bandage tape, while body length measured on the body of buffalo from *tuberculum lateralis humeralis* up to *tuberculum ischiadium* using livestock ruler. Withers height was measured on the highest point of shoulder using livestock ruler. Chest depth was measured from the point of withers (at the 3rd and 4th *costae*) to breast bone. Rump height was measured vertically from the first *sacrum* into baseline (earth), while rump width was measured on the distances between left and right *tuber ischii*. All measurements were conducted when the buffalo standing at parallelogram position. Identifying age of buffalo was done by watching the change of buffalo's teeth (replacement of temporary teeth into permanent teeth or the change of *incicivus deciduii* into permanent *incicivus*).

The qualitative data were analyzed descriptively, consisting of farmers' background, number of buffaloes, reason for keeping buffaloes and its production systems. Exterior characteristics of Moa buffaloes' data were tabulated and analyzed using one way ANOVA.

RESULTS AND DISCUSSION

Identity of Buffalo Farmers

Understanding the ability of farmers on managing their buffalos requires the background of farmers themselves. Indicator used to identify those background were ages of farmers, their jobs, numbers of buffaloes owned, educational background, experiences on keeping buffaloes and involvement of household labour in buffaloes daily management. All of indicators are presented in Table 2. The majority of respondent job was farmers (92.37%), while 4.49% was buffalo farmers and 3.69% was civil servant. Suradisastra (1984) stated that farmers are facing with problem of land possession; they have only a small piece of land, therefore it is necessary for the farmers to intensify their land and diversify their activity through keeping animal as an additional source of income. According to Soekartawi et al, (1986) cit. Worabai (2004), additional activity generally did not based on the right economic principles. The average age of farmers at 5 villages selected was 41.92 yr old; it can be classified into young and productive ages. Widayanti (1987) stated that 15 to 64 yr old is the age under productive condition.

Table 2. Farmers identity and background

	Villages					
Identity	Patti	Werwaru	Kaiwatu	Nyiama	Weet	Average
Age, yr	45.89	42.85	39.95	40.37	40.53	41.92
Occupation, %						
Farming	86.21	92.31	90	100	93.33	92.37
Buffaloes farmers	10.34	7.69	0	0	6.67	4.94
Civil servant	3.45	0	10	0	0	2.69
Educational background,%						
Elementary school	79.31	61.54	65	94.74	80	76.12
Junior high school	10.34	15.38	15	5.26	20	13.19
Senior high school	3.44	7.69	20	0	0	6.23
University	6.89	15.38	0	0	0	4.45
Experiences, yr	15.05	28	5.75	17.95	13.13	15.05
Household members involved in buffalo keeping, %						
Father	68.97	61.54	90	78.95	26.67	65.23
Mother	13.79	15.38	0	0	13.33	8.50
Children	17.24	23.08	10	21.05	60	22.47

Educational background will affect the attitude and rational thinking of farmers on managing their animal, further they will receive and adopt new technology easily (Priyanti et al., 1988). The result showed that educational background of farmers were 4.45% university, 6.23% senior high school, 13,19% junior high school and 76.12% elementary school.

Walker (1973) *cit.* Worabai (2004) stated that experiences is the accumulation result of life process which further will affect people reaction to justify new decision they made. By learning their failure in the past experiences, the farmers will obtain new understanding and insight in regards with livestock daily management (Suradisastra, 1984). Most farmers in Moa Island have long experiences on keeping buffalo, on average it was 15.55 ± 10.02 yr. According to Ilham (2008), farmers who have long experiences will able to keep their buffalo in good management, in addition, capabilities of farmers on taking new decision will improve significantly as they have longer experiences, their decision usually based on the past experiences they had.

Number of Buffaloes per Farm and Buffalo Condition

Number of buffaloes owned by the farmers and *post partum* mating condition of buffalo is presented in Table 3.

The average numbers of buffalo owned by the farmer was 37.63 heads, or 722.4 heads per village. Aziz (1993) *cit.* Worabai (2004) stated that in Indonesia, farmers mostly kept livestock as small enterprises and the average numbers of animal kept by the farmers is around 1-4 heads. This condition, however will significantly affect farmers motivation on keeping livestock. Numbers of buffalo owned by the farmers in Moa Island was relatively high, it can be said that keeping buffalo is a medium enterprises which can be used as main sources of income. This condition could be related with long time experiences of farmers in keeping buffalo and their capital condition. According to Azis (1993) *cit.* Nazlah (2008), farmers who have more capital will invest their capital in the form of animal, considering that animal is productive investment in farming system which can be sold when the farmers urgent cash need.

Table 3. Numbers of buffalo owned by farmers

Composition	Villages					Total	Average
	Patti	Werwaru	Kaiwatu	Nyiama	Weet		
Weaned, head							
Male	122	49	19	57	20	267	53.4
Female	93	56	31	107	87	374	74.8
Young, head							
Male	153	90	28	90	110	471	94.2
Female	120	125	76	130	160	611	122.2
Adult, head							
Male	225	66	52	218	175	736	147.2
Female	369	176	80	228	300	1153	230.6
Total	1082	562	286	830	850	3612	722.4
Animal unit	940.0	477.0	245.2	720.2	755.0	3,137.4	627.5
Post partum condition of buffalo, %							
Thin	65.52	0	60	52.63	66.67	244.82	48.96
Medium	6.89	0	30	42.11	20	99	19.8
Fat	27.59	100	10	5.26	13.33	156.18	31.24

It is expected that buffalo condition after partus was fat, which is reflecting that those buffalo are in good management, mainly on feed availability and feed offered, it is also indicated that farmers pay more attention on their buffalo. Moa Island was 48.96% thin, 19.8% medium and 31.24% fat. Post partum mating condition in this research was relatively long, indicating that farmers did not give much attention on the female buffalo condition before and after partus. Extensive farming system applied by the farmers and low involvement of household labour on buffalo daily management could be the main factors for low post partum condition. Father is dominant household labour on keeping buffalo, the fact that the father has to work at other job (double job) so that their time spent on keeping buffalo was relatively low, have been contributed significantly on post partum condition. Other factor such as the availability of feed which affected by climate could also contributed to this condition, as stated by Worabai (2004).

Population Structure of Buffalo in Moa Island

The result showed that population of female buffalo was higher than male buffalo at various ages. Adult female buffalo was significantly higher than those of male buffalo, while for weaning and young buffalo, female buffalo also higher than male. Sex ratio between male and female buffalo in Moa Island was 1:1.56. Population structure of buffalo in Moa Island is presented in Table 4.

Low percentage of male buffalo population could be related with farmers' habit, they prefer to sell male buffalo compared to female, because the market price of male buffalo is high. Farmers usually reluctant to sell female buffalo, due to the fact that apart from low market price, female buffalo was used to replace old female, furthermore, farmers have high awareness that in the future, buffalo population can only be improve by keeping female buffalo and prevent their female from illegal slaughtering. Low population of male buffalo kept by farmers caused by high market price,

therefore farmers give priority to sell male buffalo firstly. High population of female buffalo could be advantage effect on supporting breeding program at farmers' level.

Table 4. Population structure of Moa buffalo in Moa island

Buffalo structure	Sex	
	Male	Female
Weaned		
Population, head	267	374
%	35.61	52.25
Animal unit	97.53	224.40
Young		
Population, head	471	611
%	63.27	93.76
Animal unit	37.68	488.80
Adult		
Population, head	736	1153
%	97.28	152.29
Animal unit	736	1153
Sex ratio (male : female)	1374 : 2138 (1.00 : 1.56)	

Body Size and Bodyweight of Female Moa Buffalo

The average body size and body weight of female buffalo at variuos age was presented in Table 5. the average of body length of female buffalo at 2-3; 3-4; 4-5 and more than 5 yeras old were 88.92 cm; 105.21 cm; 116.14 cm and 121.44 cm, respectively. Body length of buffalo at 2-3 yr old in this reserach was relatively closed to body length of buffalo in Yogyakarta province, 87.46 cm at the same age (Dhake Dae, 2005), while at 3-4 yr old, it was higher than those of female buffalo in Demak district namely 100.48 cm (Ngadiyono, 1982). At 4-5 yr old, body length of female buffalo in this research was lower than the study conducted by Ngadiyono (1982) in Demak district which found that the body length was 118.38 cm, but it was higher than body length of buffalo in Yogyakarta province and Sukabumi district, namely 134.14 and 113.92 cm, respectively (Dhake Dae, 2005; Ilham, 2008). At more than 5 yr old, body length in this research was lower than buffalo in Yogyakarta and Demak, which is 127.49 and 129.25 cm respectively ((Ngadiyono, 1982; Ngadiyono, 1984; Dhake Dae, 2005). This result indicated that body length of female buffalo kept by farmers in Moa Island were varied widely, it could be affected by variation in environmental condition. Fahminuddin (1972) stated that body length of Indonesian buffalo is generally lower than buffalo in India, Europe and Latin America.

Table 5. Body size , cm and body weight , kg of female Moa buffalo

	Age, yr			
Parameters	2-3	3-4	4-5	> 5
Body length, cm	88.92±9.94	106.21±4.19	116.14±10.98	121.44±12.22
Heart girth, cm	136.69±21.05	163.61±16.40	174.04±12.12	180.91±16.63
Withers height, cm	94.77±7.23	110.03±6.14	115.07±3.28	120.19±3.76
Rump height, cm	91.77±8.37	109.08±5.88	113.07±3.74	119.49±13.74
Chest depth, cm	56.54±7.06	65.58 ± 6.69	67.36±7.44	74.40±5.52
Rump width, cm	44.77±5.54	46.82 ±4.62	48.07±3.74	58.72±4.88
Body weight, cm	192.46±29.12	253.45±30.79	270.43±27.24	295.09±29.76

Heart girth average of female buffalo kept by farmers in Moa Island at 2-3; 3-4; 4-5 and more than 5 yr old were 136.69; 163.61; 174.04 and 180.91 cm, respectively (Table 5). Dhake Dae (2005) found that heart girth of 2-3 yr old female buffalo in Yogyakarta province was relatively low, while Ngadiyono (1982) found that hearth girth of 3-4 yr old female buffalo in Demak district was 152.76 cm, it was significantly lower than this research, however, Ilham (2008) found that heart girth of

female buffalo in Demak district at 3-4 yr old was 169.40, it was similar with this result. Compared to Yogyakarta province, Demak and Sukabumi districts, heart girth of female buffalo in Moa Island relatively high, however, generally heart girth of buffalo in Indonesia was reported lower than those of Mediteranean buffalo as stated Anonymous cit. Dhake Dae (2005). High heart girth will increase the respiration capacity so it will optimize thermoregulation mechanism (Bodhipaksha and Fischer, 1992 *cit.* Dhake Dae, 2005).

Withers height average of female buffalo in Moa island at 2-3; 3-4; 4-5 and more than 5 yr old were 94.77; 110.03; 115.,07 and 120,19 cm, respectively. Dhake Dae (2005) reported that withers height of 2-3 yr old female buffalo in Yogyakarta province was 90.38 cm. In Demak district, Ngadiyono (1982) reported that withers height of 3-4 yr old female buffalo was 106.42 cm. while in Yogyakarta province, it was 90.38 cm (Dhake Dae, 2005). In Yogyakarta province, withers height of female buffalo at 4-5 yr old was 114.86 cm (Dhake Dae, 2005) while in Sukabumi district, it was 115.23 cm (Ilham, 2008). Dhake Dae (2005); Ngadiyono (1982) and Ilham (2008) further found that at more than 5 yr old, heart girth of female buffalo in Yogyakarta province Demak and Sukabumi districts were 127.41;123.8 and 118.24 cm, respectively. Overall, withers height of female Moa buffalo was relatively higher than those of buffalo in Java Island at various ages. It could be caused by great variation on environmental factor including ages and management systems. Djagra et al. cit. Hartati (2009) reported that the development of rump height was higher than withers height at early maturation buffalo, meaning that growth of withers height is continued even rump height growth was finished, after maturity is achieved, withers and rump height will be relatively same.

Rump height average of Moa buffalo in Moa Island at 2-3; 3-4; 4-5 and more than 5 yr old were 91.77; 109.08; 113.07 and 119.49 cm, respectively. At 2-3 and 3-4 yr old, the rump height in this research was relatively higher than those of buffalo in Yogyakarta province, namely 88.85 and 90.38 cm as reported by Dhake Dae (2005). In contrast, at 4-5 yr old, rump height of buffalo in this research was lower than buffalo in Demak district namely 119.67 (Ngadiyono, 1982). Dhake Dae (2005) stated that body size of buffalo in Indonesia was relatively low compared to body size of buffalo in other countries such as India, China, Egypt, Laos, Thailand and Europe, it could be caused by unavailability of good feed quality and quantities, traditional management system and long time inbreeding cases.

The average of chest depth of Moa buffalo at 2-3; 3-4; 4-5 and more than 5 yr old were 56.54; 65.58; 67.36 and 74.40 cm, respectively. Compared to the chest depth of 2-3 yr old of female buffalo in Demak district which was 55.80 cm, chest depth in this research was relatively high, the same result was found on 3-4 and more than 5 yr buffalo (Ngadiyono, 1982) which was 55.80 and 71.05 cm, respectively, while at 4-5 yr old, both Moa buffalo and local buffalo in Demak district had the same chest depth. The differences of chest depth between Moa buffalo and local buffalo in Yogyakarta province and Demak district could be caused by differences in environment, types and quantity of feed offered.

The average of rump width of Moa buffalo at 2-3; 3-4; 4-5 and more than 5 yr old were 44.77; 46.82; 48.07 and 58.72 cm, respectively. At 2-3 yr old, rump width of female buffalo in this research was higher than rump width of female buffalo in Demak district as found by Ngadiyono (1982). The same result was found on female buffalo under 3-4 and more than 5 yr old. At 4-5 yr old, rump width of female buffalo in this research was quite similar with female buffalo in Demak district. Overall, rump width of female in this study is higher than those of study done by Ngadiyono (1982), indicating that environmental effect could be positively affecting rump width of female Moa buffalo, mainly types and quantity of feed, age of buffalo. Santosa (2008) stated that rump width has positive correlation with birth process; the widest rump will support birth process easily.

Body weight average of female Moa buffalo at 2-3; 3-4; 4-5 and more than 5 yr old were 192.46; 253.45; 270.43 and 295.09 kg, respectively, as presented in Table 5. Compared to the national standard of body weight in Indonesia and based on the regulation of Agriculture Minister 1999, which stated that minimum bodyweight of female buffalo could be 350 kg; the result of this study was relatively low. The fact that body condition of female buffalo was dominated by thin condition (53.13%) could be the main factor for low body weight of female Moa buffalo. Genetic factor such as simultaneous inbreeding was considered as the cause of decreasing buffalo performances including body weight, as stated by Hardjosubroto (1993). Low bodyweight and body size of Moa buffalo if it compared to national standard might be caused by low genetic quality, there were found many

inbreeding cases and negative selection in Moa island that have been happen since many yr ago. In addition, environment, management and feed availability factors could also contributed to the low performance of Moa buffalo. Sumadi (2007) stated that the longer body length they have, the higher production capacity will produced, all others body dimension will also have positive correlation to the buffalo productivity. Further, there was positive correlation between body size and age, the older buffalo will have optimum bone and muscle growth. Ngadiyono (1984) stated that specific body size of buffalo such as body length, heart girth and withers height was affected by altitude and sex differences.

CONCLUSIONS

Based on this research, it can be concluded that exterior characteristic of Moa buffalo was higher than those of study carried out in Yogyakarta province, Demak and Sukabumi districts. However, it is still lower than the national standard of buffalo in Indonesia. The exterior characteristics of female Moa buffaloes were depended on the ages, the older buffaloes, the higher exterior characteristics.

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