International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

Dendrogram Simulations with Determinatvariable Identifer to Determine the Farm Classification Systems of Bali Pigs

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Abstract: ***Research on dendrogram simulations with variable identifier to determine the classification systems of the bali pig farms have been done in three villages in the GerogakDistrict, Buleleng, which has selected as purposive sampling. Proportionate stratified random sampling was performed based on the number of pigpopulations in the villageVariable identifier livestock system includes intensive, semi-intensive and extensive (traditional) rearing methods. Direct question to ech farmer was conducted regarding to the maintenance management, food given, the treatment and pig health, and the selection of breeding stocks. In addition to those questions, direct observation was conducted to the animals in the sites. Each of questions or direct observations conducted was scoredin ordinal scale, namely: 1, 2 and 3, each depicting the classification system of intensive, semi-intensive and extensive. Data were analyzed in single solution Hierarchical Cluster,so that any variable has the same score will cluster together, but differ to other score. The result shows that the dendrogramsimulations with variable identifier can be used to classify the variables into clusters. Based on the 25 variables studied to classified the bali local pigs, the value of each cluster were 5, 9 and 11 of intensive, semi-intensive and extensive rearing methods, respectively.***

Keywords: dendrogram, variable identifier, Bali pig, cluster analysis

1. Introduction

Bali has a variety of germplasm such as animal / livestock and has already beenwell known nationaly and internationaly. Bali pig is one source of germplasm which is unique from both the morphological form and its adaptability to food, maintenance management, and other rearing environment (Astawa et al., 2016). Culinary products of pork that is very popular and has Balibranded is suckling pig. Personal experience as a Balinese found that bali pigreared in a lard (extensive) is a pig that is good to be process as a sucling pig. This is due to the proportionaly fatcomposition foldedunder the skin thatproduces excellent aroma and texture of pork. Bali pig farms is widely farmed, but is more found in three districts of Bali province, namely Buleleng, Klungkung and Karangasem. Fifty three percents of pig population were found in Buleleng District (Suarna*et al*., 2015). Bali pigs are commonly reared in three different ways, those are intensive, semi-intensive and extensive or traditional (Zurita et al, 2011). In order to improve balipig productivity, a study is necessary to idenfify the better way of raising bali pigs, based on way of reasing pigs above

Cluster analysis is a statistical analysis of multivariate, aims to determine the structure of data into a groups, so it can be distinguished the differences amongsgroups, or by separating the cases / objects into several groups with different characteristics between one group to others. In this analysis each group should be homogeneous among the members in the group, or variable analyzed has high similarity within a group (Anderberg, 1973). Dendrogram was introduced as a graphical tool to evaluate the classification, based on sample data from the object to replicate each of the proposed class, demonstration dendrogram motivated by the need to vote easily communicated (Sickle, 1997). In other words, cluster analysis was conducted to categorize the objects based on characteristic similarity among objects, easier to analyze and explain interpret.

Grouping variables or objects can be based on its molecular relationships and morphological similarity among organisms refer as phylogenetics, or can also be based on its morphological similarity without regarding its evolutionary origins which refers as phonetics. In contrary to phenetics, cladistics is the way of grouping organism based on its evolutionary origins. Cladogram is a picture of the evolutionary tree cladistics study results. So in this study, emphasized the convergence process of evolution. Dendrogram is a branching tree diagram, showing taxonomic relationships based on the degree of similarity (Wijaya, 2009).

Cluster analysis is served to simplify the data and present them in the form of graphs. The variables used to group the objects has to be homogeneous properties or with very small variations, so that the cluster analysis can clearly distinguish between the cluster groups to another group. In biology, a dendrogram is a tree-shaped diagram that shows the degree of equality among the members of a group of living things. The degree of similarity can be any number of characteristic in the taxonomy, representing the similarity relationship between a group of unity, a dendrogram can be used as a clearer view on an independent support or contradiction to the various hypotheses about the similarities and differences (Michael and Smith, 2012).

Employing dendrogramsimulationsin addition to anidentifier variable, it was expected that the variables examined of bali pig farms can be divided into three clusters, namely the classification of intensive , semi-intensive and extensive (traditional). Dendrogram simulation with variable identifier, in addition to describing the 3 clusters, is also

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expected to be more easily to understand in order to make a choice of farming system of bai pigs.

2. Materials and Methods

Study Sites

This explorative research was conducted on balipig farms in three villages in Gerogakdistrict, Buleleng, Bali., Indonesia. The district was purposively chosen, in which the fig farms were commonly found, and the villages was proportionately sampled, ththe village of Sanggalangit, Musi and Penyabangan. The total number of 68 samples collected were the vellages.

Data Collection Procedures

Interview was conducted to the farmers, which each respondent (farmer) was given a question regarding the maintenance management: those were paddocks and its tool used, feeding, the treatment for pigs, animal health, death of piglets at birth and prior to weaning, as well as wastewater treatment and livestock. The selection of breeding stock observed wasinclude the selection of piglets as parental. Direct observation was also conducted to the pigs in the locations.

Data analysis

Data yang diperolehdianalisisdengananalisis Hierarchical Cluster, dengan single solution number of clusters 3, sehinggasetiap variable yang mempunyaikesamaanskorakanmenjadisatukelompok, berbedadengankelompok lain.

Data were analyzed by Hierarchical Cluster analysis, with single solution number of 3 clusters, so variable that have similar scor will be in one group, differ to the other varibales that has different scor. The group formed has not have characteristic name, but it can be named as its cluster characters or variable identifier, which the name referred to as Intensive (scored 1), Semi Intensive (scored 2) and Extensive (traditional) scored 3.

Height of vertical lines on dendrogram, indicating the degree of differences between branches, the higher the line the greater the difference. The percentage of similarity of each variable against identifier can be searched based on the similarity score. So it can be simulated if a variable percentage of the higher scores to one variable identifier is created, then the percentage would lead to these variables and the height of the vertical line on the lower dendrogram. So if 100% similarity to variable heights dendrogram identifier will be the same with the variable identifier, and the height of the lowest dendrogram, the next smaller the percentage of similarity, the height of the dendrogram will be higher. Procedure was analysed in SPSS 22.

3. Results and Discussion

Twenty five variableswere indentified from interview that falls into the category of Intensive, Semi-intensive and Extensive system of pig farming. The hierarchical cluster analysis results with a single solution number of 3clusters, without variable identifier, showed that the 25 variables studied were grouped into three major clusters, each consisting of 11, 5 and 9 variables. Cluster 1 consists of the paddocks, extra milk feeding to piglets, and the condition of floor of the paddocks; cluster 2 consists of aged pig mated, age of pregnancy, and the condition of the paddocks; cluster 3 consists of the state of sows, feeding of the sow, and th replacement of the sows (Figure 1). Up to ths stage, the name of the clusters formed in dendogram has not been known, although three names have been identified for the three clusters namely: Intensive, Semi-intensive and Extensive.

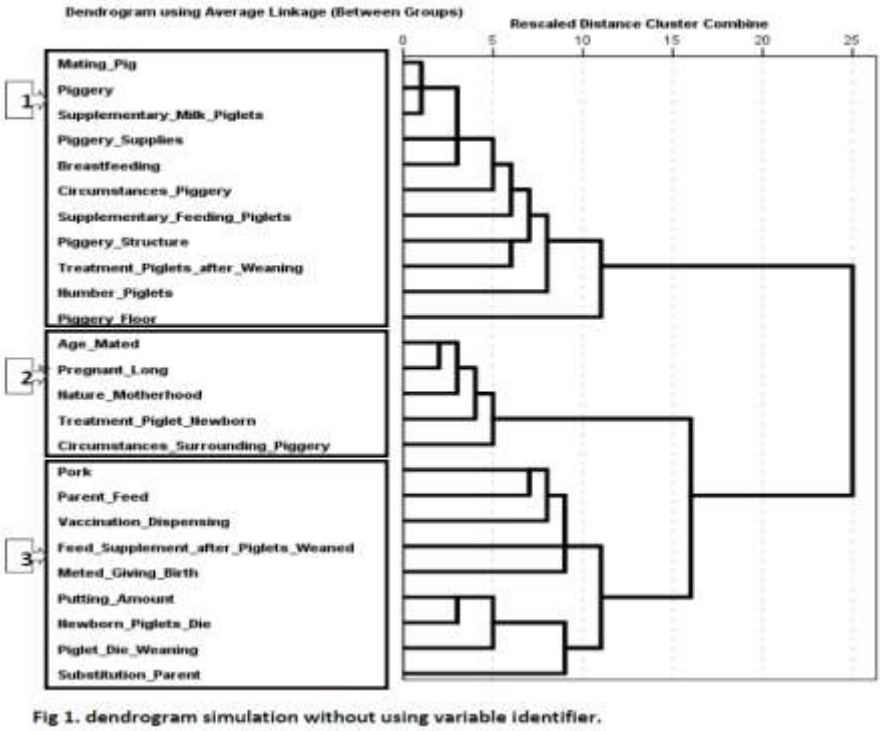

Fig 1. dendrogram simulation without using variable identifier.

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The name of each cluster can be done by adding a third variable identifier, so that each cluster formed will be given a name correspondingthe characteristic variables created, namely the classification intensive, semi-intensive and extensive. The analisis of Hierarchical cluster with single solution number of clusters 3 showed that, by adding a variable identifier, three culters was formed with each name of the cluster, those were cluster **3** as extensive, cluster 1as the intensive and cluster **2** as semi-intensive (Figure2).

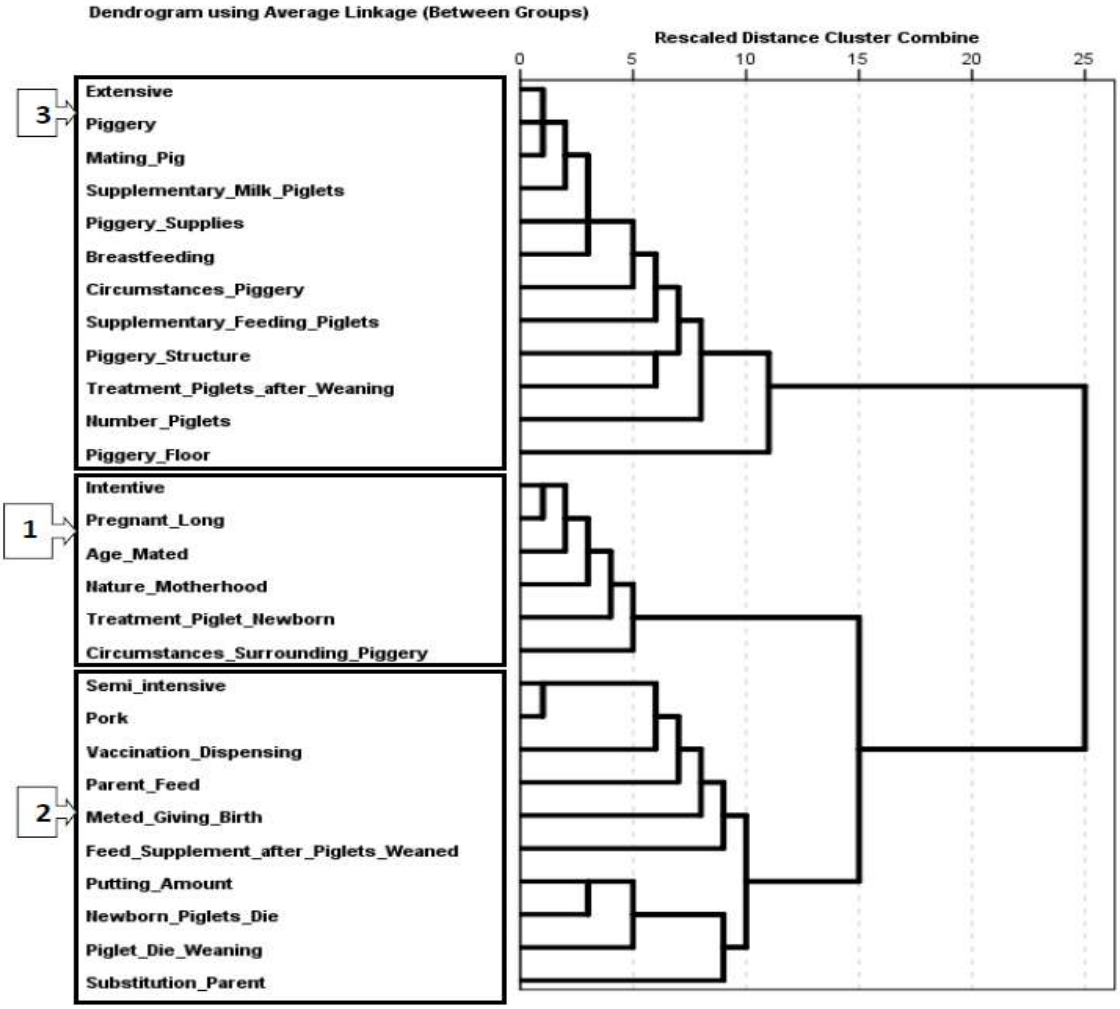

Fig 2. dendrogram simulation using variable identifier.

Simulation of dendrogramwith or without variable identifier has similar results. However, the simulation dendrogram with variable identifier of each cluster formed can be labeled in accordance with the variable characteristics given, thus more easily to communicate,. Simulation of dendrogram with variable identifier which resulted in 3 named clustres was also easier to communicative and understandsin order to decide the way of raising pig, thus increasing productivity. Variables clustering can also easier to predict the basic variables that influence pig famring(Jang et al, 2014).

Dendogram can show grouping variables that have similarity or dissimilarity among them. Similar group of variables such as paddock and the tool available in the paddocks which is still in traditional way fall into one cluster, that is the extensive cluster. The dgree of similarity among variables whitin similar classification shows similarity among places of farming, therefore it was easy to prodict the group of farming. A dendogram can be used to find out more clearly the support or contradict that it has shown (Michael dan Smith, 2012).

The simulation of the dendogram in this study resulted in 3 varibale clusters, namely intensve, semi intensive dan extensive, with the value of 11, 9 and find, respectively. This means that most of the variables fall into intensive cluster. This study can illustrate and explain the problems and the solution of how the production of pig farming can be improve in Bali, particularly for the group that are belong to extensive farming. The increase of production and the perspective of farmer can be deal by understading the problemsOosting et al., 2014).

Simulation of dendogramwith variable identifier has beneficial, beside each variable is clearly belong to a cluster as its variable identifier, the percentage of similarity and the differences among cluster and within varibales in a cluster can also be identified. Table 1 shows that the variable similarities of insentive cluster was 67.6 – 100%, semi intensive was 35.3 – 94.1%, and 39.7 – 100% for extensive cluster.

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Table 1. The division Classification System Ranch Pig Bali Based on 3 Cluster Membership

Variable	Clusters	The similarity with the Identifier Variable (%)
Intensive	1	**Identifier 1**
Consists of Age Mated	1	100.0
Long of pregnancy	1	89.7
Nature of Motherhood	1	86.8
Treatment of New Piglets Born	1	86.8
State of the Cage	1	67.6
Semi- Intensive	2	**Identifier 2**
Consisting of Sows	2	94.1
Vaccination -Treatment	2	64.7
Total Nipple Sows	2	64.7
Feed the Sow	2	57.4
Piglets Die Before Weaning	2	55.9
Newborn Piglets Die	2	54.4
Interval Marriage Sows	2	54.4
Turn of the Sows	2	52.9
Feeding Piglets after Wean	2	35.3
Ekstensive	3	**Identifier 3**
Cages	3	100.0
Pig Marriage	3	97.1
Giving Extra Milk to the Piglets	3	92.6
Apparatus of Cages	3	83.8
Feed for Parent Breastfeeding	3	79.4
Conditions Cages	3	67.6
Supplementary Feeding on Piglets	3	66.2
Number of Piglets	3	55.9
The Cage Structure	3	52.9
Floor of the Cage	3	48.5
Treatment of Piglets after Weaning	3	39.7

Cluster **1** with character identifier of intensive farming system with 100% similarity on the variable of the time of pregnancy, which may indicates that the time of pregnancy of pig belong sto intensive cluster which own by all respondents. Other variable that indicates the intensive cluster is first age breeding females, motherhood, the care given to the newborn piglets and the condition of paddock with the similarity up to 89.7%. The smallest percentage was recorded on the condition surrounding the paddocks or enclosure (67.6%), which this value is included to intensive cluster in bali pig.

Cluster **2** with the variable identifier is semi-intensive, consist of the raised sows, vaccination or drug treatment, the number of nipples, and the feeding post weaning. The highest similarity in semi-intensive cluster was 94.1% and the lowest was 35.3%. The cluster III with variable identifier of extensive cluster consist of paddocks, mating, additional milk feeding for piglets, and the raising of piglets after weaning has 100% similarity to the least of 39.7%.

Dendogram simulation shows that the nearer and the shorter the line from the variable identifier, the higher percentage of similarity. Variable with relatively smaller percentage of similarity (>50%) was less suitable to be included into the present variable identifier, or it can form a new cluster or new variable identifier. Podani (2000) states that the number of clusters that most suitable for dendogram simulation is satisfy the axioms of identity and depending on the choice descriptor. A new method of visualizing trends and patterns of temporal attribute data values can be done by data clustering technique that represents between variables observed (Radha et al, 2012).

Dendrogram simulation on bali local pig farms can be classified into three classifications, namely intensive, semi-intensive and extensive, with various value of similarity. This classification can increase local bali pig productivity, because in dendogram simulation, each variable can be communicate, which similar to the statement of Sickle (1997).

Classification of farming system conducted by local bali pig farmers was only a small portion calsified as intensive, followed by semi-intensive, but most of the system was fallen into extensive classification.

Classification of farms system conducted by local Bali pig farmerscommunity, a small portion went into intensive classification, then there are already classified as semi-intensive, but are still classified as extensive. Tjis may due to lack of capital owned by the farners, so farming system was conducted traditionally or extensively, particularly on building the paddocks and equipment used. Farmer knowledge of rising pig, health and choosing piglets to rise is low. Lack of fund that farmer has result in smaller number of pigs that teay can rise andn the use of input factors which have impact of small benefit that the farmer get (Zadrak et al., 2014).

Other factor that cause most variables in pig farming was conducted extensively was the slow growth of bali pigs due to low quality and quantity of food given to the pigs (Dewantoro et al. 2013). The pattern of the growth of body length, chest circumference and body weight of bali pigs were low with the inflection point at the age of 7-20 weeks (Sampurna, et al. 2016). The village area are still potential to rise bali pigs, because it is environmentally supported, the care of the farmer and the bali pig itself has good ability to reproduce, that is shown by those variables were included in intensive characteristics.

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Dendogram simulation practically and communicatively can be used to improve the production of livestock by improving production variables that has been practice extensively. This information will be very useful for the government on decision making in order to help the farmers, therefore as on target.

4. Conclusion

Dendogram simulation with variable identifiers can be used to classify the varibales into clusters as muach as the number of variable identifier made. Based on 25 indocators observed, there were 11, 9, and 5 indicators that devided the pattern of rising bali local pig into intensive, semi-intensive and extensive.

5. Suggestion

Dendrogram demonstration identifier needs to be done before decisions are made to improve the farm system or practice in rural areas. In order to increase the production of bali local pig, it is suggested to improve the variables that clustered in extensive classification.

6. Acknowledgment

Sincerely thank to Mr. Prof. Dr. I NyomanGdeAntara, M.Eng as the Head of Research and Community Service, and to Dr. drh. NyomanAdiSuratma, MP, Dean of the Faculty of Veterinary Medicine, Udayana University, the facilities and services provided.

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