

The Characteristic of Buffalo Production (*Bubalus bubalis*) at The Small Holder Farmers in Sukoharjo Regency, Central Java, Indonesia

M M Fajar, J Riyanto, R Dewanti, M Cahyadi, A K Wati, W Pawestri and Y Yanti

Animal Science Program Study, Faculty of Agriculture, Universitas Sebelas Maret.

Jalan Ir. Sutami No. 36A Ketingan, Surakarta, Jawa Tengah, 57126, Indonesia

Corresponding author: yuliyanti_fp@staff.uns.ac.id

ABSTRACT

This study aims to obtain the information on cattle production of swamp buffalo at small holder farmers in Sukoharjo. The methods used were survey and sample determining technique called purposive sampling. Data collection applies interviews and observation method. The sample taken is 90 swamp buffalos owned by 30 stockbreeders. The result of the study respectively shows the average of withers height, waists height, body length, chest girth and estimation body weight of adult male buffalo (>36 months) in 129,3 cm; 129,9 cm; 131,1 cm; 205,8 cm; and 502,3 kg. On the other hand, the result for adult female buffalo were 126,8 cm; 127 cm; 127,1 cm; 198,4 cm and 469,7 kg. On 12 months old buffalo shows the average result were 109,7 cm; 110,2 cm; 107,3 cm; 154,3 cm and 301,2 kg. While the 12 months female buffalo's result is in 112,1 cm; 112,7 cm; 107,9 cm; 162,8 cm and 328,9 kg. According to the result, it can be concluded that swamp buffalos productivity in Sukoharjo was in a good production.

Keywords: Body Length, Body Size, Chest girth, Productivity, Swamp Buffalos

Introduction

Meat is one of the basic needs of the community as a source of animal protein. The need for meat in Indonesia increases every year, but the fulfillment of meat has not been fully fulfilled from internal. It is necessary to increase livestock productivity to support the achievement of the meat self-sufficiency program. Fulfilling the needs of meat in Indonesia can be done by looking for other sources of meat production, such as buffalo meat.

Buffalo (*Bubalus bubalis*) is a large ruminant that is common in Indonesia. Buffalo has the advantage to be developed because it has a high level of ability to

low-quality feed. Buffaloes in Indonesia are used as meat-producing livestock as well as working cattle, but in some areas buffalo are also used as milk producers (Nuraini et al., 2010), and as a complement in traditional ceremonies (Tabib et al., 2014). Buffaloes are generally kept in a simple management, where maintenance is not aimed at fattening but only as a farmer's savings. Buffalo farmers on average only raising 2-6 buffaloes. The population of buffalo in Sukoharjo Regency in 2020 were 605 heads while the population in 2010 were 2519 heads (Central Bureau of Statistics, 2021). This showed that the buffalo population has decreased by 76% in the last decade. The decline in population has caused buffalo become scarce. It was also suspected that buffalo scarcity can occur due to improper maintenance management factors. Traditional maintenance management allows changes in buffalo production characteristics such as buffalo body sizes.

The characteristics of buffalo production can be presented in their body sizes. It can be an indicator of the successful of a buffalo farming business. Quantitative properties are parameters that can be used as benchmarks in the selection program. Quantitative traits that can be measured include withers height, waist height, waist width, chest width, chest girth, chest girth, body length, and body weight. Body weight and body size are generally measured at the age of 3-4 years (Rusdin et al., 2018). Adult cattle can be seen from the changes in the buffalo incisors, the age of an adult buffalo is 3 years (Krisnadi et al., 2016). Buffaloes aged 3 years and over have a decreased growth rate, so that the buffalo's body weight relatively does not increase (Komariah et al., 2014). Buffalo withers height < 3 years old was 115.8 ± 14.9 cm and age > 3 years was 126.0 ± 10.7 cm (Hairil et al., 2016). An adult male swamp buffalo has a waist height of 132.3 cm, an adult female buffalo is 124.49 cm and a young female buffalo has a waist height of 113.25 cm (Gerli et al., 2012). Male buffalo aged 3-4 years had a body length of 129.92 ± 13.05 cm and female buffaloes of the same age 127.74 ± 14.80 cm (Rusdin et al., 2018). The female swamp buffalo had an average chest girth of 183.7 ± 22.02 cm, while the male buffalo was 188.3 ± 34.20 cm (Anggraeini et al., 2011).

There has been no research on the characteristics of buffalo production in Sukoharjo Regency. It is necessary to conduct research on the characteristics of buffalo production to directly determine the condition of buffaloes in smallholder

farms, especially in Sukoharjo Regency. This study aims to obtain information about the characteristics of buffalo production on smallholder farms in Sukoharjo Regency.

Materials and Methods

This research was carried out from April to September 2021 in Sukoharjo Regency, Central Java Province. This research activity was carried out in two stages: pre-survey and survey (data collection). The pre-survey stage begins with collecting data on the distribution of livestock and mapping the location to be used. The next activity is sampling data which is carried out directly at the research location. Data were collected by interview and body measurements of buffaloes.

The determination of the buffalo population was adjusted to the population data at the Sukoharjo Regency Agriculture Office. The choice of Sukoharjo Regency was because based on field surveys there were still many breeders who kept buffalo. The buffalo selected must be located in Sukoharjo Regency or owned by a breeder with domicile in Sukoharjo.

The sampling method was carried out by purposive sampling method (Sugiyono, 2015). The farmers selected as respondents were selected based on their willingness to be interviewed and their livestock measured and the breeders residing in Sukoharjo Regency. The cattle selected for data collection were chosen deliberately based on consideration of the livestock population. The population of buffaloes owned by farmers is at least 2 heads. The number of samples taken was 15% of the total buffalo (605 heads) population spread in Sukoharjo Regency (Central Bureau of Statistics, 2021). The number of samples can be seen in Table 1.

Data was collected by several methods, namely interviews and observations. Interviews were conducted directly by conducting interviews with respondents or buffalo farmers based on questions or questionnaires that had been prepared to obtain primary data. Observations were carried out directly by observing and measuring the object under study, namely the buffalo to get a picture and measurement results from the object.

Tabel 1. Sampling of Buffalo in Sukoharjo

District	Buffalo (Head)
Tawanghari	16

Sukoharjo	20
Mojolaban	8
Grogol	7
Baki	11
Kartasura	28
Total	90

The variables observed in the research on buffalo production characteristics were age, withers height, waist height, body length, chest girth and estimated body weight of cattle. The age of buffalo can be identified in 2 ways; based on birth registration or by estimating the change of incisors. The incisors of the Poel 1 buffalo can be estimated to be between 2-3 years old and the Poel 2 can be guessed that the age of the buffalo is more than 3 years old (SNI 7706, 2011). Withers height is measured perpendicularly from the cattle stand to the top of the withers at the back of the hump, expressed in centimeters (SNI 7706, 2011).

Waist height was measured by measuring perpendicularly from the base of the cattle to the tip of the waist to the top of the buffalo's waist (SNI 7706, 2011). Body length was measured from the distance from the head of the withers (*Tuber scapula*) to the tip of the pelvis (*Tuber iscii*) (SNI 7706, 2011). Chest girth was measured using a measuring tape. The method of measurement is by wrapping a measuring tape through the withers past the back of the withers blade (*scapula*) (Nur et al., 2018). Buffalo body weight was measured using Smith's formula.

$$\text{Smith formula} = \frac{(\text{Chest Girth} + 18)^2}{100} \text{ kg (Tigor et al., 2016).}$$

All obtained data were analyzed using descriptive analysis (Sugiyono, 2015). Descriptive analysis was carried out by describing the data collected in the form of tables, averages, standard deviations, and percentages. Data processing using excel application.

Result and Discussion

The characterization of farmers

The characteristics of the breeder are quite important because they are related to how a farmer is able to manage their farm. Characteristics of respondents in Sukoharjo Regency are presented in Table 2.

Tabel 2. Characterization of farmers

Characterization	Respondent (people)	Percentage
Farmer's age (years old)		
a. 15-65	17	57%
b. >65	13	43%
Length of farming experience (years)		
a. ≤ 10	2	7%
b. > 10	28	93%
Amount of buffalo (head)		
a. ≤ 4	25	83%
b. > 4	5	17%
Occupation		
a. Farmer	23	77%
b. Others	7	23%
Farming purpose		
a. Saving	29	97%
b. bussines	1	3%
Type of farming		
a. Semi Intensif	23	77%
b. Intensif	7	23%

Buffalo breeders in Sukoharjo Regency have a dominant age of 15-65 years or 57% of the total sample of breeders. It means 43% of farmers are over 65 years old. The age of breeders with a range of 15-65 years is a productive age to develop and manage livestock optimally. This is in accordance with the Sukoharjo Regency BPS (2021) that the productive age is between 15 years and 65 years, and those over 65 are unproductive. Hastang and Asnawi (2014) also stated that productive age breeders have the opportunity to increase farmer production.

About 93% of breeders in Sukoharjo district have more than 10 years of farming experience, while the rest have less than 10 years of experience. The long period of breeding experience makes the breeders already have a lot of knowledge in buffalo maintenance. This much experience makes farmers understand in maintenance management and know all things related to raising buffalo. Ibrahim et al. (2020) stated that the length of experience of farmers has an influence on the success rate in raising livestock, this is because farmers already understand the ins and outs of raising livestock. Generally, buffalo breeders in Sukoharjo have carried out maintenance from generation to generation from their previous parents.

The number of buffalo holding by breeders in Sukoharjo Regency were on average less than 4 heads. There are 83% of farmers who have buffalo with less

than 4 heads and only 17% who keep buffaloes with more than 4 heads. At least the number of buffalo kept by farmers shows that the scale of maintenance was small scale farmers. This is in accordance with the opinion of Hastang and Asnawi (2014) that rearing 1-4 head of livestock is categorized as a small scale. The occupation of the majority of respondents was farmers (77%), so that only small-scale buffalo breeding does not interfere with their main work. Febriana and Liana (2008) state that raising livestock is considered a part-time job so that only a small amount of time is spent taking care of their livestock.

Buffalo rearing is carried out by farmers for 2 purposes, for saving and for bussines. Based on the data in Table 2 as many as 97% of respondents keep buffalo for the purpose of saving, and only 3% who keep buffalo for use as bussiness. It can be understand because the majority of breeders have other jobs, so that buffalo management is carried out only in the morning and evening. Buffalo maintenance is also carried out as additional income to meet the special needs of farmers, such as for children marriage or paying school fee. Sasoeng et al. (2020) stated that smallholder farmers have a goal or motivation in raising livestock as future savings and as additional income for the family. Febriana and Liana (2008) stated that raising livestock is not the main business but as a side business.

As much as 77% of farmers keep buffalo semi-intensively, ie by grazing on the field in the morning and evening, then the rest of the buffalo stay in cages. Hilmawan et al. (2019) states that in smallholder farms, buffalo maintenance is carried out in a traditional or semi-intensive sytem in which buffaloes are grazing during the day and kept in cages at night. About 33% of breeders rearing is carried out only in cages without removing buffalo in the grazing area so that feeding and drinking buffalo is carried out in the cage. Semi-intensive maintenance is more dominantly carried out by buffalo farmers in Sukoharjo because farmers do not need to find fresh forage every day. It is enough for farmers to provide dry rice straw in the cage, and farmers routinely take the buffalo for grazing in the morning and evening. Meanwhile, intensive maintenance where buffaloes are always in cages makes farmers have to find fresh feed/forage every day and more regularly to clean the cage so that feces do not disturb the comfort of livestock. Fresh forage either obtained in grazing areas or from cutting grass is needed by buffaloes to meet

their nutritional needs, because if it is only rice straw, the nutrient content is very low (Yanti and Yayota, 2017).

A. Buffalo's age

Buffalo in small holder farms in Sukoharjo district have age variations from 2 weeks to tens of years old. Breeders do not record in a structured way but only rely on memories and scribbles on the walls of the cage. Buffalo ages are grouped as in Tables 3 and 4 according to age variations in the research sample. In Tables 3 and 4 it can be seen that the age of buffalo affects the body size, the higher age the greater body size. The increase in body size is in accordance with the opinion of Hairil et al. (2016) which states that the age greatly affects the body size of the buffalo, the higher the age, the longer body size. Livestock age also affects buffalo body weight. Komariah et al. (2014) stated that along with increasing age of buffalo, body weight will also increase.

Withers height

The withers height of an adult male buffalo (>36 months) was higher than that of an adult female buffalo, as shown in Figure 1 (A). The withers height of an adult male buffalo was 129.3 cm and at the age of 1 year it was 109.7 cm. An adult female buffalo has a withers height of 126.78 cm and at the age of 1 year has a withers height of 112.07 cm. The withers height of adult male buffalo in Sukoharjo was almost the same as that of Dudi et al. (2011) reported in Serang 129.7 cm and in Pandeglang 129.8 cm. However, the result in Sukoharjo Regency for adult female buffalo had a higher withers height compared to Serang 118.8 cm and Pandeglang 119.2 cm. Withers height is one of the body characteristics of buffalo which has increased significantly from birth to adulthood. Hairil et al. (2016) stated that withers height measurements can be used to determine the growth of buffaloes. The increase in withers height growth is influenced by the age of the livestock, this was also conveyed by Nur et al. (2018) that the age factor has a significant effect on the withers height of the buffalo.

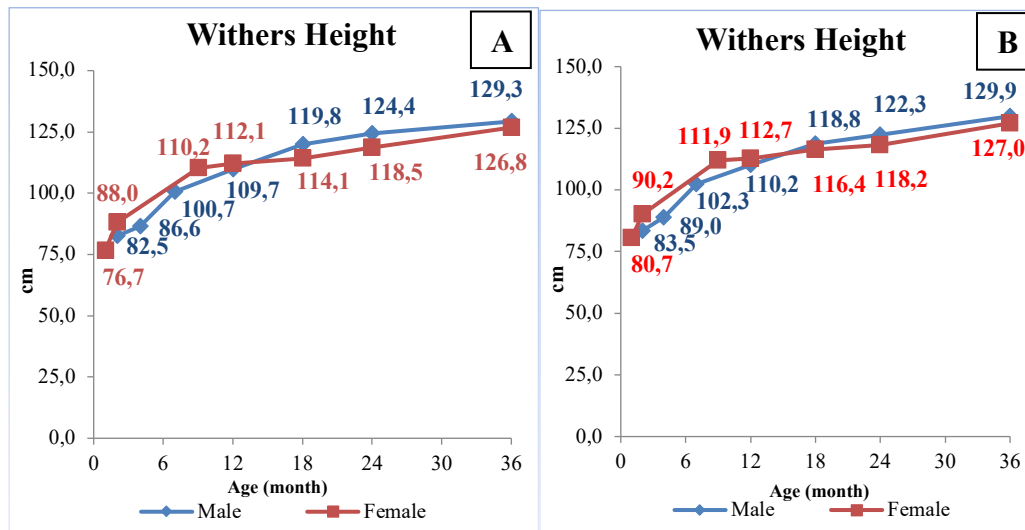


Figure 1. Withers Height Buffalo (A) and Waist Height Buffalo (B)

Waist Height

The average waist height in Sukoharjo district was 129.9 cm for adult male buffalo and 127.0 cm for adult female buffalo. These waist height were in accordance with the research results of Suhardi et al. (2020) which states that the waist height of male buffalo in East Kalimantan was 129.58 cm and female buffalo was 127.13 cm. The waist height of a 2 year old male buffalo in Figure 1 (B) also has the same results as the study of Hilmawan et al. (2019) in the Kudus Regency which was 122.6 cm. The waist height of the swamp buffalo in Sukoharjo district was not much different from the height of the witherss. The height of the body's waists is balanced with the growth of the height of the witherss. Nur et al. (2018) stated that waist height and withers height have a balanced growth rate.

Body length

The average body length of adult male buffalo in Sukoharjo district which was showed in Figure 2A has a higher result than the results of Rusdin et al. (2018) where the male adult buffalo in Southeast Sulawesi has a body length of 129.9 cm. Meanwhile, the average length of adult female buffalo had the same result between buffaloes in Sukoharjo and in Southeast Sulawesi, which was 127.7 cm. The results of research by Mufidah et al. (2013) in Lumajang Regency adult female buffalo had a higher body length of 134.6 cm. Body length increased with age indicating that the buffalo had good growth.

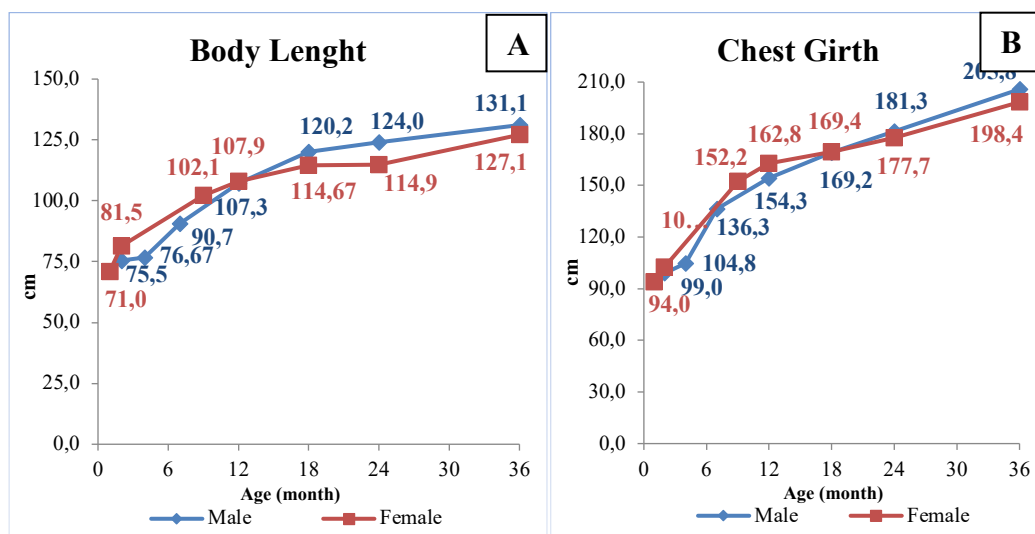


Figure 2. Body length of buffalo (A) and Chest Girth buffalo (B)

B. Chest Girth

The chest girth of an adult male buffalo has an average of 205.8 cm while a 2 year old male buffalo has an average chest girth of 181.3 cm. The results of the chest girth of buffalo were similar to the results of Gerli et al. (2012) in swamp buffalo in North Sumatra, the chest girth of an adult male buffalo was 203.0 cm and a male buffalo aged 2 years was 182.5 cm. The similarities and differences in body size results for buffalo in Sukoharjo with other areas are possible because of the high genetic variation of the swamp buffalo and the large number of swamp buffalo clumps in Indonesia. Mufidah et al. (2013) stated that the body size of livestock in an area can indicate the quality of the breed available in that area. The increase in chest girth has a relations with body weight, this was also stated by Komariah et al. (2014) that an increase in chest girth has a correlation with an increase in body weight of livestock.

Table 3. Body weight estimation of buffalo in Sukoharjo in 2021

Body weight estimation		
Age (month)	Body weight estimation (kg)	
	Male	Female
3	136,1	174,3
6	213,2	-
12	301,2	328,9
18	350,6	351,8
24	397,6	402,8
>36	502,3	469,7

Body weight estimation

The estimated body weight of buffalo in Sukoharjo Regency in Table 3 has higher results than the results of Rusdin et al. (2018) in Southeast Sulawesi local buffalo, adult male buffaloes have an average weight of 419.82 kg and adult females 372 kg. Body weight is one of the factors that can be used to determine the productivity of livestock. Komariah et al. (2014) stated that knowing body size, condition of livestock and body weight of livestock can be used to determine the performance of buffalo production. The results showed that the buffalo body weight increased according to increasing age, this was in accordance with the opinion of Nur et al. (2018) which states that along with increasing age, body weight also increases. The results of the study were also greater than that of swamp buffalo in North Sumatra for 2-year-old male buffaloes at 305.17 kg and female 223.65 kg, while for adult male buffaloes 462.17 kg and females 398 kg. Differences in body weight can be caused by genetic influences and also different maintenance. Mufidah et al. (2013) stated that the rearing environment has a significant effect on body weight of livestock. The environment in question includes feed management and maintenance systems. Good quality feed will make buffaloes have high productivity which is described by high body weight. Intensive maintenance system will make buffaloes fat faster if supported by good feed, such as concentrate. Meanwhile, semi-intensive maintenance depends on the type of feed available in the pasture. The higher the nutrient content of the field grass, the higher the buffalo productivity.

Conclusion

Buffalo farmers in Sukoharjo Regency are dominated by rice farmers, so buffalo farming is a side business. The scale of maintenance is small farmers, with buffalo owners under 4 heads and experience of raising more than 10 years. Based on the results of body measurements of buffalo such as withers height, waist height, body length, chest girth, and estimated body weight, it can be concluded that buffalo productivity in Sukoharjo Regency has a good productivity.

Acknowledgments

The authors are grateful to Sebelas Maret University for supporting this project through the Non APBN Research Grant with contract number 260/UN27.22/HK.07.00/2021.

References

- Anggraeni A, Sumantri C, Praharani L, Dudi and Andreas E 2011 *Jurnal Ilmu Ternak Veteriner* **16** 199
- Central Bureau of Statistics (Badan Pusat Statistik) 2021 Populasi kerbau Kabupaten Sukoharjo
- Dudi, Sumantri C, Martojo H and Anang A 2011 *Jurnal Ilmu Ternak* **11** 61
- Febriana D and Liana M 2008 *Jurnal Peternakan* **5** 28
- Gerli, Hamdan, and Daulay A H 2012 *Jurnal Peternakan Integratif* **1** 276
- Hairil A, Hadini, and Baharudin R 2016 *Jurnal Ilmu dan Teknologi Peternakan Tropis* **3** 16
- Hastang and Asnawi A 2014 *Jurnal Ilmu-Ilmu Peternakan* **1** 240
- Hilmawan, Fiyy, Henny N and Rudy P 2019 *Jurnal Ilmiah Fillia Cendekia* **4** 56
- Ibrahim, Supamri, and Zainal 2020 *Jurnal Sosial Ekonomi Pertanian* **13** 307
- Komariah, Kartiarso, and Lita M 2014 *Buletin Peternakan* **38** 174
- Krisnandi G, Rahmat D, and Dudi 2016 *Jurnal Fakultas Peternakan Universitas Padjadjaran* **5** 2
- Mufidah N, Ihsan M N and Nugroho H 2013 *Jurnal Ternak Tropika* **14** 21
- Nur E A, Nugroho H and Kusmawati K 2018 *Jurnal Ternak Tropika* **19** 156
- Nuraini H E N N Y, Andreas E, and Sumantri C 2010 Seminar dan Lokakarya Nasional Kerbau. Departemen Ilmu Produksi dan Teknologi Peternakan, Fakultas Peternakan *Institut Pertanian Bogor* p 31
- Rusdin M, Solihin D S, Gunawan A, Tabib C and Sumantri C 2018 *Jurnal Ilmu Pertanian Indonesia* **23** 203
- Sasoeng A, Tilaar W and Kalangi J K J 2020 *Agri-Sosio Ekonomi* **16** 291
- Singarimbun, M., dan S. Effendi. 2006. Metode penelitian survai. Jakarta : LP3ES.
- Siyoto, S., dan A. Sodik. 2015. Dasar metodologi penelitian. Yogyakarta : Literasi Media Publishing.
- SNI 7706. 2011. Bibit Kerbau . Badan Standarisasi Nasional. Indonesia.
- Sugiyono 2015 Metode penelitian pendidikan (Bandung:Alfabeta)
- Suhardi, Sumppunn P, Duangjinda M and Wuthisuthimethavee S 2020 *Biodiversitas* **21** 5128
- Tabib C, Herawati T and Hastono 2014 *Wartazoa* **24** 83
- Tigor N, Hasanudin and Hamdan 2016 *Jurnal Peternakan Integratif* **4** 173
- Yanti Y and Yayota M 2017 *Reviews in Agricultural Science* **5** 65