# Analysis of the Sustainability of Beef Cattle Breeding Business-Intensive Rearing Patterns in, Indramayu Regency, West Java

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## ABSTRACT

The increase population growth may cause an increase in the need for food originating from animal protein, one of which is meat. The demand for beef is not matched by an increase in the national cattle population or productivity. Policies on cattle breeding in the future require basic information, potential resources, and supporting facilities that are actualized in indicators and aspects of sustainability. The aim of the study was to analyze the index and status of the sustainability of a cattle breeding business with an intensive rearing pattern in Situ Bolang Indramayu, West Java, which was assessed from ecological, socio-cultural, economic, legal-institutional, and technological-infrastructure indicators. The method used is multidimensional scaling (MDS) with the Rap-UPTS approach for the analysis of index values and sustainability status. The identification of sensitive indicators, errors in index values, and sustainability in each aspect was carried out by Leverage and Monte Carlo analysis. The respondents amounted to 12 farmers. The results of the sustainability index analysis illustrate that the ecological indicators are 66.39, socio-cultural 57.14, economic 56.31, and legal-institutional 57.44, with a fairly sustainable status. In the Technology-Infrastructure Indicator 45.48, the status is less sustainable. It is necessary to increase the status of sustainability in the future, and it is necessary to make efforts to improve overall in all sensitive aspects of increasing the status of cattle breeding areas.

Keywords: cattle breeding business, intensive rearing pattern, rap-UPTS

## ABSTRAK

Peningkatan pertumbuhan penduduk menyebabkan meningkatnya pangan asal hewani salah satunya daging. Permintaan daging sapi tidak diimbangi dengan peningkatan populasi dan produktifitas sapi Nasional. Kebijakan pembibitan ternak sapi dimasa depan membutuhkan informasi dasar, potensi sumberdaya dan fasilitas pendukung yang diaktualisasikan dalam indikator dan aspek keberlanjutan. Penelitian bertujuan untuk menganganalisis indeks dan status keberlanjutan usaha pembibitan ternak sapi dengan pola pemeliharaan intensif di Situ Bolang Indramayu Jawa Barat yang di nilai dari indikator ekologi, sosial-budaya, ekonomi, hukum-kelembagaan dan teknologi-infrastruktur. Metode yang digunakan adalah Multi Dimensional Scaling (MDS) dengan pendekatan *Rap-UPTS* untuk analisis nilai indeks dan status keberlanjutan. Identifikasi indikator yang sensitif dan kesalahan nilai indeks dan keberlanjutan pada setiap aspek dilakukan analisis Leverage dan Monte Carlo. Responden yang digunakan berjumlah 12 orang peternak. Hasil analisis indeks keberlanjutan menggambarkan bahwa indikator ekologi 66.39, sosial-budaya 57.14, ekonomi 56.31, dan hukum-kelembagaan 57.44 statusnya cukup berkelanjutan. Pada Indikator Teknologi-infrastruktur 45.48 statusnya kurang berkelanjutan. Perlunya peningkatan status keberlanjutan masa yang akan datang maka perlu dilakukan upaya perbaikan secara menyeluruh pada semua aspek yang sensitif dalam peningkatan status wilayah pembibitan ternak sapi.

Kata kunci: pola pemeliharaan intensif, *rap-UPTS*, usaha pembibitan ternak sapi

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## INTRODUCTION

The increase in population growth causes an increase in the need for food originating from animal proteins, one of which is meat. The government has designed various programmes to make Indonesia self-sufficient in beef by 2025, which means that 90% of the national meat demand comes from within the country (Ministry of Agriculture 2019). To deal with dependence on imported meat, it is necessary to have a very large government intervention to implement plans and strategies for the development of beef cattle farming in Indonesia. The strategy used is to increase potential income and optimal value among breeders for the beef cattle breeding business.

Based on BPS data for West Java Province (2021), Indramayu Regency in 2020 recorded a population of beef cattle reaching 11.033 heads, and there was an increase, namely that in 2021 it would reach 11,364 heads. Based on the cooperative's report, the Situ Bolang tourist area has a population of 1.580 cattle, but unfortunately, the production rate has never been updated on livestock productivity to be analysed so that this livestock business can be sustainable. The demographics of the Situ Bolang area are located in the coastal area of the river and have the largest rice production from one of Indonesia's food estates, as well as mango plantations as a regional superior product that is very widely spread, so that it has potential in breeding cattle cultivation because it still has potential if it is integrated as animal feed. Along the way in the village, there are many cattle roaming around (untied), owned by farmers and ranchers. However, it has not been able to meet the criteria for production and good breeding techniques because it is kept in a simple and traditional manner.

Areas that have sustainable livestock development have indicators that need to be evaluated, including ecological, socio-cultural, economic, legal-institutional, technological, and infrastructure aspects. It will be optimal if the development of sustainable livestock (sustainable development) is able to apply and unify the views of various stakeholders (Saragih and Sipayung 2002); Suyitman *et al.* (2009). In general, the aim of the research is to assess the status of the index of sustainability and sensitivity in the cattle breeding business with intensive maintenance patterns from various indicators and aspects for improvement and as a basis for formulating policies for the development and breeding of sustainable beef cattle breeding in the future.

## MATERIALS AND METHODS

The research was carried out in Situ Bolang, Cikedung District, Indramayu Regency, West Java Province. At this research stage, it was started by conducting site visits, observations, direct field observations, Focused Group Discussions (FGD), and interviews using a questionnaire (question list) with beef cattle breeders with intensive rearing patterns to obtain primary data. Secondary data was obtained from written documents from the Village Government, District, related offices, livestock cooperatives in the farms of Situ Bolang Village, Cikedung District, Indramayu Regency, previous studies, and previous research (journals and research reports) as a sampling reference. The determination of respondents was carried out using a purposive sampling method, taking into account the potential of human resources, land conditions, the geographical location of the area, and fluctuations in the nursery business. This has been carried out for a long time (Singarimbun and Efendi 1995). The respondents used amounted to 12 farmers with the characteristics of having breeders over 30 years of age, a minimum education history of elementary school (SD), having farming experience of more than 10 years, and having the largest number of livestock (more than 1 head).

Analysis of the sustainability of the cattle breeding business is carried out using multidimensional scaling (MDS), which is called the Rap-UPTS approach (Rapid Appraisal of Cattle Breeding Business), which is a development modification of the Rapfish method (Rapid Appraisal of Fisheries), which is used in assessing the sustainability status of fishing based on ecological, economic, social, technological, and institutional indicators (Kavanagh 2001). MDS is used to assess the level of sustainability and identify sensitive aspects of each indicator in the cattle breeding business, which includes ecological, socio-cultural, economic, legal-institutional, and technological-infrastructure indicators. The results of these values then determine one or certain points to be able to describe sustainability so that it can be analyzed from two references, namely a good point with a number 100 and a bad point with a number 0. The following are the categories of sustainability in a system that were identified in the analysis contained in Table 1.

Table 1. Cattle breeding business sustainability status category

| Index Value | Category |
| --- | --- |
| 0.00 – 24.99 | Bad (un sustainable) |
| 25.00 – 49.99 | Less (less sustainable) |
| 50.00 – 74.99 | Sufficient (sufficiently sustainable) |
| 75.00 – 100.0 | Good (sustainable) |

Source: Kavanagh and Pitcher (2004)

For indicators that are sensitive to each aspect, follow-up is carried out through leverage analysis. To correct random errors made in input or errors in the resulting model, it is necessary to carry out Monte Carlo analysis with a confidence value of 95%. To determine whether or not there are additional aspects and to compare the accuracy of the indicators analyzed with the actual situation, it is necessary to determine the value of stress (S) and the coefficient of determination ($R^2$). If the stress value is less than 0.25 and $R^2$ is close to 1, then the results of the analysis are categorized as pretty good. This analysis is all summarized in one software application called MDS Rap-Fish, which is complete inside

### RESULTS AND DISCUSSION

West Java Province (West Java) is known as a strategic area with great tourism and agricultural potential, one of which is in the livestock sector, especially in cattle management. With the potential of the existing area to fulfil the increase in production value, it can contribute to efforts to fulfil the national meat supply, one of which is the fulfilment of beef in West Java and Indramayu Regency. Geographically, Indramayu Regency is located at coordinates 107052-108036 East Longitude and 6015-6040 South Latitude (BPS Indramayu Regency 2018). Most of the land settlements in Indramayu Regency are land with a slope of 0%–2%, covering an area of 201.285 ha (96.03%) of the total area. The climate in the Indramayu region is included in the tropical climate category, with air humidity ranging from 70–80% in 2017. The average rainfall during 2017–2018 was 2.146–2.147 mm, with 142 and 90 rainy days. Based on this location, Indramayu Regency has the potential to be used as land for agriculture, plantations, and animal husbandry. This is also supported by the culture of the people, who have been accustomed to farming and raising cattle for a long time and integrate each other as a whole. Besides that, Indramayu district is known as the national food stomach for rice and is famous for Indramayu mangoes. So, it is no longer wrong if the district has the potential to be the right place for cattle breeding and development.

Based on the MDS, it was found that the index value of the sustainability of the cattle farming business with an intensive maintenance pattern in Situ Bolang, Cikedung District, Indramayu Regency, West Java, with an average of 56.55 was obtained from the assessment of the five indicators, namely ecology, socio-culture, economy, law-institutions, and technology-infrastructure. The sustainability status in this analysis can be categorized as quite sustainable because it is in an ordinate scale position between 50.00 and 74.99. The resulting stress value obtained an average of 0.13 with a good category because it is below the value of 0.25, and the average coefficient of determination ($R^2$) is 0.95 with a good and high status because it is close to 1. These results are in line with Fisheries' opinion (1999), which states that if the stress value is less than the value of 0.25 and the value of R2 is close to 1, The statistical index values of the five sustainability indicators from the Rap-UPTS analysis are shown in the form of a kite diagram in Figure 1 and in the
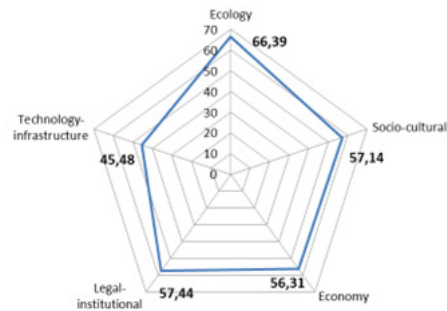


Figure 1. Sustainability index kite diagram

form of a table presented in Table 2.

Sustainability index values for each indicator of cattle breeding business in ecology (66.39), socio-cultural (57.14), economy (56.31), and legal institutions (57.44) are included in the good category with quite sustainable status, while the technology-infrastructure indicator (45.21) is in the bad category with less sustainable status. The index value will continue to increase until it reaches sustainability status, so it is necessary to improve the sensitive aspects that affect the index value of the five indicators in each aspect, which are assessed by respondents based on the geographical conditions of the area. The stress value analyzed by MDS for each indicator has an average value of > 0.25, where the smaller the stress value, the better the MDS analysis results. The coefficient of determination (R2) for each indicator and its average value are very high (close to 1).

In the Monte Carlo value analysis with 95% confidence in Table 2 for each of the indicators, the results are not too far different from the MDS results. This difference illustrates that the analysis under study obtained the highest level of trust (Thamrin *et al*. 2007). This slight difference in scores explains that (1) there is a relatively small error in designing the score for each aspect, (2) there are variations in scoring due to relatively small differences of opinion (opinion), (3) there is stability in the repeated MDS analysis process, and (4) if an error occurs in data entry, missing or missing data can be avoided. Based on the statistical index of the cattle breeding business with an intensive rearing pattern in Situ Bolang, Cikedung District, Indramayu Regency, West Java, it can be concluded that all aspects of each indicator can describe sustainability in the future.

Table 2. Value index Sustainability. Monte Carlo 95%. and statistical parameters (goodness of fit) for cattle breeding business

| Indicator | Index Sustainability | | Difference | Stress | $R^2$ |
|---|---|---|---|---|---|
| | MDS | Monte Carlo | | (%) | (%) |
| Ecology | 66.39 | 65.4 | 0.99 | 0.131 | 0.956 |
| Socio-cultural | 57.14 | 57.51 | 0.37 | 0.133 | 0.953 |
| Economy | 56.31 | 56.28 | 0.03 | 0.134 | 0.955 |
| Legal-institutional | 57.44 | 57.38 | 0.06 | 0.135 | 0.955 |
| Technology-infrastructure | 45.48 | 45.47 | 0.01 | 0.140 | 0.952 |
| Average | 56.55 | 56.41 | 0.14 | 0.13 | 0.95 |

Source: Primary data processed in 2023

For the discussion of the results of the Rap-UPTS and Leverage analysis on each sustainability indicator are as follows:

1) **Ecological Indicator Sustainability Status**

Based on Figure 2, the results of the Rap-UPTS ordination on the ecological indicator obtained an index value of 66.39 (located at an ordinated scale position between 50.00 and 74.99), and the results of the analysis show that the cattle breeding business with an intensive maintenance pattern carried out in Situ Bolang, Cikedung District, Indramayu Regency on ecological indicators has status in the fairly sustainable category. MDS analysis on ecological indicators has a stress value of 0.1309 and an $R^2$ value of 0.9556. If the resulting stress value is less than 0.25 or less than 0.25 and the $R^2$ value is close to 1, then the results of the current analysis have described very good results.

and 74.99), and the results of the analysis show that the cattle breeding business with the intensive rearing pattern carried out in Situ Bolang, Cikedung District, Indramayu Regency on socio-cultural indicators has a status in the fairly sustainable category. The MDS analysis of socio-cultural indicators has a stress value of 0.1331 and an $R^2$ value of 0.9530. If the resulting stress value is less than 0.25 or less than 0.25 and the R2 value is close to 1, then the results of the current analysis have described very good results.

To see aspects that have a sensitive value and have a significant influence on the value of the sustainability index on socio-cultural indicators, a leverage analysis is carried out. Based on the results of the leverage analysis, it was found that 5 aspects were sensitive to the sustainability index value of socio-cultural indicators, namely: (1) the level of experience of the workforce in animal husbandry (4.04); (2) the distribution of poskeswan locations (3.68); (3) the
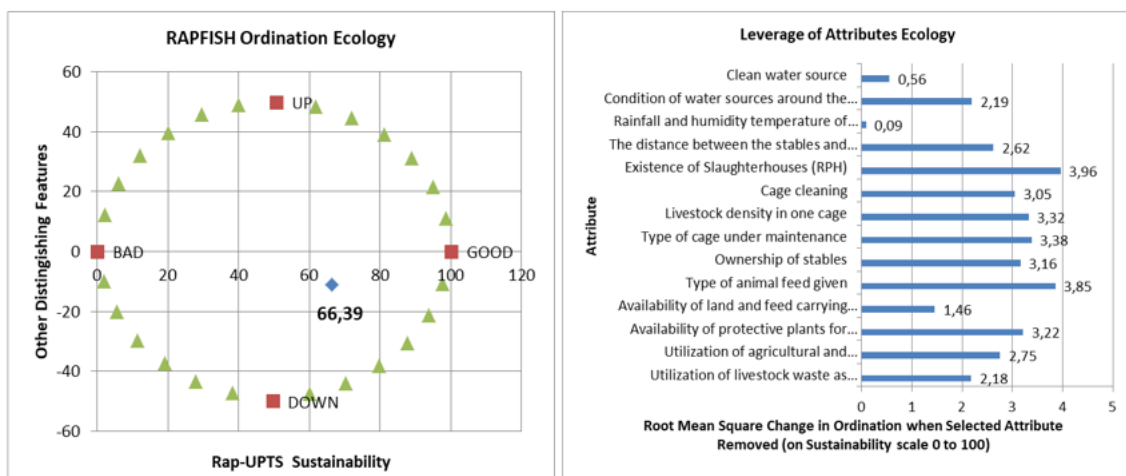


Figure 2. Sensitive value and sustainability index of ecological indicators

To see aspects that have sensitive values and have a significant influence on the value of the sustainability index on ecological indicators, a leverage analysis is carried out. Based on the results of the leverage analysis, it was found that four aspects were sensitive to the sustainability index value of ecological indicators, namely: (1) the presence of slaughterhouses (3.96), (2) the type of animal feed given (3.85), (3) the type of cage used in the maintenance of cattle (3.38), and (4) the density of livestock in one pen (3.32). Four of the fourteen sensitive aspects of this ecological indicator are closely related to the management of livestock breeding. If farmers are able to maintain and even improve the existing conditions and work on them in a coordinated manner, hopefully these small problems can be resolved together. According to Ramadhan *et al.* (2014) on beef cattle farms implemented in Bondowoso Regency, the aspect of distance and location of livestock businesses to residential areas is one of the most influential aspects of the sustainability index in ecological indicators.

2) **Sustainability Status of Socio-Cultural Indicators**

Based on Figure 3, the results of the ordination Rap-UPTS on socio-cultural indicators obtained an index value of 57.14 (in a position on the ordination scale between 50.00

frequency of extension workers and training for breeders (3.58); (4) family participation in the cattle business (3.34); and (5) management of the surrounding environment as a result of damage from the livestock business being carried out (3.31). Five of the twelve sensitive aspects of the socio-cultural indicators are closely related to the habits of farmers in managing livestock breeding. In increasing the sustainability index value of these activities, it can be seen in terms of social indicators because there needs to be special attention and treatment for aspects that provide sensitive values so that they are able to pursue the index value status of being quite good or very sustainable (Mersyah 2005). Livestock business cultivation activities are one of the business systems that have coverage of upstream, cultural, and downstream business systems and supporting services (Saragih 2020). According to Randu and Hartono (2020), The role of livestock consulting and training institutions is very important because it provides a place to increase the capacity of breeders in maintenance management and understanding of new technologies.

3) **Sustainability Status of Economic Indicators**

Based on Figure 4, the results of the Rap-UPTS ordination on economic indicators obtained an index value
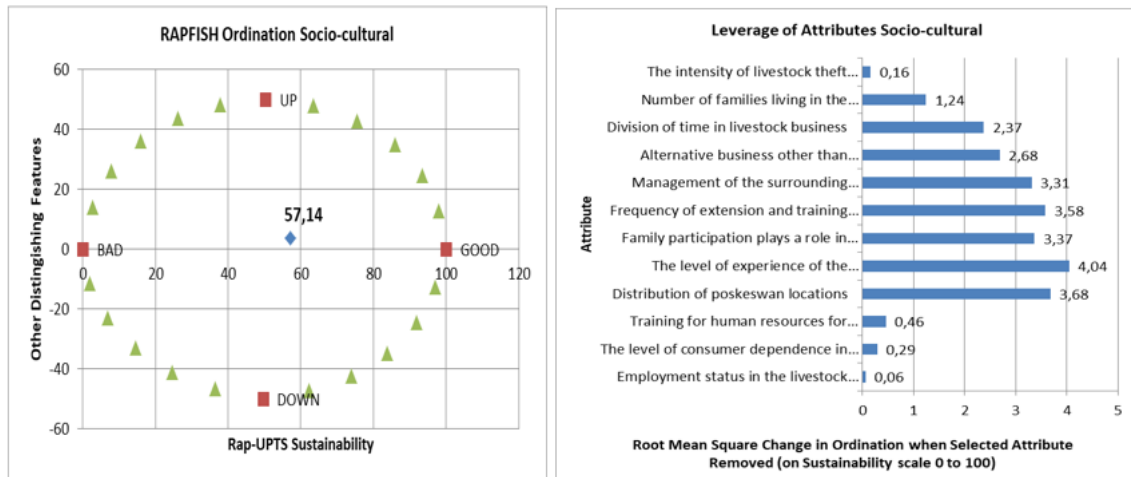
Figure 3. Sensitive value and sustainability index of Socio-Cultural indicators
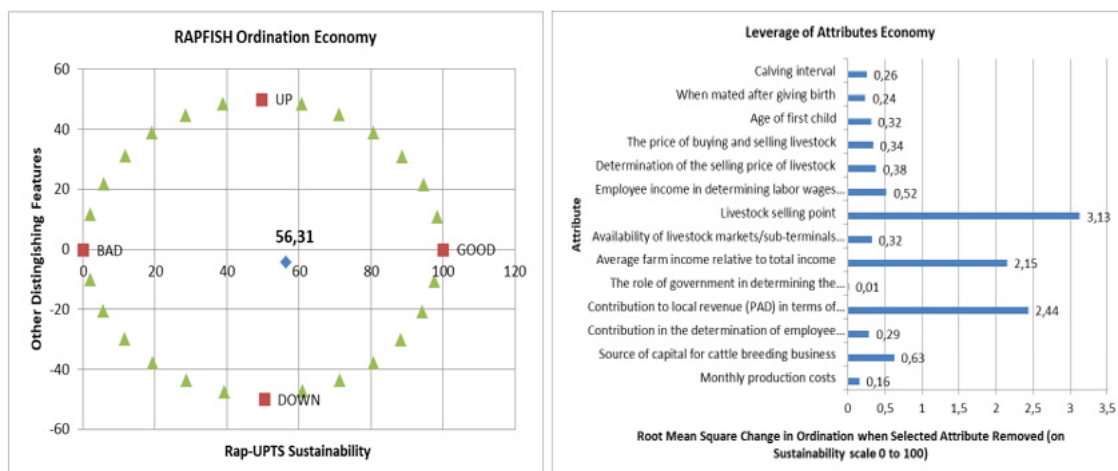


Figure 4. Sensitive value and sustainability index of Economic indicators

of 56.31 (located at an ordinated scale position between 50.00 and 74.99), and the results of the analysis show that the cattle breeding business with an intensive maintenance pattern is carried out in Situ Bolang, Cikedung District, Indramayu Regency on economic indicators having status in the category of quite sustainable. The MDS analysis of economic indicators has a stress value of 0.1343 and an $R^2$ value of 0.9548. If the resulting stress value is less than 0.25 or less than 0.25, and the R2 value is close to 1, then the results of the current analysis have described and shown very good results.

To see aspects that have a sensitive value and have a significant influence on the value of the sustainability index on economic indicators, a leverage analysis is carried out. Based on the results of the leverage analysis, it was found that three aspects were sensitive to the value of the sustainability index of economic indicators, namely: (1) places of sale of livestock (3.13), (2) contribution to regional original income in terms of taxes (2.44), and (3) the average income of breeders relative to total income (2.15). Three of the fourteen sensitive aspects of these economic indicators are closely related to the management of livestock breeding, especially the economic indicators that serve as a reference for farmers in entrepreneurship, so

they need to be maintained. According to Farid *et al*. (2014) setting a standard selling price at the level of producers needs to be enforced by a policy so that it can protect producers (breeders) from price fluctuations and at the same time guarantee production to farmers so that their business has sustainable value going forward. The selling price of livestock greatly affects the income of farmers; what else is done by means of intensive maintenance (Ervina *et al*. 2019).

4) **Legal-Institutional Indicator Sustainability Status**
Based on Figure 5, the results of the Rap-UPTS coordination on the legal-institutional indicator obtained an index value of 55.44 (located in an ordination scale position between 50.00 and 74.99), and the results of the analysis indicate that the cattle breeding business has a rearing pattern. The intensive program carried out in Situ Bolang, Cikedung District, and Indramayu Regency on legal-institutional indicators has a status in the fairly sustainable category. The MDS analysis on legal-institutional indicators has a stress value of 0.1347 and an $R^2$ value of 0.9545. If the resulting stress value is less than 0.25 or less than 0.25, and the $R^2$ value is close to 1, then the results of the current analysis have described and shown very good results.
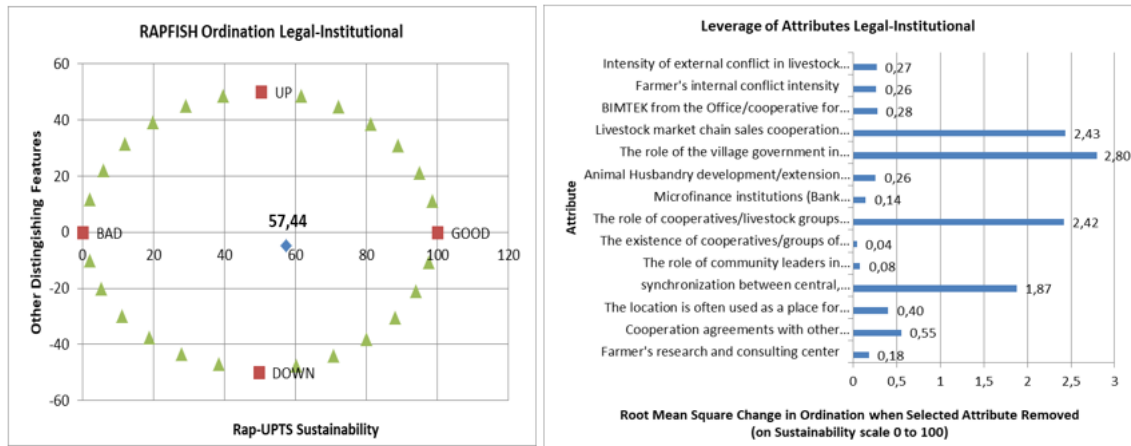
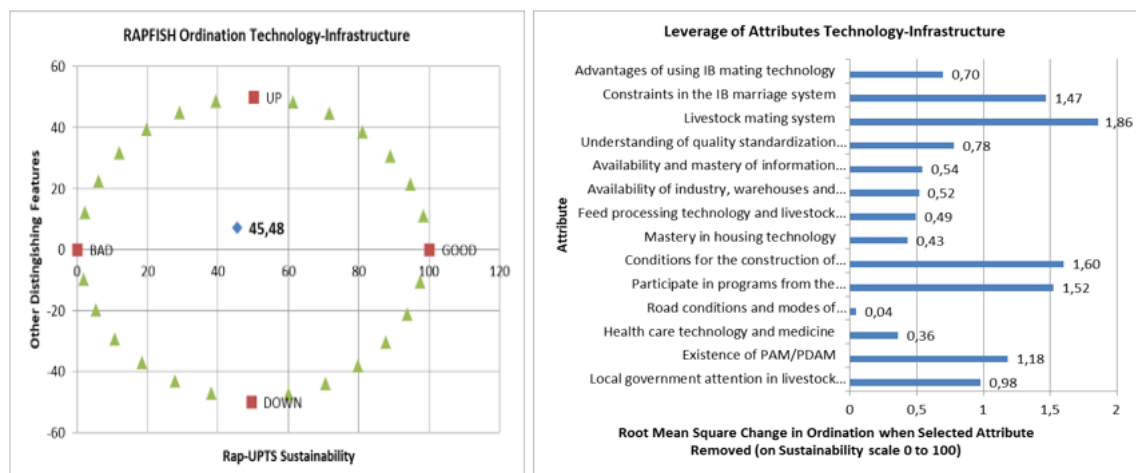Figure 5. Legal-Institutional Indicator Sensitivity and Sustainability Index



Figure 6. Sensitive value and sustainability index of Technology-Infrastructure indicators

To see aspects that have a sensitive value and have a significant influence on the value of the sustainability index on legal-institutional indicators, a leverage analysis is carried out. Based on the results of the leverage analysis, it was found that four aspects were sensitive to the value of the sustainability index of legal-institutional indicators, namely: (1) the role of the village government in determining the zoning of livestock land (2.80), (2) the cooperative network of livestock marketing chain sales (2.43), (3) the role of cooperatives and livestock groups in supporting business sustainability (2.42), and (4) synchronization between central, provincial, and district government policies in the development of sustainable livestock (1.87). Four out of the fourteen sensitive aspects of the legal-institutional indicators are closely related to the management of livestock breeding, so attention is needed so that the goal of meat self-sufficiency in the regions can be fulfilled. According to the Ministry of Agriculture (2016), institutions are a very important aspect of agricultural development. Through animal husbandry institutions and good cooperation, risks in business can be minimized, and businesses are able to develop properly and increase natural resources (Amam and Rusdiana 2022). Some institutions that have the role of developing an environment-oriented beef cattle business and

agribusiness system are: banking, insurance, cooperatives, transportation, extension workers, health posts, government policies, and educational and research institutions (Mersyah 2005).

5) **Technology-Infrastructure Indicator Sustainability Status**

Based on Figure 6, the results of the ordination Rap-UPTS on the Technology-Infrastructure indicator obtained an index value of 45.48 (located in an ordinated scale position between 25.00 and 49.99), and the results of the analysis show that the cattle breeding business with the rearing pattern The intensive program carried out in Situ Bolang, Cikedung District, and Indramayu Regency on the Technology-Infrastructure indicator has a status in the less sustainable category. The MDS analysis on the Technology-Infrastructure indicator has a stress value of 0.1402 and an $R^2$ value of 0.9519. If the resulting stress value is less than 0.25 or less than 0.25 and the $R^2$ value is close to 1, then the results of the current analysis have described very good results.

To see aspects that have a sensitive value and have a significant influence on the value of the sustainability index on the technology-infrastructure indicator, a leverage analysis is carried out. Based on the results of the leverage

analysis, it was found that four aspects were sensitive to the value of the sustainability index of the technology-infrastructure indicators, namely: (1) the livestock mating system (1.86), (2) conditions of longevity of development, sometimes cattle (1.60), (3) following programs from livestock services and extension services (1.52), and (4) constraints in the artificial insemination mating system (1.47). Four of the fourteen sensitive aspects of the technology-infrastructure indicators are closely related to the habits of farmers in managing livestock breeding. According to Budi and Aminah (2010), technology has an important role in increasing production and must carry out better or simpler updates as an absolute condition for the sustainability of agricultural and livestock development. The role of livestock consulting and training institutions is very important because it provides a place to increase the capacity of breeders in maintenance management and understanding of new technologies (Randu and Hartono 2020).

## CONCLUSION

The status of the sustainability index for cattle farming with intensive rearing patterns after being analyzed using multidimensional scaling (MDS) resulted in an average of 56.55, a stress value of 0.13, and a coefficient of determination ($R^2$) of 0.95. The index results and sustainability status on ecological indicators (66.39), socio-cultural indicators (57.14), economic indicators (56.31), and legal institutional indicators (57.44) have quite sustainable status, while technology-infrastructure (45.48) is included in the less sustainable status category. Unsustainable status can occur because the value of the sexy aspect is too high. The results of the leverage analysis show 20 out of 68 sensitive aspects that affect business sustainability. The number of sensitive aspects for each indicator, namely ecology, is 4 out of 14; socio-cultural, there are 5 out of 12 sensitive aspects; the economy, there are 3 out of 14 sensitive aspects; legal-institutional, there are 4 out of 14 sensitive aspects; and infrastructure-sensitive technology, there are 4 out of 14 sensitive aspects. Based on the analysis, it can be concluded that improvements are needed in all sensitive aspects of each indicator, especially infrastructure and technology, so that all indicators become sustainable and production can be increased in the future.

## ACKNOWLEDGEMENT

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