



Characteristics of Breeders and Maintenance Management in Improving the Productivity of Balinese Pigs as Bali Germplasm in Gerokgak District, Buleleng Regency



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Abstract

The purpose of this study was to describe the characteristics, and behavior of breeders and rearing management as well as analyze and find the relationship between characteristics and behavior with the level of application of Bali pig farm maintenance management. This research was conducted in Gerokgak District, Buleleng Regency in June-August 2022. Purposive sampling (with certain considerations). The sampling as respondents were 100 Balinese pig breeders with the criteria of maintaining one to two broods and at least having kept them for one year. Sampling using the "Snowball Sampling" method. The analysis used is quantitative descriptive analysis and Spearman rank-level correlation test. The level of implementation of Balinese pig rearing management is in a good category. Descriptive research results Management, production management with an average weaning age of 67.65 ± 5.4 days, reproductive management in the good category. The results of the correlation test for the Spearman rank level. The relationship between the characteristics of age, and land area, has a positive and significant effect ($P < 0.05$), formal education has a very significant positive relationship ($P < 0.01$), the main occupation of raising livestock has a positive and no significant effect ($P > 0.05$).) with the implementation of maintenance management. Breeders' behavior which includes knowledge of breeders has a very significant positive correlation ($P < 0.01$) with the application, attitudes, skills, and motivation of breeders have a positive relationship and significant effect ($P < 0.05$) with the application of maintenance management.

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1 Introduction

The livestock sub-sector has an important role in supporting regional and national economies. The development of animal husbandry developed in Indonesia includes poultry, ruminants, and non-ruminants. One of the non-ruminant sectors being developed is pig farming. Pigs are livestock that has prolific characteristics, namely many children in one birth that can reach 6 -12 heads per birth in a year can give birth twice ([Pasaribu, 2015](#)). The existence of pig breeders is almost spread throughout Indonesia. One of the provinces that has a high pig population is Bali. According to the Bali Province Central Statistics Agency (BPS), in 2020 the population of pigs in Bali Province will reach 398.29 thousand heads.

The high concentration of pigs in Bali Province is caused by environmental suitability. One of the pigs owned specifically in the province of Bali is the Bali pig. Bali pig as one of the germplasm that is already known for its existence at the national and international levels. Based on the results of the livestock census (PKH, 2020) the population of Bali pigs in Bali Province is 110,915 heads. The advantages possessed by Balinese pigs are that they are resistant to heat stress or disease, are more efficient on water, can grow even if only given kitchen waste and makeshift food ([Budaarsa, 2012](#)). Along with the times, the development of Bali pigs has decreased due to the cultivation of Bali pigs, most of which are still carried out as a sideline.

The population of Bali pigs each year has decreased according to the livestock population data (PKH, 2020) by 28.83% from 2019-2020. This causes the existence of Bali pigs to be found only in certain areas. According to [Sumardani & Ardika \(2016\)](#), Bali pigs are found in the northern and eastern parts of Bali, including the districts of Buleleng, Karangasem, and Klungkung. These areas are areas that tend to be dry, have few sources of water, and have low rainfall. Buleleng Regency, especially in Gerokgak Subdistrict, Bali Pigs are still developing because the socio-cultural conditions of the people in Gerokgak Subdistrict are predominantly non-Muslim, and are supported by an environment that is suitable for raising Balinese pigs. According to (PKH, 2020) Gerokgak sub-district has the highest number of pigs in the Buleleng district of 28,074 heads. Pigs are developed by the community as a business that supports the economy of breeders ([Pugliese & Sirtori, 2012](#); [De Vries, 1989](#); [Kauffold et al., 2006](#)).

Increasing the productivity of pigs can be done by improving the quality of their genetics and through improving the quality of their rearing management. The development of Bali pigs is also influenced by the characteristics of the breeder and livestock management. According to [Hidayah et al. \(2019\)](#), the characteristics of breeders have a significant effect on the adoption of rearing technology in livestock. Livestock maintenance includes feed provided, housing, health care, marriage, waste treatment, and related aspects that are expected to produce high productivity. Bali pigs have weaknesses in production and reproductive productivity compared to imported pigs, so there is a need for improved rearing management. The obstacle faced by breeders in raising Bali pigs is the lack of knowledge of breeders on maintenance management and implementation which causes the maintenance of Bali pigs to be less than optimal. Based on the problems mentioned above, it is necessary to conduct research on "Characteristics of Breeders and Maintenance Management in Increasing the Productivity of Bali Pigs as Balinese Germplasm in Gerokgak District, Buleleng Regency"

2 Materials and Methods

According to Félix-Redondo et al. (2009), the research design is a plan, and framework work to conceptualize the structure of variable relations in a research study. The author uses this type of quantitative research with survey methods. The quantitative descriptive method aims to describe the facts about the problem under study as it is, as well as provide a description of the situation or provide a relationship between phenomena, objects or research subjects, testing hypotheses, making predictions and implications of a problem to be solved (Usman & Akbar, 2020). The purpose of this study was to determine the characteristics of breeders and breeding management in increasing the productivity of Bali pigs as the original Bali germplasm. The indicators of the research variables are as follows: Variables of breeder characteristics using indicators of age, formal education, non-formal education, breeder experience, main job, odd job, land tenure, and breeder income. The behavior of breeders uses indicators of the level of knowledge, attitudes, skills, motivation, and application of maintenance management (Herold et al., 2010; Lemke et al., 2006; Wang et al., 2020). Maintenance management variables consist of feed management, cage management, production management, production management, and disease management. Feed management uses indicators of the type of feed, the number of feedings and the frequency of feeding. The management of the cage uses indicators of the type and equipment of the cage. Production management uses indicators of weaning age, and length of maintenance. Reproductive management used indicators of pigeon age, litter size, gestational age, calving interval, dry period and age of sows. Management of disease handlers uses indicators of the level of cleanliness of the cage, water sources, and biosecurity (Pol et al., 2021; Thu et al., 2012; Garforth et al., 2013).

Population and sample

The population in this study were all Balinese pig breeders in Gerokgak District, Buleleng Regency. The sampling technique used in this study used a purposive sampling technique. The determination was made purposively and based on objective considerations in accordance with the research objectives, namely Gerokgak District is one of the centers for Bali pig production, starting from breeding and fattening with a population of 28,074 individuals (PKH, 2020). The sampling as respondents were 100 Balinese pig breeders with the criteria of maintaining one to two broods and at least one year of rearing. Sampling using the "Snowball Sampling" method, which is a method to identify, select and take samples in a network or continuous chain of relationships, (Neuman, 2003).

Analysis

Descriptive statistics are used to analyze data on breeder characteristics and maintenance management by describing the data used. have been collected as is without the intention of making generalized conclusions or generalizations. Characteristics of Balinese pig breeders, which include knowledge, attitudes, skills, motivation and application of rearing management used the Likert method. The Likert method is a method that describes several question items arranged in a questionnaire and each question is given a score equal to the respondent's choice (Black et al., 1992). The income analysis was processed using an econometric approach model and described descriptively using SPSS 25 (one-way ANOVA test) to compare income with the maintenance of different parent numbers. To see the relationship between the characteristics of breeders and the level of implementation of maintenance management for Balinese pig farms, non-parametric statistics were used, the Spearman rank correlation test (rho or rs) (Siegel, 1997), with the SPSS version 25 program. Decision making, namely the hypothesis is accepted if $t_{count} > t_{table}$ at $P < 0.01$ of the two variables tested, there is a very real relationship, $t_{count} > t_{table}$ at $P < 0.05 - 0.10$ then there is a real relationship, $t_{count} > t_{table}$ at $P > 0.10$ then there is a very insignificant relationship real.

3 Results and Discussions

Based on the results of the study, it was found that the level of implementation of Bali pig rearing management by breeders was in the good category with an average of 3.6. Most of the respondents of breeders with good implementation were 60 people (60%), breeders with moderate implementation were 30 people (30%), breeders with very good implementation were 10 people (10%) (Rojo-Gimeno et al., 2016; Maydasari, 2016). Based on the results of the study, it was found that the application of maintenance management was carried out by breeders in the maintenance of Balinese sows. The weaning age applied by breeders has an average of 67.65 ± 5.433 days. After weaning before being sold, the breeders maintain an average of 31.56 ± 2.235 days. The age of the virgin Bali pigs before mating had an average of 7.83 ± 0.403 months. The number of children born / litter size Bali pigs with an average of 8.11 ± 1.729 tails. The duration of pregnancy for Bali pigs is 115.07 ± 1.610 days, the dry period for Bali pigs is 16.49 ± 2.312 days, the calving interval for reared Bali pigs is 203.70 ± 2.505 , the frequency of giving birth to mothers until they are rejected is average. 10.83 ± 1.311 times, the age of parent rejection obtained an average of 6.942 ± 0.6810 years,

Table 1
Management of production and reproduction of Bali pigs in Gerokgak District

No	Maintenance Management	Average maintenance management	
		Average	Std. Deviation
1	Weaning Age (Days)	67.65	5.433
2	Seedling Maintenance (Days)	31.56	2.235
3	Pig Age (Month)	7.83	.403
4	Litter Size (Tails)	8.11	1.729
5	Gestational Age (Days)	115.07	1.610
6	Dry Period (Days)	16.49	2.312
7	Calving Interval	203.70	2.505
7	Frequency of childbirth	10.83	1.311
8	Age of Rejection (Year)	6.199	.6670

Based on data analysis using the Spearman Rank Correlation Test, it shows that the characteristic factors that influence the application of respondents in raising Bali pigs such as age are significantly related ($P < 0.05$), formal education is very significantly related ($P < 0.01$), a land area significantly related ($p < 0.05$), an old breed of raising was not significantly related ($P > 0.10$).

Table 2
The results of the correlation spearman rank level characteristics of breeders

No	Factors	Farmer Application	
		r_s	t hitung
1	Age	0.133	2.338 ⁿ
2	Formal Education	0.371	4.817 ^{Sn}
3	Main Jobs	0.019	0.677 ^{Tn}
4	Land Area	0.209	2.102 ⁿ
5	Old Breed	0.139	0.955 ^{tn}

Description

r_s = correlation coefficient

S_n = very real t table (0,01) d.b 98 = 2.3650

n = real t table (0.05)d. b 98 = 1.660

tn = Not real t table (0.10) d.b 98 = 1.290

Based on data analysis using the Spearman Rank Correlation Test, it shows that behavioral factors that affect the application of respondents in raising Bali pigs such as knowledge are very significant ($P < 0.01$), Attitudes

are significantly related ($P < 0.05$), and Skills are significantly related. ($p < 0.05$), the motivation was significantly related ($P < 0.05$).

Table 3
The results of the correlation rank level spearman breeder behavior

No	Factors	Farmer Application	
		R_s	T hitung
1	Knowledge	0.409	2.536 ^{Sn}
2	Attitude	0.436	2.252 ⁿ
3	Skills	0.377	1.758 ⁿ
4	Motivatioan	0.446	2.123 ⁿ

Description

r_s = correlation coefficient

Sn = very real t table (0,01) d.b 98 = 2.3650

n = real t table (0.05) d. b 98 = 1.660

tn = Not real t table (0.10) d.b 98 = 1.290

Discussion

1) Level of application of management of Bali pig rearing in Gerokgak District.

The results of the analysis showed that the average achievement score of the implementation was 3.6 which was included in the good category. This is because breeders in Gerokgak District have been raising pigs for a long time. The high knowledge of breeders affects the attitudes and skills of breeders to implement good rearing management to increase the productivity of Bali pigs. This is in accordance with the opinion of [Sarungallo et al. \(2019\)](#), who state that the implementation of the management of the swine farming business is influenced by knowledge and attitudes where to get optimal results, good maintenance management is needed. The implementation of pig rearing management tends to be motivated by the profits earned, participants race against other livestock who get bigger profits with the implementation of better management. Technological developments make it easier for breeders to access information related to maintenance management so that more breeders assume that raising Bali pigs is easier and marketing is faster. This is in accordance with the opinion of [Mardikanto \(2009\)](#), which states that the speed of adoption by a person at each stage of adoption is strongly influenced by various sources of information that convey innovation.

2) Bali pig rearing management in Gerokgak District

Production management is all the efforts needed to improve livestock performance starting from the starter, grower, and finisher phases ([Sihombing, 2006](#)). The weaning age of Bali pigs in Gerokgak District based on table 1 shows an average of 67.65 days. The weaning age applied by breeders is different because breeders think that weaning too early causes piglets to experience growth delays later. The length of weaning age is also influenced by the piglets only consuming mother's milk so if the protein of the mother's milk is low, it will also affect growth which causes the weaning time of the piglets to be longer. This is in accordance with [Putri et al. \(2018\)](#), stating that the age of weaning Bali pigs ranges from 60-90 days in the Gianyar district. The length of maintenance is the time from when the cattle are found until the cattle are sold. After the weaning period, Balinese pigs will keep for approximately one month to be fattened before selling to collectors at a higher price. This is in accordance with the opinion of [Suranjaya et al. \(2018\)](#), the growth of livestock after weaning depends entirely on the individual's own ability (genetic factors) as well as on the factor of feed given. Reproductive management is all forms of business that are applied to increase the productivity of the nursery business ([Ardana & Putra, 2008](#)). In general, the reproductive performance of pigs is not different from that of other breeds of pigs. Based on the results of the study in Table 2, a reproductive performance which includes female Bali pigs kept by breeders experiences sexual maturity with an age range of 7-8 months with an average deviation of 7.83 ± 0.403 months, while Balinese pigs reared in

Kertiyasa, I. K. Y., Ingriati, N. W. T., & Sumadi, I. K. (2022). Characteristics of breeders and maintenance management in improving the productivity of Balinese pigs as Bali germplasm in Gerokgak District, Buleleng Regency. International Journal of Life Sciences, 6(3), 107–117. <https://doi.org/10.53730/ijls.v6n3.13621>

Karangasem district reach sexual maturity at the age of 6.65 ± 2.18 (Sumardani & Ardika, 2016). the litter size of Bali pigs in Gerokgak sub-district is on average 8.11 ± 1.7 heads/birth. This is in accordance with the opinion of Sumardani (2020), which states that the number of litter-size Bali pigs in the Karangasem district is around 6.98 ± 2.37 tails. The gestation period for Bali pigs is 115.07 ± 1.610 days, the gestation period is longer than The Feradis (2010), standard states that the duration of pregnancy of sows is 114 days. The dry period of Balinese pigs in the study area is an average of $16.49 \pm 2,312$ days, this is in line with the research of Sadguna et al. (2017), which stated that the dry period or estrus cycle in Balinese pigs in Gerokgak sub-district ranges from 15-20 days. The calving interval of Bali pigs in Gerokgak sub-district with an average of 203.70 ± 2.505 days, the length of the calving interval is due to the age of weaning carried out by breeders. The normal range of calving interval of sows is >140 days (Feradis, 2010). The age of parent rejection by breeders with an average age of 6 years and an average frequency of giving birth 10 times the breeder has never calculated the age of the parent (years) and only use the frequency of childbirth. The breeder rejects the mother when she is unable to give birth to twice the normal number of children and based on the health, fertility, and maternal nature of the show. This is in accordance with the opinion of Pero et al. (2020), who stated that the maximum age at marriage was caused by the declining fertility rate of pigs.

- 3) The relationship between the characteristics and behavior of breeders on the implementation of management of Balinese pig rearing in Gerokgak District

The results of the research analysis in Table 2 show that age has a very significant positive relationship ($P > 0.01$) with the implementation of management of Balinese pig rearing. The average age of respondents in Gerokgak sub-district is 46 years in the productive age category. This shows that productive age is the main capital in the development of livestock business and is able to coordinate and take effective steps in the application of maintenance management. In accordance with the opinion of Saragih (2000), states that age has an influence on work productivity in types of work that rely more on physical exertion. The level of formal education of respondents in Gerokgak District has a very significant relationship ($P < 0.01$) to the implementation of the management of Bali pigs. This means that the higher the level of education in the application of maintenance management, the better. This is in accordance with the opinion of Inggriati (2014), which states that formal education in livestock can increase the insight of breeders so that breeders become innovative. Breeders who have higher education also find it easier to find or get new information that can increase livestock productivity. This is in accordance with the opinion of Murtiyeni et al. (2005), who stated that the higher the level of education of breeders, the management of maintenance is better because breeders can adopt innovations and change ways of thinking and problem-solving methods are mature. The respondents' main and secondary jobs in Gerokgak District had a positive relationship and had no significant effect ($P > 0.10$) on the implementation of maintenance management. The main and side jobs have the same level of application in implementing management of Bali pig rearing. This is because most of the respondents have main jobs as breeders and side jobs as breeders. This is in accordance with the opinion of Handoko (2000) which states the livestock farming business carried out by most rural communities is still part-time. The land area has a positive relationship and significant effect ($P < 0.05$) on the implementation of the management of Bali pigs in Gerokgak District. That is, the wider the land owned, the more Bali pigs will be raised. breeders who have more land will be able to place more livestock and have the availability of feed ingredients (banana stems) will also be available. This is in line with the opinion of Luanmase et al. (2011), who stated that the area of land owned by breeders has a significant effect on the amount of cattle rearing. Balinese pig breeders generally raise livestock as a source of additional income, produce meat, and as savings for breeders. Old breed rearing had no significant relationship ($P > 0.10$) on the implementation of management of Bali pigs. This means that breeders who have long experience in raising livestock have the same level of application in the management of raising Bali pigs. Breeders with longer experience do not guarantee better maintenance. The experience of breeders should make progress in raising Bali pigs, no longer raising them extensively or semi-intensively, in order to increase livestock productivity, intensive cages need to be made. This is in accordance with the opinion of Murwanto (2008), which states that the experience of breeders who have been raising pigs for a long time should have undergone an overhaul of the way of raising pigs from the traditional system to semi-intensive and even intensive.

- 4) The relationship between the behavior of breeders on the implementation of Balinese pig rearing in Gerokgak District.

Based on the results of the analysis of table 3, the knowledge of breeders has a positive and very significant effect ($P < 0.01$) on the implementation of management of Balinese pig rearing in Gerokgak District. The higher the knowledge of breeders in raising Bali pigs, the stronger the application of maintenance management in increasing the productivity of Bali pigs will be. Knowledge will affect the mindset of breeders and have an important role in implementing better maintenance management, so as to increase income. This is in accordance with [Inggriati & Suarta's \(2022\)](#), opinion that breeders who have higher knowledge about an innovation tend to apply the innovation better than breeders who have lower knowledge. The attitude of breeders to the implementation of management of Balinese pig rearing in Gerokgak District was positively related and had a significant effect ($P < 0.05$). This shows that the positive attitude of the respondents can improve the implementation of maintenance management. The more positive the attitude of a breeder the easier it will be to accept innovation or new technology and it will be easier to implement. The formation and change of attitude do not occur by themselves, attitudes are formed from the social interactions experienced by breeders. The interaction between the breeder or the surrounding environment will lead to a mutually influencing relationship between individuals with one so that behavior and motivation will be formed in improving the Balinese pig-rearing system. This is in accordance with the opinion of [Inggriati \(2014\)](#), which states that attitude is a determining factor (determination) of behavior because it is related to perception, personality and motivation. Breeders' skills on the application of maintenance management in Gerokgak District were positively related and had a significant effect ($P < 0.05$). This shows that the higher the skill level of the breeder, the higher the application of the maintenance management category. The skills of breeders need to be improved again to be able to increase the productivity of Bali pigs that are kept so that the productivity of Bali pigs is more optimal. Skills can be improved by participating in counseling activities carried out by the government and related agencies as non-formal guidance. that improving the skills of breeders can be done through training in an extension process that aims to increase knowledge, attitudes and skills ([Inggriati, 2014](#)). The motivation of breeders to the implementation of management of Balinese pigs has a positive relationship and has a significant effect ($P < 0.05$) in Gerokgak District. This shows that the greater the motivation or encouragement of breeders in raising Bali pigs, the better the application of maintenance management is carried out to obtain maximum results. This is in accordance with the opinion of [Hambali \(2005\)](#), which states that the motivation of breeders to meet the needs of existence, namely the satisfaction of breeders with the income obtained as a result of their livestock business. The motivation of breeders is also influenced by internal and external factors so that the motivation of each animal is different. According to [Luanmase et al. \(2011\)](#), stated that the motivation of breeders in rural areas is influenced by age, level of education, economic motivation, the experience of raising livestock, number of dependents in the family.

Hypothesis

- 1) There is a significant relationship between rearing management and the productivity of Bali pigs as germplasm native to Bali in Gerokgak District, Buleleng Regency.
- 2) There is a significant relationship between the characteristics and behavior of breeders and the implementation of management of maintenance of Balinese pig farms in Gerokgak District, Buleleng Regency

4 Conclusion

- 1) Production management with an average weaning age of 67.65 ± 5.4 days, an average maintenance time of $31.56 \pm 2,235$ days. Reproductive management which includes months, litter size with an average of 8,111,729 tails, duration of pregnancy in Bali pigs with an average of $115.07 \pm 1,610$ days, age of

rejecting sows obtained an average of $6,942 \pm 0.6810$ years. The implementation of maintenance management in Gerokgak District is in a good category.

- 2) The relationship between the characteristics of age, land area, has a positive and significant relationship, formal education has a very significant positive relationship, the main occupation of raising livestock is not significantly related to the implementation of breeding management. The behavior of breeders which includes knowledge of breeders has a very significant positive relationship with the application, attitudes, skills, and motivation of breeders has a positive relationship and has a significant effect on the implementation of maintenance management. The characteristics and behavior of breeders that are positively related and have a strong motivation will shape the creativity of breeders to work effectively and be integrated with all efforts to implement optimal rearing management to increase the productivity of Bali pigs.

Suggestions

- 1) Breeders, it is expected to optimize the resources they have, both human resources, natural resources from land ownership, as well as technology that supports the rearing of Bali pigs, it is necessary to increase the scale of rearing Bali pigs to more than two so that maintenance is more optimal energy and time to get higher profits. Bali pig breeders need to form livestock groups to make it easier to exchange information and easier to get counseling from orders
- 2) For educational institutions and researchers, it is necessary to continue to review the demographic conditions of Balinese pig breeders and continue to create applied innovations, so that they are truly applicable to traditional breeders. Considering Bali pigs as germplasm that must be protected.
- 3) The relevant local government and agricultural extension workers are expected to provide direction to villages in Gerokgak District to form a group of Balinese pigs to make it easier to provide new innovations or disease control in supporting the increase in the productivity of Bali pigs as Bali's original germplasm.

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