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Cluster Analysis of Bali Cattle Business In Barru Regency, Sulawesi Selatan, Indonesia

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ABSTRACT

The aims of the study were to identify the entity of cluster of Bali cattle pure breeding business. The location of research is in the Lompo Tengah Village, District of Tanete Riaja, Barru Regency South Sulawesi Province. The research was conducted from May to October 2014. Respondents used were 141 respondents. Data obtained were analyzed with K-Means cluster analysis. The results showed that there were 3 groups. Higher agglomeration categories were 51 members, Medium agglomeration were 30 members and low agglomeration were 60 members.

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INTRODUCTION

Development of livestock industry is one of the strategy to establish industrial clusters. Clusteris approximate geographical grouping of a number of interrelated industry activities and connected as well as complementary to a community. [7] defined the purpose of the clusteris a geographic grouping of related entitiesin a particular field. Barru Regency of South Sulawesi is one of the region of Bali cattle purification development based on Regional Regulation No. 4 of 1975 on Development Purification of Bali cattle in the province of South Sulawesi.

In South Sulawesi, Barru Regency was second place in cattle population numbers. Bali cattle raising system is semi-intensive. The cows were stabled and only occasionally taken for grazing, while the heifers is released during the day and stabled at night. In general, breeders always hope to be able to earn income or profit from their livestock business.

In Bali Cattle business in the area of Barru, breeders are divided into groups of Farmers. The group consists of 25 to 30 breeders. The labor come from farmers' families. The family contribute on improving the overall productivity of their livestock business.

The idea of K-Means Cluster Analysis was first found by Lloyd [5], recently published in 1982. Forgey [1] published the same technique known as Lloyd-Forgy on several sources. Wu and Kumar (2009), published the same thing in Friedman and Rubin [2] and Mc Queen [6].

Cluster analysis is used to classify objects or cases (respondents) into relatively homogeneous groups called clusters, objects or cases in each group tend to be similar to each other and much different (not equal) with objects from other clusters [10]. Cluster establishment procedure is divided into two, that is hierarchical and non-hierarchical. The formation of the cluster hierarchy have the nature of the development of a hierarchy. The method can be agglomerative hierarchical or devisive. The method consists of a linkage agglomerative method, variance methods, and centroid method. Linkage methods mentioned above consistsof single linkage, complete linkage and average linkage. Non-hierarchical method is often called the K-means clustering method [10].

Mac Queen [6] suggest K-Means to decompose the algorithm that set some object into a cluster that has nearby centroid (mean). In the simplest form, this process consists of three stages [4]. Partitioning objects into the beginning of the K-Means cluster; 2). Starting with the noted objects, assigning an object to a cluster having

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a nearby centroid (mean). The distance is usually computed using standardized Euclidean distance observation or non-standardized. Recalculate the cluster centroid to acquire new objects and clusters losing the object; 3). Step two is repeated until here is no more object removal.

The research was required because the methods employed by the farmers'group were based on government administrative classification which covered respondents on these cracteristics. This method was considered unable to organize farmers' activity. Therefore K-means cluster was intended to be able to organize activities based on agglomeration chracteristics which theoretically was more effective in the grouping of the farmers for this research purposes.

MATERIALS AND METHODS

Data were collected through primary survey with breeder questionnaires, interviews of agencies, community leaders as informants and field observations. Secondary data were obtained through survey to related institution, especially Bank Indonesia Makassar office as the donor of Corporate Social Responsibility / CSR in this area.

This research was conducted in the District of Tanete Riaja, Barru Regency, South Sulawesi, to obtain data from breeder respondents who are members of clusters of pure Bali cattle business, this study was conducted from June to October 2014. The data processing was conducted with the K-meas cluster [12] with 17.0 SPSS for Windows. Interpretation of the data was done to produce outcomes.

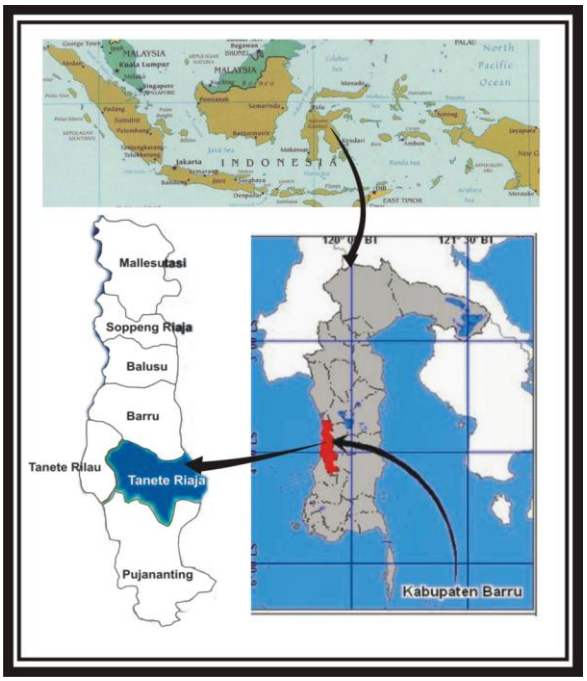
The sampling technique of this study was a full-sampling technique as many as 141 respondents from five selected groups, each group has unique characteristics such as group with CSR support, group with government support in cattle optimization program, group with traditional production sharing *(Teseng)*, similar group with womens' labor, and traditional *teseng* with non-grouping.

RESULTS AND DISCUSSION

Regional state:

Lompo Tengah village is located in the district of Tanete Riaja Barru Regency, approximately 100 km to the north of Makassar city, the capital of the Province. It is in a position between 4°05'49 "SLt - 4°4'35" SLt and 119°35'00 "Elg - ELg 119°49'16. with rainfall of 2,332 mm / year. The location has easy access to transportation. The village can be reached through high-way within + 120 minutes from Makassar.

Livestock groups farmer *Sipurennu* on its achievement as independent cattle group was managed to get help from corporate social responsibility of Bank Indonesia Makassar form stable colonies which can accommodate up to 100 head of cattle worth IDR 145,000,000, - (one hundred and forty-five million rupiahs), the impact was felt by other farmers from the surrounding farmers' groups.



Map of Research Location

System Raising of Bali Cattle:

Contribution of the corporate social responsibility of Bank Indonesia Makassar mentioned above had effect on the dynamics of Bali cattle raising. Development colony stables had influence on Bali cattle farming techniques, where feces and urine in former days were not utilized. At present both wastes are transformed into biogas, compost and liquid fertilizer in the form of biourine. The main business are farming and gardening. Reared cattle can be used as savings. In the research location, maintenance scale had reached 12 cattles per family head.

System raising was performed in semi-intensive. The animals were released at noon and stabled and fed in the afternoon. Sugeng [9] stated that a semi-intensive maintenance system during the day in the garden or yard cattle are detachable for grazing, then in the afternoon and in the evening the cattle entered the stable for drinking forage / grass or leaves.

Characteristics of Breeders:

Livestock Breeders group *Sipurennue* in keeping their animals in age of 17-84 years, with an average of 40 years, includes conditions such as the age of childbearing age, since the age of productive work basically ranged from age 20 to age 65 years. According Harjono, *et al.* [3]the productive age of labor was between 25-65 years. Meanwhile, according to Soekartawi (1988), a practical distinctionbetween productive and non productive is by age, at the age of 20 - 65 were classified as productive age.

Education is one of the requirements of supporting the success of thebreeding, because education also affects the way of thinking in making decision which will be more receptive to something new and have a better perspective of an object. Based on in Table 1the average level of education in Group was 7,52% completed Elementary school, 24,11% completed Junior High school, 19,86 % completed senior high school and 8.51% graduated from University. While raising cattle ranchers could run their business properly to produce outcome because they had knowledge and experience, they can write and read although they were still poorly educated.

Table 1: Characteristic of Farmers/Breeders

No.	Characteristic	Number (Person)	Percentase (%)
1	Age (Years)		
	17 – 22	1	0.71
	23 – 28	5	3.55
	29 – 34	28	19.86
	35 – 40	32	22.70
	41 – 45	22	15.60
	46 – 50	24	17.02
	51 – 55	12	8.51
	56 – 60	4	2.84
	>60	13	9.22
2	Education		
	Elementary School	67	47.52
	Junior High School	34	24.11
	Senior High School	28	19.86
	Undegraduate	12	8.51
3	Number of Family		
	Nothing	3	2.13
	1 – 4 Person	110	78.01
	5 – 8 Peson	27	19.15
	9 – 12 Person	1	0.71
4	Farmer Experience		
	1 – 15 year	71	50.35
	16 – 30 year	46	32.62
	31 – 45year	17	12.06
	46 – 60 year	7	4.96
5	Farm Scale in 1 year		
	1 – 4 head	71	50.35
	5 – 8 head	64	45.39
	9 – 12 head	6	4.26

Source, Primary data, 2015:

Table 1 above indicated that on average each year 20 raising experience. Knowledge gained by breeders was hereditary, self-study and training so that farmers have the insight to raise cattle. Based on this fact farmers could manage their cattle business well without encountering significant problems.

Experience in running a business will make it easier to resolve problems and make decisions, the longer they live the more experience gained. Swastha [11] stated that experience can affect a person in the act of

observation. Experience can be obtained from all actions in the past or may be learned by studying because someone will getknowledge. Experience affects a person's level of knowledge to a problem encountered.

Table 2: Descriptives Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Group Farmer with CSR support	141	1	3	1.83	.665
Group Farmer with Government support	141	1	3	1.99	.751
Group Farmer with Tradisional Production sharing	141	1	3	1.74	.704
Group Farmer with Women labour Production Sharing	141	1	3	2.00	.717
Non Group Production sharing	141	1	3	2.53	.555
Valid N (listwise)	141				

Initial Cluster Centers:

	Cluster		
	1	2	4
Zscore: Group Farmer with CSR support	-1.24777	.25595	1.75967
Zscore: Group Farmer with Government support	-1.32184	-1.32184	1.34072
Zscore: Group Farmer with Tradisional Production sharing	.37300	-1.04843	1.79443
Zscore: Group Farmer with Women labour Production Sharing	-1.39443	.00000	1.39443
Zscore: Non Group Production sharing	.84356	-2.76075	.84356

The table above is the first display of data clustering process prior to iteration. To detect how many times the iteration process is done in the process of clustering of 141 objects under study, it can be observed from the following outputdisplay.

Iteration History[a]:

	Change in Cluster Centers		
Iteration	1	2	3
1	1.753	1.871	1.798
2	.250	.256	.180
3	.076	.110	.000
4	.000	.000	.000

a. Convergence achieved due to no or small change in cluster centers. The maximum absolute coordinate change for any center is ,000. The current iteration is 4. The minimum distance between initial centers is 4,384.

It turns out that the process of clustering is done through 4 stages of iterations to get the right cluster. The above table indicated that the minimum distance between the centers of the clusters that occurs in iteration is 4,384. The end result of the clustering process is described below:

Final Cluster Centers:

	Cluster		
	1	2	3
Zscore: Group farmer with CSR support	-.54013	-.64628	.78225
Zscore: Group farmer with government support	-.19939	-.83370	.58633
Zscore: Group Farmer with production sharing	-.49101	-.52724	.68098
Zscore: Group farmer with women labor support	-.90228	.55777	.48805
Zscore: Non Group farmer with production sharing	.17217	-1.13881	.42306

The final output of the cluster centers above was associated to previous data standardization process, which refers to the z-cores with the following provisions:

• A negative (-) means that the data is below total average.

• A positive (+) means that the data is above the total average.

From the final output, with the above provision, the table cluster centers can be defined as follows:

• Cluster-1

Cluster 1 contains respondent/breeders who have low levels of satisfaction towards CSR program.

• Cluster-2

Cluster 2 contains respondents/breeders who have moderate levels of satisfaction towards CSR program

• Cluster-3

Cluster 3 contains the respondent/breeders who have a high level of satisfaction of the CSR programs.

Next step to be done is to see how the difference of variables in the cluster is formed.This can be observed from the value of F and the probability value (sig) of each variable, as indicated in the following table.

Anova:

	Cluster		Error			
	Mean Square	Df	Mean Square	Df	F	Sig.
Zscore: Group Farmer with CSR support	32.062	2	.550	138	58.314	.000
Zscore: Group Farmer with Government support	21.753	2	.699	138	31.110	.000
Zscore: Group farmer wiith production sharing	24.229	2	.663	138	36.526	.000
Zscore: Group farmer with women labor support f	32.572	2	.542	138	60.049	.000
Zscore: Non-gropu farmer with production sharing.	25.579	2	.644	138	39.732	.000

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

Formula of F Value:

Cluster results obtained in this study indicated that the instrument Tesang group with active women showed a difference from other instruments in the three clusters were formed. The value of F = 60.049 and sig = 0.000.

Furthermore, to determine how the number of members of each cluster is formed can be observed in the table of the following output:

Number of Cases in each Cluster:

Cluster	1	51.000
	2	30.000
	3	60.000
	Valid	141.000
	Missing	.000

In the above table, it is clear that cluster-1 consists of 51 respondents, cluster-2 consisted of 30 respondents, and cluster-3 consisted of 60 respondents.

Conclusion:

Conclusions from the analysis of 141 samples indicated the following results:

Based on the results of studies with the K-means cluster analysis as a basis of respondents grouping to value the benefits of CSR, the results should be based on breeders grouping homogeniety, the respondents were divided into groups of low, medium, and high ententity. Therefore, livestock research indicated that group in this region can benefit from the corporate social responsibility introduced by Bank Indonesia Makassar.

Suggestions:

To increase the income of Bali cattle farmers, the level of of cattle ownership of every farmer needs to be increased with CSR support.This support will be able to accelerate the number of cattle possession and the utility faces and urine as complementary income. The farmers need to be given correct knowledge of how to

calculate income from cattle raising so that they understand reasonable calculation of following rational economic program.

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