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Article

Designing and Analyzing Properties of Socio-Culture and Perception From Livestock Farmers: An Evidence in Utilizing Oil Palm Plantation Land-Use of West Papua

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Abstract: Socio-culture and perception exist and perceive farmers in achieving optimal benefits have been discussed worldwide by many scholars. However, lack of knowledge and data on specific cases in community-dependent oil palm plantations is available. This study aims to explore and synthesize the roles of socio-cultural properties and perceptions of farmers in utilizing tropical oil palm land use in West Papua. The field research was conducted using the survey method by applying interviews with 118 farmers selected from four districts of Warpramasi lowland valley. The findings show that socio-cultural properties such as age, gender, objectives of livestock rearing, experiences, livestock size as assets, jobs/employment, and years of experience have significant contributions both strong (r>0,50)/weak (r<0,50), and positive (r>+0,50)/negatives (r>−0,50) in applying oil palm plantation area. Experiences and ages are shown as an example. Farmers' perceptions of oil palm land use also vary. Local community supports are determined by age, gender, experiences, values, and beliefs. Farmers perceive local community support as one crucial factor that determines the success and sustainable productivity of farming land, economics, and livestock. Improvement of oil palm plantation land use will be achieved its benefit when all parties (stakeholders) will share and contribute to resources needed accordingly.

Keywords: socio-cultural productivity; farmer perception; utilization of free-rearing land; oil palm plantations; Manokwari

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1. Introduction

Palm oil plantation in the tropical land use of Indonesia contains various interaction of utilization. Several oil palm plantations exist in several provinces in Indonesia. The one is in West Papua provinces. For community-dependent oil palm, parameters of socio-cultures and perception are established for a length of time. Productivity and farmers' perceptions regarding the use of open land in oil palm plantation areas can be influenced by several factors (Sudirman et al., 2021). Socio-cultural productivities include social activities and interactions in a society that can influence the results and quality of work and daily life. In the context of utilizing open land in oil palm plantation areas, the following socio-cultural factors will affect productivity such as age, gender, objectives, experiences, and occupancies, including collaboration and togetherness. The level of cooperation between farmers and oil palm plantation companies will benefit farmers and the productivity of resources such as land, plants, and livestock. The good collaboration between farmers and plantations is created by providing available palm oil land for free-rearing livestock, planting forages, and includes community empowerment such as effective training and mentoring programs. In turn, the perception of the local community, farmers, and other stakeholders including local government will positively improve. In this case, sociocultural productivity and the perception of the farmers in particular are shaped by mutual cooperation.

The level of skills and knowledge of farmers (Ediset et al., 2017; Praza, 2016) in managing open land and running livestock businesses will have an impact on productivity. Since the operation of the oil palm plantation in West Papua in 1987, little is known concerning the socio-culture and perception performances of the present plantation. Farmers with their socio-culture traits such as age, gender, jobs, and experience are contributing to accelerating better utilization of oil palm land use provided by the company for a length of time. Mutual and positive cooperation between the company and land owners including farmers will have consequences for the sustainable oil palm company and its land.

Farmers' perceptions refer to farmers' understanding, views, feelings, values, and attitudes (Kauber et al., 2017; Kauppinen et al., 2013; Shikuku et al., 2017). This case is regarding the use of open land in oil palm plantation areas. This perception can have an impact on farmers' actions and productivity. Several factors that cause farmers' perceptions are economic benefits (Cortner et al. 2019; Paris, 2002). It occurs when farmers have access to, see, and experience significant economic benefits. Rearing livestock in free ranges under the canopy of palm oil trees, growing forages and edible livestock plants will aid direct benefit. In turn, they tend to have a positive perception of the land use of palm oil plantations. As consequences, farmers will save and protect land and resources from environmental degradation (Kauppinen et al., 2013). The negative impact of environmental damages will be reduced. Therefore, in this study, we are eager to evaluate and assess how performances of socio-culture and farmers' perceptions (Boogaard, 2009; Mukhopadhyay, 2009) shaped and worked under this mutually interlinked process.

The application of multivariate analysis is rarely presented on these two properties, i.e. socio-culture and perception concerning the benefit of oil palm land use in this region and under the tropical setting of Indonesia. The application of the correlation matrix and the principal component will enable scholars and policy makers to assess the strengths and weaknesses of the relationships of applied parameters. For policy makers, intervention will be designed and implemented for improving this connectivity.

The support from plantation corporations, government, or other institutions can also affect farmers' perceptions (Campos et al., 2014; Ediset et al., 2017; Sekaran et al., 2021). Once farmers feel supported in developing livestock businesses under palm oil open land, they are more likely to have positive perceptions and contribute to livelihood productivities. The aim of this study is to synthesize and explain the level of farmer productivity which is influenced by socio-cultural aspects and farmer perceptions**.**

2. Materials and Methods

2.1. Sampling Location

Manokwari Regency is divided into 9 districts, with a total area of 4650.32 km^2. Manokwari Regency with its 9 districts is astronomically placed below the equator, between 0°14' S and 130°31' E. The geographical boundaries of Manokwari Regency are in the West bordering Tambrauw Regency, in the North bordering the Pacific Ocean, in the East is the Pacific Ocean, and to the south is the Arfak Mountains Regency and South Manokwari (Figure 1). Sample locations from the review and field research were taken from the four districts in Manokwari district, West Papua, i.e. Warmare, Prafi, Masni, and Sidey.

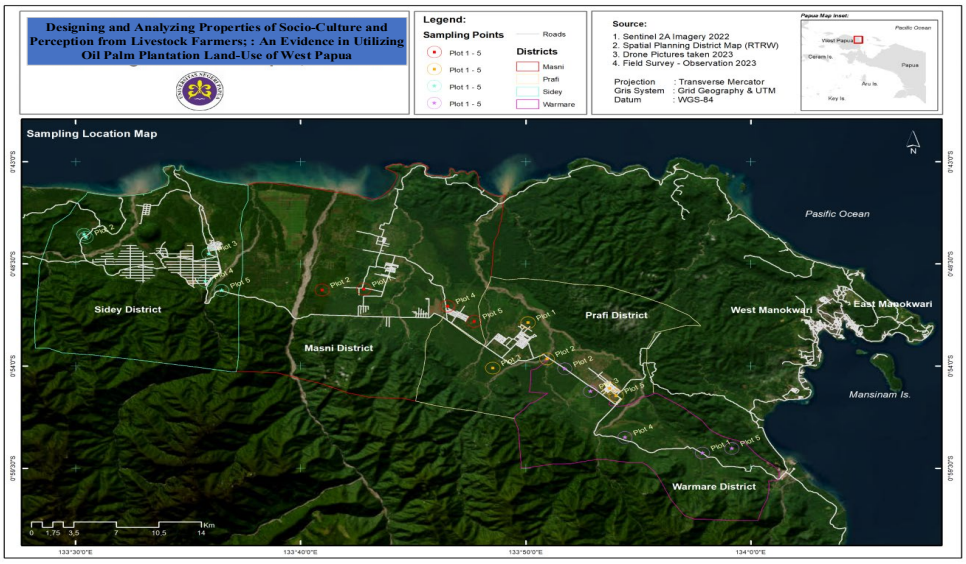


Figure 1. Spatial map of research sites at four districts, Warmare, Prafi, Masni, and Sidey.

The basic selection of these areas is by the reason that these areas have been widely used for several types of land-uses, namely plantations, transmigration areas, fertile land, communal land, and as a livestock production center in Manokwari. The total study area is 1,022.67 km^2 (102,266.54 ha). In general, the profile of the study area consists of coastal areas, lowland areas, and highland areas. The precipitation conditions are clear between the wet months (rain) and the dry months based on information from BMKG Manokwari Regency data, namely the wet months are from December to May (6 months) for 221 days with rainfall of 287.4 mm^2. Meanwhile, the dry months are from June to November (6 months) every year.

2.2. Methods of Study

In conducting this study, methods employed were descriptive methods by using techniques of field survey and observation towards farmers and livestock production. In doing the field survey, we designed a semi structure questionnaire (Appendix).

2.3. Farmers' Samples

Determination of farmers' samples was carried out using the Snowball Technique. From the results of respondents' exploration, we reached 118 households of farmers. Table 1 shows the 118 respondents and their proportion in detail of district and village origin.

Table 1. Sampling in districts and villages in Warpramasi.

District	Village	Respondent	Proportion (%)
Warmare	5	30	25,42
Prafi	5	30	25,42
Masni	5	28	23,74
Sidey	5	30	25,42
Total	20	118	100

2.4. Observation Variables

The variables measured were the farmer age (years/person), gender (male/female), farming goals, farming experience (years/person), and the number of livestock owned for cattle, pigs, goats, ducks, free-range chickens (tails /person) and type of breeder's job (State officers, Army/Police, Farmer, Breeder, and Private), as well as year of start of farming (year of start of farming/person).

Perception aspects of livestock cultivation which include seeds (cows, goats, and pigs), maintenance, slaughter, health and reproduction, business capital loans, availability of oil palm habitat as pasture, availability of feed from oil palm land, and aspects of community support, especially customary land rights owners and the surrounding community.

2.5. Data Analysis

Data analysis was used using descriptive statistics by calculating frequency, proportion, average, standard deviation values and presented in tabulated form. In the analysis of variance for principal components analysis (PCA) (Far & Yakhler, 2015; Hosseini et al. 2016), the goal of the analysis is to understand how much variation in the data is explained by each principal component. Principal components are linear combinations of the original variables, and each principal component has a weight (coefficient) associated with it. These weights indicate the relative contribution of each original variable to the principal components.

Values close to 1 or −1 indicate a strong correlation between two variables, while values close to 0 indicate a weak correlation or no correlation. Correlation does not necessarily indicate a cause-and-effect relationship but only shows a linear relationship between variables. By using PCC, socio-cultural analysis of livestock farmers can provide insight into the relationship between relevant variables in the livestock context and help make better decisions in the sustainable socio-cultural development of livestock farming.

3. Results

3.1. Sociocultural Aspects of Breeders

The socio-cultural parameters of farmers in Warpramasi are discussed which include age, gender, farmer objectives of breeding livestock, experience, and number of livestock reared (cattle, pigs, goats, ducks, free-range chickens), and types of farmers' works (state officers, army/police, farmers, breeders, and private), as well as the year he started breeding. We consider these properties as indicators of socio-culture that have a strong relationship with farmers' productivities, and livestock productivities (Table 2).

Table 2. Socio-cultural characteristics of breeders in Warpramasi.

Parameter Socio-culture	Frequency	Proportion	Mean	StDv	Minimum	Maximum
Age (yr)			44.75	44.75	25	65
Gender						
Man	106	90.60	0.897	0.305	0.000	1.000
Women	12	10.26	0.103	0.305	0.000	1.000
Objectives of livestock raising						
Business	24	20.51	0,205	0,406	0.000	1.000
Social	88	75.21	0.744	0,439	0.000	1.000
Culture	3	2.56	0.026	0,159	0.000	1.000
Experience (yr)			7.419	4,522	0.000	21.000
Livestock number (head):						
Cattle						
Calve			2.675	1,686	0.000	10.000
Grower			2.521	2,128	0.000	12.000
Adult			4.043	2,276	0.000	12.000
Pig						
Piglet			0.265	0,950	0.000	5.000
Gilt			0.214	0,808	0.000	5.000
Hog			0.154	0,582	0.000	3.000
Goat						
Kid			0.111	0,389	0.000	2.000
Yearling			0.060	0,400	0.000	4.000
Buck			0.205	0,737	0.000	4.000
Duck						
Duckling			0.650	2,802	0.000	20.000
Grower			0.487	2,156	0.000	11.000
Adults			0.427	1,945	0.000	14.000
Chicken						
Chick			6.932	10,022	0.000	40.000
Grower			3.538	5,169	0.000	20.000
Hen/Rooster			2.735	4,016	0.000	20.000
Jobs						
State officers	3	2.56	0.026	0.206	0.000	2.000
Army/Police	1	0.85	0.009	0.092	0.000	1.000
Farmer	69	58.97	0.581	0.495	0.000	1.000
Livestock farmer	8	6.84	0.068	0.253	0.000	1.000
Private	23	19.66	0.197	0.399	0.000	1.000
Experience (yr)			2015	4.5	2001	2022

Information: 1. Age, 2. Gender (Male), 3. Gender (Female), 4. Purpose of raising: Business, 5. Purpose of raising: Social, 6. Purpose of raising customs/culture, 7. Experience, 8. Number of livestock Cows: Calve, 9. Number of Cows: Grower, 10. Number of Cows: Steer/Heifer, 11. Number of pigs: Piglet, 12. Number of pigs: Grower, 13. Number of pigs: Boar/Sows, 14. Number of goats: Kid, 15. Number of goats: Yearling/Grower, 16. Number of goats: Buck, 17. Number of ducks: Duckling, 18. Number of ducks: grower, 19. Number of ducks: adults, 20. Number of free-range chickens: Chick, 21. Number of village chickens: Grower, 22. Number of village chickens: Hen/Rooster, 23. Occupation: Civil servant, 24. Employment: Army/Police, 25. Employment: Farmer, 26. Employment: Breeder, 27. Employment: Private, 28. Years of Breeding

Discussion of socio-cultural aspects which include age, gender, breeder goals, experience, number of livestock, type of breeder's work, and year of start of farming can provide a more complete understanding of the social and cultural context of farmers. The average age of breeders in the study location was 44.75 ± 44.75 years. Age can influence the farmer's approach and knowledge in raising livestock. Younger breeders may have a more innovative approach and tend to use modern technology in their livestock business, while older breeders may rely on traditional knowledge and inherited experience.

Gender roles in animal husbandry are also important to consider (Patel et al., 2016; Suradisastra & Lubis, 2000). The gender ratio was found to be 106:12. Where the number of male breeders is more dominant (90.60%) compared to female breeders which is only 10.26%. Some cultures may have a different division of labor between men and women in raising livestock. For example, in some societies, men may be more likely to be involved in raising large animals such as cows or pigs, while women may be more involved in raising small animals such as goats or chickens.

The goals of breeders can also vary (Aritonang et al., 2018; Dady et al., 2018; Iyai et al., 2013). The goal of raising livestock is predominantly directed towards social needs (75.21%), followed by business goals (20.51%) and customs/culture (2.56%). Some ranchers may raise livestock as their primary livelihood, while others may do it as a side business or to provide for their family. The goals of the farm can influence the scale of production, the techniques used, and the business approach taken by the breeder.

The level of experience in raising livestock can also influence the success of breeders (Bell et al., 2018; Le Thi Minh et al., 2017; Quisumbing, 1996). Breeding experience was found to be 7,419 ± 4,522 years. Farmers who have extensive experience may have more in-depth knowledge of animal management, health care, and best practices in the livestock industry.

The number of livestock kept by a farmer can have an impact on the scale of production and livestock management approaches. The largest number of livestock kept by farmers is chickens, 6,932 ± 10,022 chickens/breeder for chicks, followed by chickens in the grower phase (3,538 ± 5,169 chickens), and broodstock 1,735 ± 4,016 chickens/breeder. This is followed by mother cows, juvenile cows, and calves. Pigs, goats, and ducks are still kept in limited numbers. Farmers with larger herds may use more advanced technology and infrastructure, while farmers with smaller herds may use a more traditional approach and rely on manual labor.

The breeder's type of occupation can provide insight into their social and economic background. The type of work for breeders in Warpramasi is dominated by farmers (58.97%), followed by the private sector (19.66%), livestock breeders (6.84%), civil servants (2.56%) and the lowest is working as the Indonesian army force/police (TNI/Polri) (0.85%). Farmers who work as civil servants (PNS), army/police, farmers, livestock breeders, or private employees may have differences in resources, access to technology, or approaches to managing their farms.

The year of start of farming is also important to know because it can reflect changes in farming practices over time. On average, it was found that livestock cultivation businesses in Warpramasi Manokwari have been carried out since 2015. This can be confirmed that the breeders in Warpramasi have now been engaged by the younger generation as young breeders (millennial breeders). Farmers who have been farming for a long time may have adopted new innovations and existing technologies, while new breeders may still be learning best practices and developing their skills. Understanding these socio-cultural aspects will help in designing appropriate livestock development programs, understanding the challenges faced by livestock farmers, and promoting sustainable and inclusive practices in the livestock industry.

In general, determining the number of main components can be done using three approaches, namely the cumulative proportion of variance that can be explained by the main components. The main component taken is the main component that covers at least 80% of the variance in the data or can be said to be at least capable of capturing 80% of the diversity of the data (Figure 2).

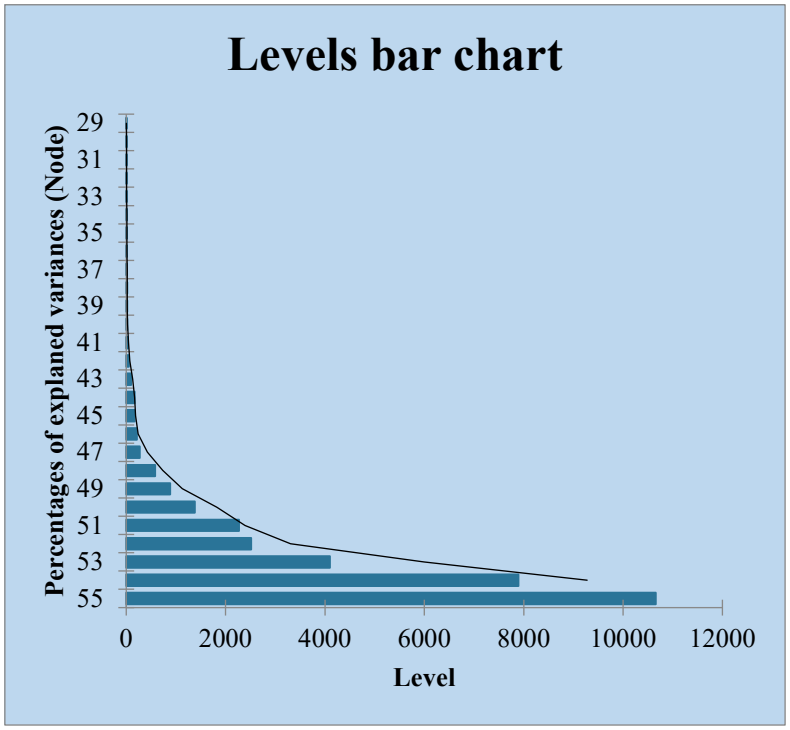


Figure 2. Profile of diversity (variance) explained by levels (dimensions).

Figure 2 explains the suitability of numbers for dimensions stored for creating clusters in Agglomerative Hierarchical Clustering (AHC) analysis using XLStat software. The second approach is Eigen Value. The main components taken are principal components that have an eigenvalue of more than one. The eigenvalues are obtained from the variance matrix or correlation matrix. Eigenvalues describe the variance explained by the principal components. The third approach is *Scree Plot* is a plot between the kth principal component and the variance or eigenvalue of that component (Figure 2).

Table 3. Analysis of various parameters used in socio-cultural aspects.

Variable	DF (Model)	Mean Squares (Model)	DF (Error)	Mean Squares (Error)	F	Pr > F
Age	2	230,384	115	67,136	3,432	**0,036**
Gender (Male)	2	0,107	115	0,092	1,168	0,315
Gender (Female)	2	0,107	115	0,092	1,168	0,315
Purpose of raising: Business	2	0,302	115	0,161	1,874	0,158
Purpose of raising: Social	2	0,262	115	0,190	1,381	0,255
Purpose of raising: Custom/Culture	2	0,017	115	0,025	0,670	0,514
Experience (yr)	2	324,738	115	15,040	21,592	**<0,0001**
Sum of cattle: Calve	2	3,794	115	2,805	1,353	0,263
Sum of cattle: Grower	2	8,554	115	4,437	1,928	0,150
Sum of Cattle: Steer/Heifer	2	11,179	115	5,038	2,219	0,113
Sum of pig: Piglet	2	1,479	115	0,886	1,669	0,193
Sum of pig: Grower	2	0,590	115	0,648	0,911	0,405
Sum of pig: Boar/Sow	2	0,389	115	0,335	1,162	0,317
Sum of goat: Kid	2	0,052	115	0,152	0,343	0,710
Sum of goat: yearling/grower	2	0,119	115	0,160	0,748	0,475
Sum of goat: Buck	2	0,178	115	0,546	0,326	0,722
Sum of duck: Duckling	2	2,258	115	7,883	0,286	0,751
Sum of duck: grower	2	1,882	115	4,658	0,404	0,669
Sum of duck: Adult	2	1,235	115	3,794	0,325	0,723
Sum of chicken: Chick	2	3847,594	115	34,817	110,510	**<0,0001**
Sum of chicken: Grower	2	1002,793	115	9,617	104,278	**<0,0001**
Sum of chicken: Hen/Rooster	2	620,462	115	5,542	111,965	**<0,0001**
Occupation: Civil servant	2	0,072	115	0,042	1,732	0,182
Occupation: Army/Police	2	0,058	115	0,008	7,657	**0,001**
Occupation: Farmer	2	2,027	115	0,214	9,478	**0,000**
Occupation: Livestock farmer	2	0,037	115	0,064	0,575	0,564
Occupation: Private	2	0,583	115	0,151	3,861	**0,024**
Year of breeding	2	269,552	115	15,886	16,968	**<0,0001**

In PCA (Principal Component Analysis), contribution represents how much information or variation each principal component provides to the original dataset. The principal component contribution describes the proportion of total variation in the dataset that can be explained by each component. In the context of analysis of variance in PCA, contribution refers to how much variation in the dataset is explained by each principal component. Analysis of variance is used to check how significant each principal component is in influencing the variation in the dataset. The principal component contribution is calculated by squaring the eigenvalues associated with each principal component and then dividing by the total number of eigenvalues. In PCA, eigenvalues indicate how much variation is explained by each principal component. By squaring the eigenvalues, the percentage of contribution or variation explained by each main component can be calculated.

A higher contribution indicates that the principal component has a greater influence on the variation in the dataset. Therefore, principal components with high contributions are usually retained, while components with low contributions can be ignored or deleted because they contribute little to the total variation in the dataset. The results of the analysis show that the variables are age ($p<0.05$), experience ($p<0.01$), number of free-range chickens ($p<0.01$), occupation, namely Army/Police ($p<0.01$), Farmer ($p<0.01$), Private ($p<0.05$) and Year of farming ($p<0.01$) had a greater influence on variation in the dataset (Table 3).

By analyzing the contribution of each principal component, PCA helps in selecting the most important parameters and reduces the dimensionality of the dataset. It is possible to understand the basic structure of the data better and identify significant patterns or relationships.

Table 4. Factor analysis of combined data (FAMD).

Variable	Component				
	F1	**F2**	**F3**	**F4**	**F5**
Age	−0,467	0,332	0,232	−0,126	0,058
Gender (Male)	0,176	−0,120	0,045	−0,336	0,113
Gender (Female)	−0,176	0,120	−0,045	0,336	−0,113
Purpose of raising: Business	−0,015	−0,277	**0,630**	0,017	−0,183
Purpose of raising: Social	−0,069	0,271	**−0,646**	−0,010	0,178
Purpose of raising: Custom/Culture	0,084	0,051	0,016	0,037	−0,085
Experience (yr)	**−0,666**	0,319	0,064	−0,410	0,271
Sum of cattle: Calve	**−0,589**	0,025	0,236	0,000	0,421
Sum of cattle: Grower	**−0,567**	0,027	0,353	0,132	0,402
Sum of Cattle: Steer/Heifer	**−0,533**	0,111	**0,535**	0,105	0,358
Sum of pig: Piglet	−0,451	**−0,591**	−0,201	**0,578**	0,051
Sum of pig: Grower	−0,416	**−0,529**	−0,220	**0,622**	0,067
Sum of pig: Boar/Sow	−0,409	**−0,576**	−0,174	**0,556**	0,043
Sum of goat: Kid	0,256	−0,012	0,641	0,251	−0,306
Sum of goat: yearling/grower	−0,026	0,188	**0,614**	0,288	0,030
Sum of goat: Buck	0,243	−0,044	**0,735**	0,242	−0,215
Sum of duck: Duckling	0,451	−0,266	0,081	−0,067	0,655
Sum of duck: grower	**0,502**	−0,340	0,120	−0,089	**0,629**
Sum of duck: Adult	0,479	−0,234	0,019	−0,036	**0,666**
Sum of chicken: Chick	0,103	**0,591**	0,001	0,414	0,344
Sum of chicken: Grower	0,201	**0,515**	−0,211	**0,530**	0,295
Sum of chicken: Hen/Rooster	0,250	**0,545**	−0,156	**0,543**	0,192
Occupation: Civil servant	−0,001	0,070	0,016	−0,036	−0,013
Occupation: Army/Police	−0,029	0,110	−0,051	−0,032	0,044
Occupation: Farmer	0,223	**0,535**	−0,020	0,339	−0,133
Occupation: Livestock farmer	0,463	−0,326	0,132	−0,057	0,371
Occupation: Private	−0,343	−0,408	−0,220	−0,142	−0,100
Year of breeding	**0,747**	−0,262	−0,019	0,341	−0,263
Eigenvalue	4,100	3,203	2,948	2,693	2,539
Variability (%)	14,642	11,439	10,530	9,618	9,070
Cumulative %	14,642	26,081	36,611	46,228	**55,298**

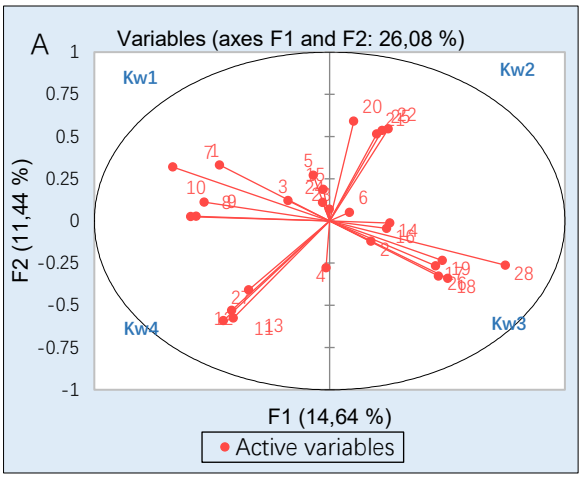
The number of correlation values (r)> 0.5 is greater in the factors in Table 4. The variables used are 28 and 5 main components are used based on Figure 2. on the scree plot graph. Table 4 cumulative value (%) explains 55.298% of the total variation value.

Table 5. Correlation matrix.

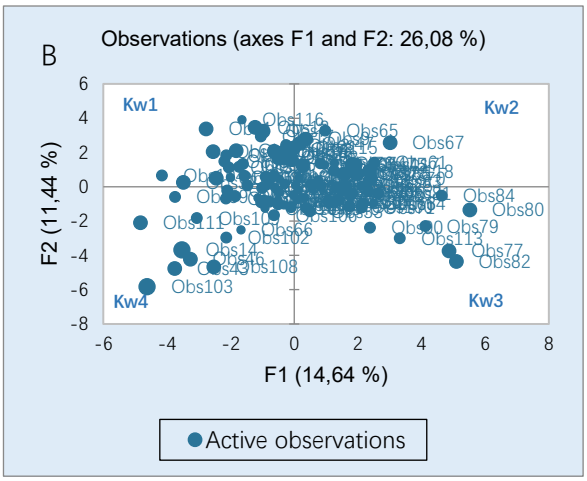
From\to	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1	1	0,011	−0,01	−0,00	0,046	−0,12	0,507	0,231	0,229	0,281	−0,04	−0,03	−0,02	0,042	0,194	0,078	−0,17	−0,17	−0,19	0,111	−0,00	−0,07	0,088	−0,05	0,073	−0,29	0,004	−0,48
2	0,011	1	−1,00	−0,03	−0,00	0,054	−0,04	−0,06	−0,00	−0,04	−0,11	−0,12	−0,00	−0,04	0,050	0,017	0,078	0,076	0,074	−0,04	−0,02	−0,09	0,042	0,031	−0,11	0,091	0,024	0,126
3	−0,01	−1,00	1	0,039	0,003	−0,05	0,048	0,066	0,008	0,042	0,114	0,121	0,008	0,049	−0,05	−0,01	−0,07	−0,07	−0,07	0,049	0,027	0,095	−0,04	−0,03	0,113	−0,09	−0,02	−0,12
4	−0,00	−0,03	0,039	1	−0,86	−0,08	−0,05	0,138	0,022	0,184	0,016	−0,02	0,085	0,183	0,190	0,291	−0,04	−0,00	−0,06	−0,11	−0,23	−0,11	0,040	−0,04	−0,13	0,199	−0,03	0,070
5	0,046	−0,00	0,003	−0,86	1	−0,27	0,083	−0,10	0,000	−0,14	0,018	0,057	−0,04	−0,23	−0,20	−0,29	−0,01	−0,05	0,048	0,118	0,206	0,129	−0,02	0,054	0,100	−0,23	0,091	−0,10
6	−0,12	0,054	−0,05	−0,08	−0,27	1	−0,08	0,000	−0,01	0,020	−0,04	−0,04	−0,04	−0,04	−0,02	−0,04	−0,03	−0,03	−0,03	−0,00	0,089	0,012	−0,02	−0,01	0,136	−0,04	−0,07	0,090
7	0,507	−0,04	0,048	−0,05	0,083	−0,08	1	0,378	0,383	0,356	−0,08	−0,12	−0,08	−0,23	−0,02	−0,23	−0,14	−0,19	−0,17	0,087	−0,11	−0,14	−0,02	0,094	−0,15	−0,22	0,118	−0,94
8	0,231	−0,06	0,066	0,138	−0,10	0,000	0,378	1	0,539	0,666	0,200	0,179	0,131	−0,19	0,030	−0,16	−0,01	−0,05	−0,05	0,037	−0,05	−0,04	0,074	0,018	−0,13	−0,08	−0,01	−0,45
9	0,229	−0,00	0,008	0,022	0,000	−0,01	0,383	0,539	1	0,649	0,223	0,218	0,211	0,021	0,316	0,089	−0,01	−0,04	−0,06	0,096	0,025	−0,07	−0,07	−0,02	−0,12	−0,10	0,078	−0,40
10	0,281	−0,04	0,042	0,184	−0,14	0,020	0,356	0,666	0,649	1	0,125	0,121	0,092	0,062	0,384	0,199	−0,02	−0,08	−0,04	0,104	−0,00	−0,07	0,016	0,039	−0,07	−0,12	−0,08	−0,39
11	−0,04	−0,11	0,114	0,016	0,018	−0,04	−0,08	0,200	0,223	0,125	1	0,936	0,908	−0,08	−0,04	−0,07	−0,06	−0,06	−0,06	−0,12	−0,05	−0,09	−0,03	−0,02	−0,16	−0,07	0,294	−0,01
12	−0,03	−0,12	0,121	−0,02	0,057	−0,04	−0,12	0,179	0,218	0,121	0,936	1	0,866	−0,07	−0,04	−0,07	−0,06	−0,06	−0,05	−0,08	0,025	−0,04	−0,03	−0,02	−0,09	−0,07	0,217	0,002
13	−0,02	−0,00	0,008	0,085	−0,04	−0,04	−0,08	0,131	0,211	0,092	0,908	0,866	1	−0,07	−0,04	−0,07	−0,06	−0,06	−0,05	−0,10	−0,00	−0,06	−0,03	−0,02	−0,13	−0,07	0,278	−0,01
14	0,042	−0,04	0,049	0,183	−0,23	−0,04	−0,23	−0,19	0,021	0,062	−0,08	−0,07	−0,07	1	0,400	0,882	0,013	0,048	−0,01	−0,00	−0,10	−0,02	−0,03	−0,02	0,151	0,010	−0,14	0,280
15	0,194	0,050	−0,05	0,190	−0,20	−0,02	−0,02	0,030	0,316	0,384	−0,04	−0,04	−0,04	0,400	1	0,455	−0,03	−0,03	−0,03	0,261	0,114	0,134	−0,01	−0,01	0,083	−0,04	−0,07	0,053
16	0,078	0,017	−0,01	0,291	−0,29	−0,04	−0,23	−0,16	0,089	0,199	−0,07	−0,07	−0,07	0,882	0,455	1	0,061	0,116	0,011	0,001	−0,06	−0,02	−0,03	−0,02	0,070	0,063	−0,13	0,271
17	−0,17	0,078	−0,07	−0,04	−0,01	−0,03	−0,14	−0,01	−0,01	−0,02	−0,06	−0,06	−0,06	0,013	−0,03	0,061	1	0,704	0,721	0,012	0,048	−0,00	−0,02	−0,02	−0,06	0,447	−0,11	0,164
18	−0,17	0,076	−0,07	−0,00	−0,05	−0,03	−0,19	−0,05	−0,04	−0,08	−0,06	−0,06	−0,06	0,048	−0,03	0,116	0,704	1	0,809	0,023	−0,06	−0,06	−0,02	−0,02	−0,10	0,522	−0,11	0,219
19	−0,19	0,074	−0,07	−0,06	0,048	−0,03	−0,17	−0,05	−0,06	−0,04	−0,06	−0,05	−0,05	−0,01	−0,03	0,011	0,721	0,809	1	0,095	0,062	0,016	−0,02	−0,02	−0,01	0,325	−0,10	0,198
20	0,111	−0,04	0,049	−0,11	0,118	−0,00	0,087	0,037	0,096	0,104	−0,12	−0,08	−0,10	−0,00	0,261	0,001	0,012	0,023	0,095	1	0,632	0,676	0,106	−0,00	0,300	−0,01	−0,18	−0,03
21	−0,00	−0,02	0,027	−0,23	0,206	0,089	−0,11	−0,05	0,025	−0,00	−0,05	0,025	−0,00	−0,10	0,114	−0,06	0,048	−0,06	0,062	0,632	1	0,791	0,028	0,081	0,291	0,085	−0,22	0,139
22	−0,07	−0,09	0,095	−0,11	0,129	0,012	−0,14	−0,04	−0,07	−0,07	−0,09	−0,04	−0,06	−0,02	0,134	−0,02	−0,00	−0,06	0,016	0,676	0,791	1	−0,06	0,030	0,336	0,045	−0,23	0,167
23	0,088	0,042	−0,04	0,040	−0,02	−0,02	−0,02	0,074	−0,07	0,016	−0,03	−0,03	−0,03	−0,03	−0,01	−0,03	−0,02	−0,02	−0,02	0,106	0,028	−0,06	1	−0,01	0,021	−0,03	−0,06	0,032
24	−0,05	0,031	−0,03	−0,04	0,054	−0,01	0,094	0,018	−0,02	0,039	−0,02	−0,02	−0,02	−0,02	−0,01	−0,02	−0,02	−0,02	−0,02	−0,00	0,081	0,030	−0,01	1	0,078	−0,02	−0,04	−0,10
25	0,073	−0,11	0,113	−0,13	0,100	0,136	−0,15	−0,13	−0,12	−0,07	−0,16	−0,09	−0,13	0,151	0,083	0,070	−0,06	−0,10	−0,01	0,300	0,291	0,336	0,021	0,078	1	−0,32	−0,58	0,135
26	−0,29	0,091	−0,09	0,199	−0,23	−0,04	−0,22	−0,08	−0,10	−0,12	−0,07	−0,07	−0,07	0,010	−0,04	0,063	0,447	0,522	0,325	−0,01	0,085	0,045	−0,03	−0,02	−0,32	1	−0,13	0,266
27	0,004	0,024	−0,02	−0,03	0,091	−0,07	0,118	−0,01	0,078	−0,08	0,294	0,217	0,278	−0,14	−0,07	−0,13	−0,11	−0,11	−0,10	−0,18	−0,22	−0,23	−0,06	−0,04	−0,58	−0,13	1	−0,15
28	−0,48	0,126	−0,12	0,070	−0,10	0,090	−0,94	−0,45	−0,40	−0,39	−0,01	0,002	−0,01	0,280	0,053	0,271	0,164	0,219	0,198	−0,03	0,139	0,167	0,032	−0,10	0,135	0,266	−0,15	1

Information: 1. Age, 2. Gender (Male), 3. Gender (Female), 4. Purpose of raising: Business, 5. Purpose of raising: Social, 6. Purpose of raising customs/culture, 7. Experience, 8. Number of livestock Cows: Calve, 9. Number of Cows: Grower, 10. Number of Cows: Steer/Heifer, 11. Number of pigs: Piglet, 12. Number of pigs: Grower, 13. Number of pigs: Boar/Sows, 14. Number of goats: Kid, 15. Number of goats: Yearling/Grower, 16. Number of goats: Buck, 17. Number of ducks: Duckling, 18. Number of ducks: grower, 19. Number of ducks: adults, 20. Number of freerange chickens: Chick, 21. Number of village chickens: Grower, 22. Number of village chickens: Hen/Rooster, 23. Occupation: Civil servant, 24. Employment: Army/Police, 25. Employment: Farmer, 26. Employment: Breeder, 27. Employment: Private, 28. Years of Breeding.

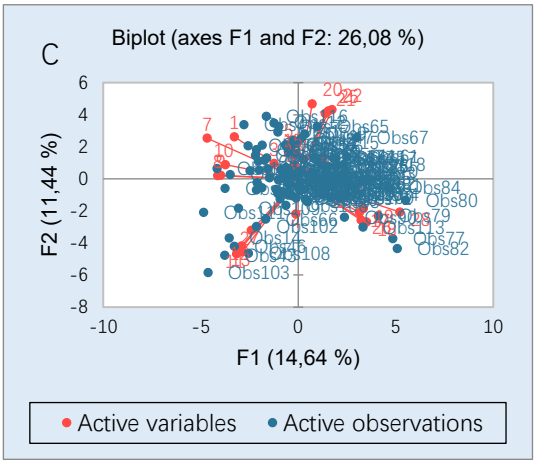
The Pearson Coefficient Correlation (PCC) matrix (Table 5), can be used in the socio-cultural analysis of breeders to determine the relationship or interrelationship between two or more variables contained in the breeders' socio-cultural data. The PCC matrix is a statistical measure that measures the degree to which two variables move together or are linearly related. This coefficient can range between −1 to +1, with a value of +1 indicating perfect positive correlation, a value of −1 indicating perfect negative correlation, and a value of 0 indicating no linear correlation between two variables.



A. Biplot graph of distribution and relationship between variables inside quadrant: Kw1–Kw4.



B. Distribution of farmers inside Biplot graph.



C. Variable and farmers mapping inside Biplot graph.

Figure 3. Description of Biplot graph concerning properties of socio-culture (A, B, and C).

Information: 1. Age, 2. Gender (Male), 3. Gender (Female), 4. Purpose of raising: Business, 5. Purpose of raising: Social, 6. Purpose of raising customs/culture, 7. Experience, 8. Number of livestock Cows: Calve, 9. Number of Cows: Grower, 10. Number of Cows: Steer/Heifer, 11. Number of pigs: Piglet, 12. Number of pigs: Grower, 13. Number of pigs: Boar/Sows, 14. Number of goats: Kid, 15. Number of goats: Yearling/Grower, 16. Number of goats: Buck, 17. Number of ducks: Duckling, 18. Number of ducks: grower, 19. Number of ducks: adults, 20. Number of free-range chickens: Chick, 21. Number of village chickens: Grower, 22. Number of village chickens: Hen/Rooster, 23. Occupation: Civil servant, 24. Employment: Army/Police, 25. Employment: Farmer, 26. Employment: Breeder, 27. Employment: Private, 28. Years of Breeding

In the context of socio-cultural analysis of breeders, PCC can help in understanding the relationship between variables that are relevant to the socio-cultural aspects of breeders. Examples of variables that can be correlated include age with farming experience, farming experience with the number of livestock owned by the farmer. The PCC matrix can be used to evaluate whether there is a correlation between livestock farmers' access to agricultural technology, such as modern equip-

ment or irrigation systems, and livestock production levels. This can help identify factors that contribute to increased production and can also help in understanding the socio-cultural impact on livestock sustainability.

Quadrant I (Kw1) is negatively correlated with the F1 axis and positive with the F2 axis (Figure 3A). Quadrant II (Kw2) is positively correlated with the FI and F2 axes. Quadrant III (Kw3) is positively correlated with the F1 axis and negative with the F2 axis. Meanwhile, Quadrant IV (Kw4) is negatively correlated with F1 and F2. In Qw1 the variables contained there are age, female gender, social goals for raising livestock, experience, number of calf cattle, number of juvenile cattle, number of cow cattle, number of kid goats, type of civil servant work, and type of army/police work. In Kw2 the variables grouped are the purpose of raising livestock for custom/culture, the number of free-range chickens (day old chicks), the number of local chickens (parental stocks), and the type of work of farmers. Farmers are concentrated in Quadrant 2 (Kw2) and Quadrant 3 (Kw3) (Figure 3B). Meanwhile, the variables for Kw3 are male gender, number of goats (children), number of goats (parents), number of ducks, number of ducks (adolescents), number of ducks (parents), breeder's type of work, and year of farming (Figure 3C). Finally, for Kw4 there are variables such as the purpose of raising (business), number of pigs (piglets), number of pigs (growers), and number of pigs (parents).

3.2. Perceptual Aspects of Animal Cultivation

Perception aspects of livestock cultivation which include seeds (cows, goats and pigs), maintenance, slaughter, health and reproduction, business capital loans, availability of oil palm habitat as grazing land, availability of feed from oil palm land and aspects of community support, especially customary land rights owners and the surrounding community are central in the following discussion (Table 6).

Table 6. Farmers' perceptions regarding the cultivation of cattle, goats, and pigs in Warpramasi.

Parameter of Perception		Frequency	Proportion	Mean	Std. deviation	Minimum	Maximum
1. Breed	Cattle	315	266,9	2,675	0,859	0,000	4,000
2. Breed	Goat	31	26,27	0,265	0,904	0,000	4,000
3. Breed	Pig	9	7,627	0,077	0,494	0,000	4,000
4. Rearing	Cattle	307	260,2	2,607	0,820	0,000	4,000
5. Rearing	Goat	35	29,66	0,299	1,002	0,000	4,000
6. Rearing	Pig	6	5,085	0,051	0,412	0,000	4,000
7. Cutting	Cattle	315	266,9	2,675	0,829	0,000	4,000
8. Cutting	Goat	31	26,27	0,274	0,925	0,000	4,000
9. Cutting	Pig	11	9,322	0,094	0,587	0,000	4,000
10. Veterinary/Reproduction	Cattle	311	263,6	2,641	0,701	2,000	4,000
11. Veterinary/Reproduction	Goat	29	24,58	0,248	0,829	0,000	4,000
12. Veterinary/Reproduction	Pig	7	5,932	0,060	0,460	0,000	4,000
13. Capital loan	Cattle	163	138,1	1,393	1,645	0,000	4,000
14. Capital loan	Goat	30	25,42	0,256	0,873	0,000	4,000
15. Capital loan	Pig	7	5,932	0,060	0,460	0,000	4,000
16. Palm oil land availability	Cattle	293	248,3	2,487	0,934	0,000	4,000
17. Palm oil land availability	Goat	28	23,73	0,239	0,847	0,000	4,000
18. Palm oil land availability	Pig	7	5,932	0,060	0,378	0,000	3,000
19. Forages from crops	Cattle	242	205,1	2,068	1,413	0,000	4,000
20. Forages from crops	Goat	26	22,03	0,222	0,842	0,000	4,000
21. Forages from crops	Pig	14	11,86	0,120	0,590	0,000	4,000
22. Local community support	Cattle	305	258,5	2,590	0,767	1,000	4,000
23. Local community support	Goat	30	25,42	0,256	0,882	0,000	4,000
24. Local community support	Pig	7	5,932	0,060	0,378	0,000	3,000

The perception aspect of livestock cultivation includes several important things that need to be considered. The following is a discussion of these aspects in the context of raising cattle, goats, and pigs, as well as related factors. Choosing quality livestock seeds is very important to start successful cultivation. For the evaluation of the perception of cattle breeders in Warpramasi, the score was 2.675 ± 0.859, which is good. Meanwhile, goat and pig breeders scored 0.265 ± 0.904 and 0.077 ± 0.494. In the context of cattle, goats and pigs, good seeds are animals that are healthy, have

superior genetics, and come from a trusted source. A good perception of these seeds includes understanding the importance of choosing superior seeds and maintaining the cleanliness and health of livestock seeds.

This maintenance aspect includes aspects of the environment, feed, water, cleanliness, and cage management. The perception of cattle breeders is at 2.607 ± 0.820, followed by goat and pig breeders. Having a good perception of husbandry means understanding the importance of providing a healthy environment, meeting adequate feed and water requirements, keeping the pen clean, and implementing good management in managing livestock. The aspect of slaughtering livestock is part of the process of utilizing livestock products. The best score was given by cattle breeders, namely 2.675 ± 0.829 and continued by goat and pig breeders. In this context, good perception involves understanding the importance of slaughtering animals using the correct procedures, maintaining cleanliness, and ensuring slaughter is carried out humanely and follows animal welfare principles.

Good perception of health and reproductive aspects includes understanding the importance of vaccination, disease prevention, routine health care, and good reproductive management. From this indicator, it can be said that the average perception of cattle farming has a better perception, namely 2.641 ± 0.701, followed by goat breeders and pig breeders. Livestock owners must understand the importance of maintaining livestock health so that productivity remains optimal and ensures healthy and controlled reproduction.

In livestock cultivation, business capital is sometimes needed to start or develop a livestock business. The perception value of cattle breeders dominates, namely 1.393 ± 1.645, followed by goat breeders and pig breeders. A good perception of business capital loans involves understanding the terms and conditions of the loan, the risks involved, and the ability to manage and repay the loan in a timely manner. In the context of raising cattle and goats, oil palm can be used as pasture. In real terms, it can be said that this aspect is still dominated by cattle breeders, namely 2.487 ± 0.934 and followed by goat breeders and pig breeders. Good perception involves understanding the potential and limitations of using oil palm as pasture, including sustainability, environmental management, and good management to ensure the sustainability of animal feed sources.

Good perception includes an understanding of the use of oil palm land as a source of animal feed, including available nutrients, the sustainability of the feed source, as well as its potential impact on the environment and animal feed quality. The availability of oil palm habitat was shown with a perception value of 2.068 ± 1.413 and was followed further by goat breeders and pig breeders. A good perception of community support includes building harmonious relationships with customary rights owners and surrounding communities. This indicator value was achieved by cattle breeders with a score of 2.590 ± 0.767 followed by goat breeders and pig breeders. This involves good communication, understanding community needs and interests, and involvement in local social and economic activities. It is important to note that these aspects are general things that need to be considered in livestock farming. However, each context and location can have differences in perception and implementation.

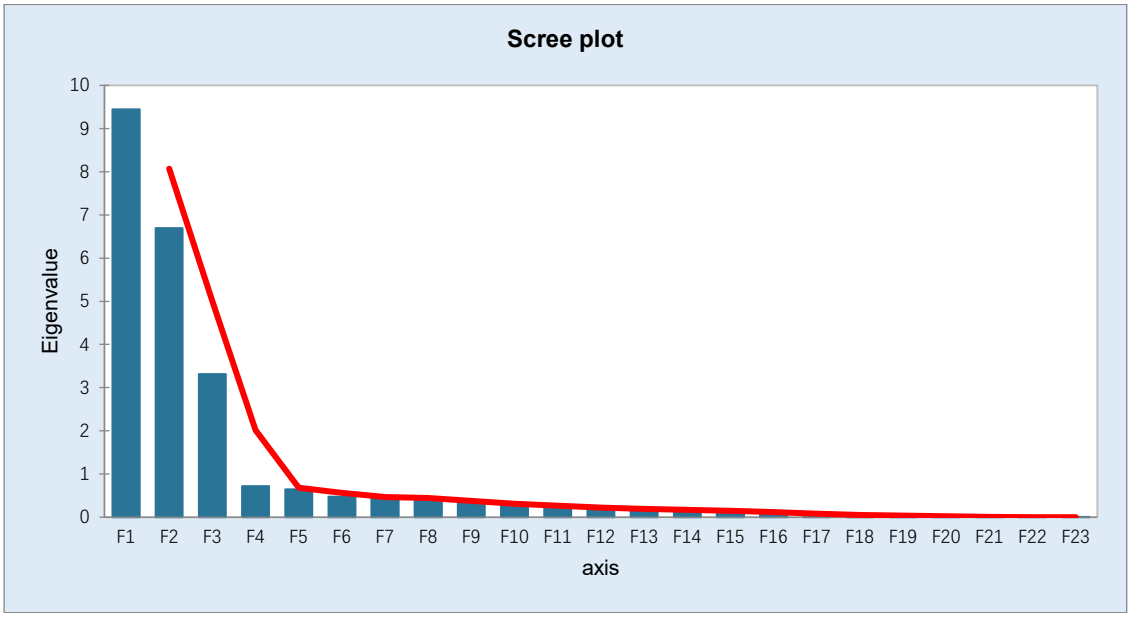


Figure 4. Scree plot values.

Figure 4 explains the suitability of numbers for dimensions stored for creating clusters in Agglomerative Hierarchical Clustering (AHC) analysis using XLStat software. The scree plot diagram

basically has the same function as the total variance explained table, namely its function is to see the factors formed from the results of analysis based on eigenvalues. The way to read a scree plot diagram is to look at the eigenvalues (on the Y axis), which have eigenvalues > 1. If the eigenvalues are more than 1 then that is the factor that is formed. Based on the diagram above, it can be seen that there are 3 points that have eigenvalues >1, this means that there are 3 factors formed.

Table 7. Factor analysis of combined data (FAMD).

Variable		Components		
		F1	F2	F3
Breed	Cattle	**0,691**	0,118	0,462
	Goat	**0,836**	−0,345	−0,329
	Pig	0,232	**0,861**	−0,216
Rearing	Cattle	**0,62**	**0,185**	**0,555**
	Goat	**0,855**	−0,372	−0,324
	Pig	0,264	**0,89**	−0,199
Cutting	Cattle	**0,597**	0,074	**0,636**
	Goat	**0,846**	−0,345	−0,329
	Pig	0,252	**0,766**	−0,039
Veterinary/Reproduction	Cattle	**0,564**	0,238	**0,512**
	Goat	**0,856**	−0,361	−0,334
	Pig	0,273	**0,909**	−0,19
Capital loan	Cattle	**0,65**	0,046	**0,501**
	Goat	**0,844**	−0,36	−0,333
	Pig	0,275	**0,921**	−0,2
Palm oil land availability	Cattle	**0,603**	0,011	**0,508**
	Goat	**0,828**	−0,379	−0,298
	Pig	0,352	**0,8**	−0,238
Forage from crops	Cattle	**0,556**	0,091	**0,536**
	Goat	**0,771**	−0,359	−0,248
	Pig	0,491	**0,648**	−0,271
Local community support	Cattle	**0,704**	0,055	0,437
	Goat	**0,837**	−0,357	−0,293
	Pig	0,207	**0,826**	−0,251
Eigenvalue		9,447	6,695	3,314
Variability (%)		39,361	27,897	13,806
Cumulative %		39,361	67,258	81,064

In Table 7, there are 24 variables used and 3 main components are used based on Figure 4 in the graph scree plot. Table 7. Cumulative value (%) explains 86.745% of the total variation value.

The results of the analysis show that the variable perception of livestock seeds owned by cattle and goat breeders is very significant ($p<0.01$) and varies in influence in the dataset. Likewise, aspects of maintenance perception had very significant variations in both cattle and goats ($p<0.01$) but had no significant influence in variations in pigs. This insignificant perception by farmers was caused by a number of cases of disease during the Covid-19 period and attacks by swine flu (ASF). The aspect of slaughtering cattle and goats experienced by breeders of these two commodities is also very significant ($p<0.01$) compared to pig breeders ($p>0.05$). The same is true in the aspect of livestock health and livestock reproduction, which is very significant for both cattle and goat breeders ($p<0.01$). Borrowing business capital from other partners was experienced favourably by both cattle and goat breeders ($p<0.01$), compared to pig breeders. The availability of livestock grazing habitat was experienced as very significant ($p<0.01$) by both cattle and goat breeders, but not by pig breeders.

Table 8. Analysis of diversity of parameters (variables) in aspects of farmer perception.

Variable		DF (Model)	Mean squares (Model)	DF (Error)	Mean squares (Error)	F	Pr > F
Breed	Cattle	2	13,709	115	0,510	26,860	**<0,0001**
	Goat	2	43,978	115	0,060	732,966	**<0,0001**
	Pig	2	0,252	115	0,242	1,044	0,355
Rearing	Cattle	2	12,144	115	0,469	25,867	**<0,0001**
	Goat	2	56,059	115	0,039	1432,627	**<0,0001**
	Pig	2	0,112	115	0,169	0,662	0,518
Cutting	Cattle	2	12,459	115	0,480	25,961	**<0,0001**
	Goat	2	46,861	115	0,049	962,324	**<0,0001**
	Pig	2	0,048	115	0,347	0,137	0,872
Veterinary/Reproduction	Cattle	2	4,926	115	0,413	11,930	**<0,0001**
	Goat	2	38,486	115	0,025	1526,186	**<0,0001**
	Pig	2	0,153	115	0,211	0,723	0,487
Capital loan	Cattle	2	134,597	115	0,406	331,835	**<0,0001**
	Goat	2	41,186	115	0,052	789,407	**<0,0001**
	Pig	2	0,153	115	0,211	0,723	0,487
Palm oil land availability	Cattle	2	17,149	115	0,584	29,362	**<0,0001**
	Goat	2	35,878	115	0,101	355,687	**<0,0001**
	Pig	2	0,176	115	0,141	1,248	0,291
Forage from crops	Cattle	2	48,002	115	1,215	39,517	**<0,0001**
	Goat	2	30,936	115	0,177	174,392	**<0,0001**
	Pig	2	1,980	115	0,316	6,258	**0,003**
Local community support	Cattle	2	10,017	115	0,423	23,695	**<0,0001**
	Goat	2	41,186	115	0,070	592,055	**<0,0001**
	Pig	2	0,153	115	0,142	1,078	0,344

An aspect that also has very significant variation in the dataset is the aspect of feed availability from agricultural land for the three commodity breeders of cattle, goats, and pigs. The aspect of community support is an important variable when livestock farming experiences constraints from other communities. The data in the Table 8 shows that there is variability in data for cattle and goat farms ($p<0.01$) compared to pig breeders ($p>0.05$).

By analyzing the contribution of each principal component, PCA helps in selecting the most important parameters and reduces the dimensionality of the dataset. It is possible to understand the basic structure of the data better and identify significant patterns or relationships.

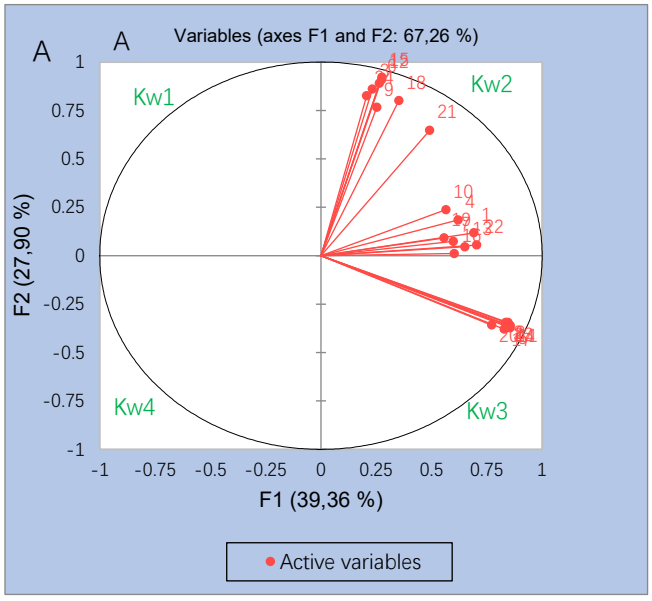
Table 9. Correlation matrix.

from \ to	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	1	0,368	0,162	0,736	0,405	0,194	0,676	0,396	0,249	0,595	0,393	0,202	0,648	0,389	0,202	0,512	0,393	0,194	0,561	0,363	0,282	0,739	0,384	0,141
2	0,368	1	−0,046	0,271	0,949	−0,036	0,244	0,944	−0,047	0,275	0,969	−0,038	0,365	0,952	−0,038	0,347	0,884	0,155	0,264	0,806	0,296	0,395	0,876	−0,046
3	0,162	−0,046	1	0,182	−0,046	0,828	0,104	−0,046	0,718	0,206	−0,047	0,927	0,091	−0,046	0,889	−0,025	−0,044	0,760	0,129	−0,041	0,708	0,107	−0,045	0,760
4	0,736	0,271	0,182	1	0,272	0,214	0,675	0,269	0,275	0,580	0,273	0,223	0,661	0,276	0,223	0,647	0,287	0,216	0,555	0,279	0,277	0,675	0,297	0,161
5	0,405	0,949	−0,046	0,272	1	−0,037	0,296	0,971	−0,048	0,205	0,988	−0,039	0,384	0,976	−0,039	0,341	0,930	0,089	0,279	0,850	0,231	0,431	0,926	−0,047
6	0,194	−0,036	0,828	0,214	−0,037	1	0,100	−0,037	0,693	0,244	−0,037	0,893	0,123	−0,037	0,984	0,069	−0,035	0,866	0,113	−0,033	0,684	0,177	−0,036	0,866
7	0,676	0,244	0,104	0,675	0,296	0,100	1	0,287	0,206	0,631	0,282	0,142	0,684	0,284	0,120	0,619	0,285	0,118	0,677	0,266	0,152	0,672	0,281	−0,046
8	0,396	0,944	−0,046	0,269	0,971	−0,037	0,287	1	−0,047	0,221	0,978	−0,038	0,383	0,981	−0,038	0,334	0,884	0,150	0,283	0,774	0,335	0,403	0,896	−0,047
9	0,249	−0,047	0,718	0,275	−0,048	0,693	0,206	−0,047	1	0,230	−0,048	0,777	0,123	−0,047	0,745	0,152	−0,045	0,635	0,190	−0,042	0,590	0,221	−0,047	0,635
10	0,595	0,275	0,206	0,580	0,205	0,244	0,631	0,221	0,230	1	0,230	0,254	0,538	0,196	0,254	0,639	0,205	0,310	0,552	0,225	0,356	0,624	0,249	0,180
11	0,393	0,969	−0,047	0,273	0,988	−0,037	0,282	0,978	−0,048	0,230	1	−0,039	0,384	0,983	−0,039	0,344	0,921	0,118	0,281	0,809	0,292	0,406	0,925	−0,047
12	0,202	−0,038	0,927	0,223	−0,039	0,893	0,142	−0,038	0,777	0,254	−0,039	1	0,129	−0,038	0,959	0,072	−0,037	0,821	0,140	−0,034	0,767	0,144	−0,038	0,821
13	0,648	0,365	0,091	0,661	0,384	0,123	0,684	0,383	0,123	0,538	0,384	0,129	1	0,380	0,129	0,588	0,366	0,157	0,706	0,323	0,218	0,548	0,358	0,074
14	0,389	0,952	−0,046	0,276	0,976	−0,037	0,284	0,981	−0,047	0,196	0,983	−0,038	0,380	1	−0,038	0,322	0,919	0,110	0,280	0,790	0,275	0,404	0,888	−0,046
15	0,202	−0,038	0,889	0,223	−0,039	0,984	0,120	−0,038	0,745	0,254	−0,039	0,959	0,129	−0,038	1	0,072	−0,037	0,871	0,127	−0,034	0,736	0,168	−0,038	0,871
16	0,512	0,347	−0,025	0,647	0,341	0,069	0,619	0,334	0,152	0,639	0,344	0,072	0,588	0,322	0,072	1	0,320	0,137	0,512	0,333	0,191	0,619	0,371	0,039
17	0,393	0,884	−0,044	0,287	0,930	−0,035	0,285	0,884	−0,045	0,205	0,921	−0,037	0,366	0,919	−0,037	0,320	1	−0,045	0,268	0,928	0,201	0,445	0,932	−0,045
18	0,194	0,155	0,760	0,216	0,089	0,866	0,118	0,150	0,635	0,310	0,118	0,821	0,157	0,110	0,871	0,137	−0,045	1	0,138	−0,042	0,780	0,175	0,057	0,759
19	0,561	0,264	0,129	0,555	0,279	0,113	0,677	0,283	0,190	0,552	0,281	0,140	0,706	0,280	0,127	0,512	0,268	0,138	1	0,227	0,198	0,507	0,257	0,042
20	0,363	0,806	−0,041	0,279	0,850	−0,033	0,266	0,774	−0,042	0,225	0,809	−0,034	0,323	0,790	−0,034	0,333	0,928	−0,042	0,227	1	0,103	0,490	0,909	−0,042
21	0,282	0,296	0,708	0,277	0,231	0,684	0,152	0,335	0,590	0,356	0,292	0,767	0,218	0,275	0,736	0,191	0,201	0,780	0,198	0,103	1	0,186	0,272	0,625
22	0,739	0,395	0,107	0,675	0,431	0,177	0,672	0,403	0,221	0,624	0,406	0,144	0,548	0,404	0,168	0,619	0,445	0,175	0,507	0,490	0,186	1	0,463	0,116
23	0,384	0,876	−0,045	0,297	0,926	−0,036	0,281	0,896	−0,047	0,249	0,925	−0,038	0,358	0,888	−0,038	0,371	0,932	0,057	0,257	0,909	0,272	0,463	1	−0,046
24	0,141	−0,046	0,760	0,161	−0,047	0,866	−0,046	−0,047	0,635	0,180	−0,047	0,821	0,074	−0,046	0,871	0,039	−0,045	0,759	0,042	−0,042	0,625	0,116	−0,046	1

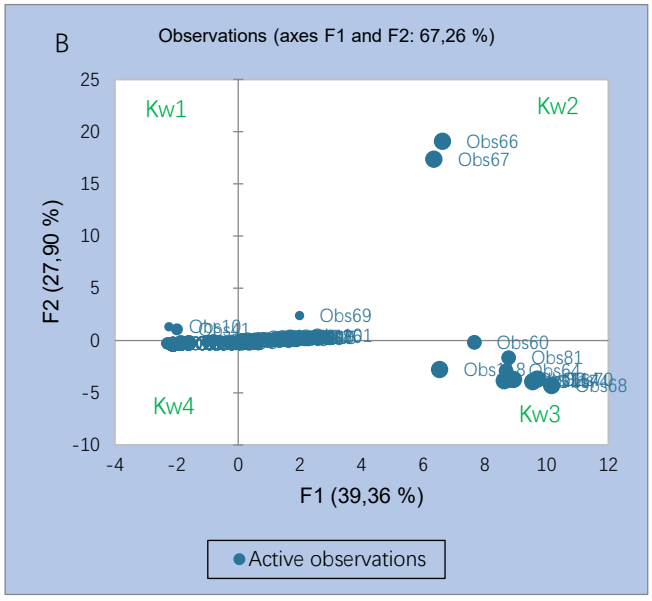
Description: 1. Breed (cattle), 2. Breed (goat), 3. Breed (pig), 4. Rearing (cattle), 5. Rearing (goat), 6. Rearing (pig), 7. Cutting (cattle), 8. Cutting (goats), 9. Cutting (pigs), 10. Veterinary/Reproduction (cattle), 11. Veterinary/Reproduction (goats), 12. Veterinary/Reproduction (pigs), 13. Capital Loans (cattle), 14. Capital Loans (goats), 15. Capital Loans (pigs), 16. Palm Oil Land Availability (cattle), 17. Palm Oil Land Availability (Goats), 18. Palm Oil Land Availability (pigs), 19. Forage from crops (cattle), 20. Forage from crops (goats), 21. Forage from crops (pigs), 22. Local community Support (cattle), 23. Local community Support (goats), and 24. Local community Support (pigs).

The correlation matrix can be used in analyzing farmers' perceptions to determine the relationship or link between two or more variables contained in the dataset. The PCC matrix is a statistical measure that measures the degree to which two variables move together or are linearly related. This coefficient can range between −1 to +1, with a value of +1 indicating perfect positive correlation, a value of −1 indicating perfect negative correlation, and a value of 0 indicating no linear correlation between two variables.

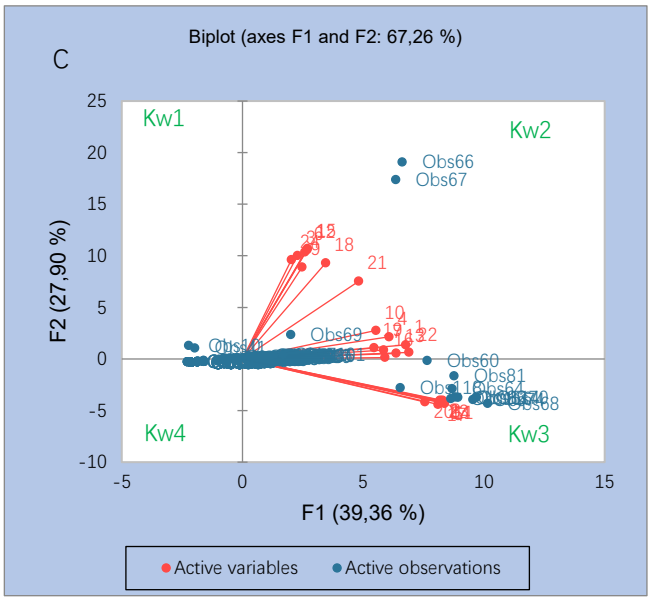
In the context of analyzing farmers' perceptions, the correlation matrix (Table 9) can help in understanding the relationship between relevant variables and aspects of farmer perception. Examples of variables that can be correlated include livestock breeding factors with maintenance (cultivation) and the level of livestock health. This can help identify perceived factors that contribute to increased production and can also help in understanding the impact of work ethic/work culture in building sustainable livestock.



A. Biplot graph of distribution and relationship between variables inside quadrant (Kw) 1–4.



B. Distribution of observation (n=118) on quadrant of Biplot graph.



C. Distribution of variables and observation in Biplot graph.

Figure 5. Diagram of Biplot variables and respondents concerning perception.

Information: Breed (cattle), 2. Breed (goat), 3. Breed (pig), 4. Rearing (cattle), 5. Rearing (goat), 6. Rearing (pig), 7. Cutting (cattle), 8. Cutting (goats), 9. Cutting (pigs), 10. Veterinary/Reproduction (cattle), 11. Veterinary/Reproduction (goats), 12. Veterinary/Reproduction (pigs), 13. Capital Loans (cattle), 14. Capital Loans (goats), 15. Capital Loans (pigs), 16. Palm Oil Land Availability (cattle), 17. Palm Oil Land Availability (Goats), 18. Palm Oil Land Availability (pigs), 19. Forage from crops (cattle), 20. Forage from crops (goats), 21. Forage from crops (pigs), 22. Local community Support (cattle), 23. Local community Support (goats), and 24. Local community Support (pigs).

Quadrant I (Kw1) is negatively correlated with the F1 axis and positive with the F2 axis (Figure 5A). Quadrant II (Kw2) is positively correlated with the FI and F2 axes. Quadrant III (Kw3) is positively correlated with the F1 axis and negative with the F2 axis. Meanwhile, Quadrant IV (Kw4) is negatively correlated with F1 and F2. No variables were found distributed in Kw1 and Kw4. In Qw2 there are variables such as 1. Seeds (cattle), 3. Seeds (pigs), 4. Maintenance (cows), 6. Maintenance (pigs), 7. Slaughter, 9. Slaughter, 10. Health/Reproduction, 12. Health /Reproduction, 13.Business Capital Loans, 15.Business Capital Loans, 16.Availability of Palm Oil Habitat, 18.Availability of Palm Oil Habitat, 19.Availability of Feed from Agricultural Land, 21.Availability of Feed from Agricultural Land, 22. Community Support Aspects, and 24. Community Support Aspects. Meanwhile, in Qw3, variables were found such as 2. Seeds (goats), 5. Maintenance, 8. Slaughter, 11. Health/Reproduction, 14. Business capital loans, 17. Availability of palm oil habitat, 20. Availability of feed from agricultural land, 23. Figure 3B shows the distribution of respondents (farmers) in Quadrant 2, 3, and 4 (Figure 5B). Aspects of Community Support. It can be concluded that the variables distributed in Kw2 and Kw3 are relatively uniform (Figure 5C).

4. Discussion

Socio-cultural productivity and farmers' perceptions of the use of public land and oil palm plantation areas are topics that cover several different aspects. In this discussion, we highlight how socio-cultural factors determine the productivity and perceptions of farmers in these two contexts. Socio-cultural productivity refers to the influence of values (Quisumbing, 1996), norms (Firth et al., 2011), and socio-cultural practices (Ayantunde et al., 2011; Molina-Flores et al., 2012) on productivity in a society. In the context of oil palm land use, socio-cultural factors that influence productivity will consist of ages, experiences, and jobs (occupancies). In Table 2, several parameters have strong (r>0,50) and weak (r<0,50) positive correlations and several have negative correlations (Table 4). The example is shown by ages vs experience, experiences vs gender both men (negative and women (positive).

The maturity of ages and positive perceptions in society will shape how farmers use open land. Experiences and perception awareness can encourage sustainable and innovative agricultural practices, which in turn can enhance productivities. The existence of well-organized farmer groups or working groups can facilitate the exchange of knowledge and resources which can increase productivity and efficiency in the use of open land. This can be done by involving local Socio-cultural factors that can also be reflected in existing institutions and policies. Policies that support good use of open land and respect local knowledge and practices can help in increasing productivities.

In the context of oil palm plantations, socio-cultural productivity plays a significant role. Farmers' knowledge and skills (Kebebe, 2019; Sekaran et al., 2021; Shamna et al., 2018) in cultivating forages and utilizing oil palm land can have a direct impact on productivity. Socio-cultural factors such as planting traditions and cultivation techniques passed down from generation to generation can influence how farmers use oil palm plantation land in proper and better ways for future sustainability. The relationship between farmers and palm oil companies can affect productivity. Good cooperation between farmers and companies, with the fulfillment of farmers' rights and fair distribution of benefits, will then enhance the productivities of farmers and sustain natural resources as assets.

Farmers' perceptions refer to their views and assessments of the use of open land and oil palm plantations. Our findings in this study show breeds, rearing livestock, slaughter livestock, veterinary/reproduction of livestock, capital loans, palm oil land availability, forages from crops, and local community support have a positive correlation. These perceptions can be determined by socio-cultural factors. The first factor is local community support. Their values and beliefs are shaped by age for maturity, experiences for skills, and gender for labor power. These properties have proven significant values both in Table 2 and 7. The values and beliefs held by farmers can determine farmers' perceptions of land use. For example, if breeders have high environmental concerns, farmers/breeders may have a more negative perception of oil palm plantations which can damage the environment. Farmers' personal experience and knowledge (Belay et al., 2022; Hamilton et al. 2020; Ugochukwu & Phillips, 2018) regarding land use can shape and shift farmers' perceptions. If farmers have had positive experiences with oil palm plantations or have seen the benefits gained from well-managed open land, then farmers may have a more positive perception. The social and economic context in which farmers find themselves can also make up their perceptions. Factors

such as access to resources, income level, and dependence on the agricultural sector can shape farmers' perceptions of land use.

In combining these two aspects, it is important to consider socio-cultural factors that have interlinkage the productivity and perceptions of farmers in the use of open land and oil palm plantations. Approaches that respect socio-cultural diversity, strengthen farmer participation (Marandure et al., 2020; Ozcatalbas et al., 2010), and promote sustainable practices can help in achieving high productivity and reducing negative impacts on the interaction between the physical environment of the oil palm land use and local communities.

5. Conclusion

From the results of this study, it can be concluded that young ages' farmers tend to have a mindset that is more open to innovation and new technology in animal husbandry. Older farmers may have greater knowledge and experience in traditional livestock practices. Traditionally, animal husbandry has often been seen as gender working oriented which is more commonly carried out by men. However, the role of women in animal husbandry is unbelievably increasing. Women tend to play a role in livestock management, marketing livestock products, or small-scale animal husbandry, while men are more dominant in physical aspects such as livestock care and cage construction. Farmers' goals can vary, including meeting personal consumption needs, and supplying the local market. Experiencing farmers tend to have better knowledge and practical skills in managing livestock and dealing with challenges that may arise. Earlier carrier farmers may need to rely on external resources such as training or consulting to gain the necessary knowledge. Farmers with larger herds may face more complex management and rearing challenges. Farmers with smaller herds may be more flexible and can provide more individual attention to each animal. Farmers' jobs can vary, from farmers who have livestock as additional income to farmers as professional managers farmers who fully manage their livestock. Farmers who work as civil servants, army/police, or private individuals may have different approaches and resources in managing their farms. Farmers who have been farming for a long time may have a better understanding and experience in effective livestock practices and management. In common, several parameters of socio-cultural properties have strong/weak and positive/negative correlations.

Conclusions related to the perception of livestock cultivation which includes selecting quality breeds is an important step in livestock cultivation. Selection of superior cattle, goat, and pig breeds will affect the productivity and quality of livestock products. Perception on rearing livestock includes providing sufficient feed and proper veterinary/reproduction. Perception on slaughtering livestock is important considered as well. Gaining access to business capital loans can help farmers expand or improve livestock farming operations. This loan can be used to buy breed, equipment, feed, and other needs. The availability of oil palm land as grazing land can be a determining factor in selecting a location for livestock rearing. Perception on oil palm land can be a primary source of forages as feeds for livestock. Farmers also perceive a positive impact on the support from customary rights owners and communities in livestock productivities. Their involvement in providing permits, knowledge, and cooperation can help create a conducive environment for developing livestock businesses. In general, like socio-cultural properties, perceptions also have strong/weak and positive/negative correlations.

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Appendix.

Questionnaire (Questionnaire)

A LIST OF QUESTIONS

Study Title:

ANIMAL PRODUCTIVITY ON OIL PALM PLANTATIONS IN WEST PAPUA

Introduction: My name is Deny Iyai (Lecturer at the Faculty of Animal Husbandry, Unipa Manokwari), currently doing research. We ask for your help and cooperation, Mr. Mrs. Farmer/Breeder in providing relevant data or information. The data from our interviews/observations will not be published to anyone who is not interested. Thank you for your cooperation, sir/madam.

Name of village/lane :

District :

Respondent's Name :

1. Breeder characteristics:

a. Age :……Yr
b. Last education:……
c. Ethnic group :……
d. Purpose of breeding:……
1. Business, 2. Social Needs (Education), 3. Pleasure/Hobby, 4. Customary/Cultural Needs
e. Years of farming:…….Years
f. Livestock ownership:
1. Cow: a. child…… tail, b. Juvenile…….tail, c. Main…….tail
2. Pigs: a. child…… tail, b. Juvenile…….tail, c. Parent…….tail
3. Goat: a. child…… tail, b. Juvenile…….tail, c. Main…….tail
4. Ducks: a. child…… tail, b. Juvenile…….tail, c. Main…….tail
5. Aym kampung: a. child…… tail, b. Teen…… tail, c. Parent..…. tail
6. Sliced Chicken: a. child……tail, b.Juvenile…….tail, c.Parent…….tail
g. The main job:
1. Civil servants, 2. TNI/POLRI, 3. Farmers, 4. Breeders, 5. Private
h. Breeding experience:……years (since……)

2. Characteristics of pig farming:

a. Origin of seeds:
1. Local Government (Dinas) assistance, 2. Buy it yourself, 3. Mosque/Church assistance,
4. Private Assistance (NGO)
b. Seed type:
1. Local, 2. Crossbred (Crossbred), 3. Forest (Wild)
c. Number of cubs per parent (Liter size):……heads/parent/yr
d. Number of births per year (Farrowing rate):……..times/year
e. Mating system: 1. Natural, 2. Artificial (IB)
f. Maintenance system:
1. Without cage, 2. There is a cage, 3. There is a cage and Detachable.
g. BCS (enter 1: skinny, 2. somewhat fat, 3. very fat):
1. Cow: a. Livestock……., b. Teenagers ……., c. Parent……..
2. Goats: a. Livestock……., b. Teenagers ……., c. Parent……..
3. Pigs: a. Livestock……., b. Teenagers ……., c. Parent……..
h. Number of livestock that die in a year:……head
i. Amount of livestock given to others:…….head
j. Number of livestock sold:……..head

3. Characteristics of animal husbandry

A. Cost
1. Fixed Costs:
a) Cage Cost: Rp……
b) Cost of work equipment/cage equipment: Rp……
c) Shelf life:……Years
2. Variable Costs:

a) Feed Cost: Rp……
b) Cost of Purchasing Animal Medicine: Rp……..
c) Paramedic/Veterinary Fee: Rp…….
d) Labor Costs:Rp……..
e) Cost of Buying Livestock Seeds: Rp…….
f) Transportation Fee: Rp……
g) Electricity Cost: Rp…….

B. Sales:

a) Sale:

1. Amount sold: a. child……..…tail, b. Juvenile……tail, c. Adult…...…tail

b) Price sold: a. Children: Rp……b. Teenagers: Rp……c. Adult: Rp……

C. Acceptance:

a. Child: Rp……..b. Teenagers: Rp……c. Adult: Rp……

4. Feed characteristics

a. Feed type:

1. Shop Feed, b. Agricultural/Plantation Products, c. Household Leftover Feed

b. Frequency of administration: a.1 time, b. 2 times, c. 3 times

5. Number of open spaces: …….location

6. Types of open land: a. former garden, b. palm oil, c. roadside, d. field, e. near pond/swamp, f. near the river/river

7. Types of garden residues used: a.sweet potato, b. rice, c. corn, d. peanut leaves, e. long bean leaves, f. others (please specify……)

8. Marketing Place of sale: a. At home, b. Local market, c. Manokwari City market

Perception of Animal Husbandry

A. Bibit:

a) Cow breeds: 1. Poor, 2. Average, 3. Good, 4. Very Good
b) Goat breeds: 1. Poor, 2. Average, 3. Good, 4. Very Good
c) Pig Breeds: 1. Poor, 2. Fair, 3. Good, 4. Very Good

B. Maintenance:

a) Cow: 1. Poor, 2. Fair, 3. Good, 4. Very Good
b) Goat: 1. Poor, 2. Fair, 3. Good, 4. Very Good
c) Pork: 1. Poor, 2. Fair, 3. Good, 4. Very Good

C. Cutting:

a) Cow: 1. Poor, 2. Fair, 3. Good, 4. Very Good
b) Goat: 1. Poor, 2. Fair, 3. Good, 4. Very Good
c) Pork: 1. Poor, 2. Fair, 3. Good, 4. Very Good

D. Animal health and reproduction services:

a) Cow: 1. Poor, 2. Fair, 3. Good, 4. Very Good
b) Goat: 1. Poor, 2. Fair, 3. Good, 4. Very Good
c) Pork: 1. Poor, 2. Fair, 3. Good, 4. Very Good

E. Capital Loan Policy from Banks/Regional Government:

a) Cow:1. Poor, 2. Fair, 3. Good, 4. Very Good
b) Goat: 1. Poor, 2. Fair, 3. Good, 4. Very Good
c) Pork: 1. Poor, 2. Fair, 3. Good, 4. Very Good

F. Availability of Palm Oil Habitat:

a) Cow: 1. Poor, 2. Fair, 3. Good, 4. Very Good
b) Goat: 1. Poor, 2. Fair, 3. Good, 4. Very Good
c) Pork: 1. Poor, 2. Fair, 3. Good, 4. Very Good

G. Availability of Feed from Agricultural Land/Garden:

a) Cow: 1. Poor, 2. Fair, 3. Good, 4. Very Good
b) Goat: 1. Poor, 2. Fair, 3. Good, 4. Very Good
c) Pork: 1. Poor, 2. Fair, 3. Good, 4. Very Good

H. Aspects of Community Support for maintenance:

a) Cow: 1. Poor, 2. Fair, 3. Good, 4. Very Good
b) Goat: 1. Poor, 2. Fair, 3. Good, 4. Very Good
c) Pork: 1. Poor, 2. Fair, 3. Good, 4. Very Good

I. Inhibiting Factors:

a) Anything for Cattle: …….
b) Anything for Goat farming:……
c) Anything for Pig farming…….

Closing: That's how we collected the data. On behalf of the Dean of the Faculty of Animal Husbandry, Unipa Manokwari and as a researcher, we would like to thank you very much for your good cooperation. Greetings.

Manokwari, 2022

Researcher

Deny A. Iyai

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