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Abstract. The sustainability of technology processing livestock waste resulting in solid or liquid organic manure, as well as biogas has several barriers. One of them is the availability of the main raw materials such as feces and urine. The production of feces and urine depend on the quantity of the cattle and the feed capacity. Currently, it was challenging to find forage (feeding ground) due to the reduction of grassland, climate change and the conversion of agriculture land into domestic and public facilities. This study aims to identify the adaptive strategy of livestock waste technology facing the vulnerability of the livestock feed ecology. The research was conduct by qualitative approach with comparative case study design on 3 (three) farmer groups at different locations in Pinrang regency result of this research found a several adaptive strategies for the farmers such as learning technology feed, making feed fermentation (silage) and feed concentrate, livestock pasturing in the rice fields after the harvest, buying land for planting fodder forage (HMT), buying urine and feces other livestock, doing other farm coop sanitation periodically, and takes fodder forage that grew into the roads, fields, and dikes on the embankment.

1. Introduction

Sewage treatment technology of livestock more labored, because contribute positively towards the prevention of environmental pollution, increase household income and human health. Some research results reported that livestock waste could be used to produce biogas and organic fertilizer to prevent environmental pollution [1,2]. Biogas energy generated from livestock waste is a clean energy source, environmentally friendly, rich in nutrients and supports sustainable agriculture this is shown with a reported potential methane from waste that can produce biogas, using typical analysis for digester anaerobic, compost from waste cattle[9]microalgae can grow and produce alternative sources of nutrients as well as bioproduct [3-8]. Research in China about the benefits of sewage treatment: use of biomass 55% increased household income,75.58% are believed to have positive impact on human health and environmental protection 82.07%, adoption of biogas technology in Significant in Indonesia, reducing firewood consumption among small farmers, but biogas technology has not yet been optimized at the household level [6,4].

Sewage treatment technology of sustainability of cattle is very dependent upon the volume of feces and urine produced beef cattle. Feces and urine of cattle, biological industry products are categorized. Biologically, the output of livestock waste in the form of feces and urine is influenced by the input that goes into the body of livestock. The input is feed and water consumption. By him that, the sustainability of livestock waste treatment technologies, should be supported by the number of cattle and fodder availability throughout the year. Current conditions, forage feed, is increasingly difficult, due to the extensive use of farmland in Indonesia changed. Based on a percentage (%), the growth of the extensive use of farmland nationwide in the year 2015-2016 showed a negative trend (-1.92%). The details of the percentage (%) of agricultural land, namely: rice (1.16%); tegal/farm (-2.68%); fields/huma (-2.25%) and the land is not cultivated (3.10%) [10]. This condition occurs in the province of South Sulawesi, the percentage growth of the vast farmland use, namely: rice (1.22%); tegal/farm (-1.66%); fields/huma (0.84%); While the land is not cultivated (38.37%), other (plantations, forests, ponds/tebat, etc. (0.36%)[11].

The development of technology subsector Pinrang Regency Ranch in South Sulawesi Province faced constraints. This is caused, the use of land area change, though the last 5 years 2011-2015, created synergy between Government and the community in the development of beef cattle. This is shown from the population growth of beef cattle on average 4.71%[12]. Population growth of beef cattle is expected along with livestock waste processing technology adoption increases. However, the condition of the field show, breeders who use sewage treatment technology of livestock number is still minimal. This caused the existence of various obstacles, including ecological factors.There are three groups of breeding beef cattle in three different areas in the Regency Pinrang which adapt to the waste treatment technology of livestock. Breeder group: Group Budidaya, the Group Ammasanggeng (Pammase Dewata) and Anugrah. The three groups with the characteristics of each product have produced a liquid organic fertilizer, organic fertilizer, and biogas. The resulting product has been marketed and used in paddy fields and non-paddy fields, but ecological changes affect the sustainability of their livestock waste treatment technology. The reduced grazing pastures, widespread decline in agricultural land area due to land conversion as well as seasonal changes directly impact the availability of fodder. Cattle that are experiencing malnutrition will be thin, sick even to death. Cattle growth and development of her body is not normal, will not produce the maximum output. Influential factors of production against the growth of livestock, so the real effect against grass consumption of livestock production, [13,14]. This is a challenge for livestock waste treatment technology.

2. Research methods

The research was carried out in April 2016 until March 2018. This study used a qualitative comparative case study approach on 3 groups of rancher's beef cattle at different locations in the Regency Pinrang. The location of the different studies, because based on the location of each group of the beef cattle breeders. Group Budidaya in the village of Bonne-Bonne Pattirosompe Subdistrict, the Group Ammasangenggeng (Pammase Dewata) in the village of Lanrisang sub-district of Lanrisang, the Group Anugrah in Kelurahan of Tata'E sub-district of Duampanua. The election of the third group of breeders, because it has the same characteristics in terms of the adoption and technological innovation capability of breeding beef cattle, as well as the use of wastewater treatment technology of livestock and livestock feed technology is better than other beef cattle breeders group, Pinrang Regency; processing units waste his cattle produce liquid organic fertilizers, organic fertilizers, and biogas, that have been used in the domestic sphere and the public sphere (marketed); marketing waste product cattle in a wide area difficult; as an escort group of novice breeders more and there is a need for gender relations in his ranch business. As for the difference regarding how marketing waste product cattle, owned resources (the number of livestock, cages, and equipment, the area of farm forage (HMT) and other supporting facilities), the type and level of education, age, ethnicity. The unit of analysis and the informant in this research is a member of the third group of breeding beef cattle, as well as other stakeholders involved in the maintenance and development of the beef cattle farm groups. Determination of informants is *snowball sampling*.

Research data sourced from primary data and secondary data. Method of collecting data: observation, interviews (in-depth interview) for individual and Focus Group Discussion (FGD) in small groups, documentation, audio and visual. The instrument uses a list of interview questions as a general guide but is developed based on the situation and conditions in the field. Descriptive data analysis using the framework [15], with the stages of analysis: 1) collect data and information from interviews, field notes, documents, audio and visual recordings, 2) Examines all data by means of reading, studying and understand it, 3) the reduction of data by way of abstraction 4). Classifying data based on analysis of the presence data, 5). Perform a triangulation of data, 6). Take the conclusions from the results of research to address the research objectives.

3. Result and discussion

3.1. The ecological vulnerability of livestock feed.

The context of ecological vulnerability faced by three groups of rancher's beef cattle against the sustainability of livestock waste processing technology is the same. This is caused, the cow is ruminant livestock, the necessities of life anyway come from forage feed. Forage feed is defined as coarse fibers or materials that are not separated by relatively high. Forage feed is part of plants, mainly grasses and Leguminosae used as feed the needs of livestock feed, forage will continue to grow in line with the increase of the weight of cattle, so the cattle feed availability throughout the year is a must for livestock waste processing technology-based beef cattle farms [16,17]. The vulnerabilities (*vulnerability*) is the conditions determined by factors or processes of physical, social, economic and environmental issues that enhance the trend (susceptibility) a community's response to the impact of hazards [18]. The context of the vulnerability of animal feed in Pinrang Regency in ecology are:

3.1.1. Vulnerability reduction of pasture grazing. The pasture grazing is provided a source of forage which is more economical and can be consumed directly by livestock and wildlife [19]. This indirect area should be able to meet the needs of forage for livestock regarding quantity, quality, continuous. Within the last 5 years, i.e. the year 2013 – 2017, extensive grazing pasture in Pinrang Regency is not experiencing growth (stagnation), the 6,911 Ha [20]. Statistically (quantity) vast grazing pastures do not undergo changes in the last 5 years, but the third group of ranchers grazing livestock area expressed diminishing from year to year, and this gives rise to problems in availability of feed livestock. The difference between statistical data regarding the growth of vast grazing pasture, with information from breeders, because of "differences of concept/definition pasture grazing/pasture" between the Government with a Cattlemen's Group beef cattle. Concept/definition pasture grazing/pasture is a special land used for grazing cattle [11]. While the land is not cultivated (left blank more than one year and less than two years) are not considered as land grazing/pasture, although there are animals who served there. Whereas according to the Group of ranchers, the land is overgrown with grass/Leguminosae in large areas and is left empty, there are no buildings, not cultivated as orchards or fields so that the cattle can graze on the grounds/in the pasture These are "grazing pasture (grazing area)."Concept /definition used the Government and groups of different beef cattle breeders, but the meaning is the same, namely the reference against the asset. The asset is the capacity of the land as a place of growing forage fodder that is ecological. Example: grazing area of the field, the school, the mosque courtyard, pasture. Based on the real conditions, access to the grazing area breeders increasingly difficult. This is due to grazing areas, generally are public, meaning that anyone can access with a different purpose. As a result, there are competitions in utilizing existing assets. Example case, the use of the field at the same time for sports activities football, children's playground, and grazing cattle. In this case, happened competition the use of assets, so that the area used for grazing livestock suffered a reduction. Another important thing, the capacity of production of grass /legume pasture grazing area on the wane. Grasses /legumes, will not be allowed to grow tall, due to the use of the field to soccer sports activities and a playground for children. Grass/legume that grows lush and tall is considered disruptive, so cutting the grass is often done. This phenomenon raises

the vulnerability of waste treatment technology for livestock-based beef cattle farms. The context of vulnerability consists of the internal and external environment, that affects the livelihood of every individual, family, and community so that the reduction of pasture grazing can be categorized as external vulnerability context [15].

3.1.2. The vulnerability of the changing seasons. The third group of farmers beef cattle has trouble getting animal feed, due to seasonal changes. In the rainy season, the abundant forage availability, but in the dry season, forage is hard, both regarding amount or regarding quality. In the dry season, forage (grass/legume) many are dead, its growth is not arable (skinny). This is due to a growth of forage fodder is influenced by various factors, the factors that affect the growth of plants grouped upon internal factors (genetic) and external factors (environment) consisting of climate, edaphic (biological and soil). The dry season, breeders should seek forage to various places, so that animal feed needs are met [21]. As a result, working time (hours/day) and the transportation costs increase. Another important thing, in the dry season, cattle are more prone to various diseases are zoonoses and zoonoses.

3.1.3. The vulnerability of agricultural land conversion. The vulnerability of agricultural land conversion (trend) felt by the three breeders' group of users waste treatment technology of livestock. The vulnerability is caused, the population increasing, so trend (trend) the conversion of agricultural land for the construction of domestic and public facilities is rising. Pinrang Regency residents during the year 2010 – 2016 growth amounted to 4.94%, with an average of 0. 82% per year. The total population in the year 2010 (352,185 inhabitants) and the year 2016 (369,595 inhabitants), so that the population of 17,410 inhabitants, a population density of 188.4 inhabitants/km2. The trend of increased population, along with an increasing number of public facilities such as education and health facilities. In the year 2010, the number of SD/MI (350 units), SMP/MTs (71 units), SMA/SMK/MA (33 units), hospitals/Clinics (17 units), whereas in the year 2016 amount to SD/MI (351 units), SMP/MTs (78 units), SMA/SMK/MA (38 units), hospitals/Clinics (18 units). Education facilities are experiencing growth of 2.86% with median 0.47% per year – is, sanitation 5.88%, with an average of 0.98% per year[22].

3.2 Adaptation strategies for livestock waste processing technology

The strategy is patterns formed by various venture planed man to overcome the problems encountered [23]. The chosen strategy is the result of human interpretation using the framework of specific thoughts, on the environment and the situation. Some of the strategies become the choice of beef cattle breeders group, to address the vulnerability of the availability of livestock feed, for the sustainability of livestock waste technology, shown in table 1.

Table 1. The context of vulnerability and adaptive strategy options

The context of vulnerability	**Adaptive strategy**	**Breeder Groups**		
		Ammasanggeng (Pammase Dewata)	**Budidaya**	**Anugrah**
1. Reduction of pasture grazing (*trend*) 2. Conversion of agricultural land (*trend*) 3. Seasons change (seasonality)	learning technology feed	selected	selected	selected
	making feed fermentation	selected	selected	selected
	livestock pasturing in the rice fields after the harvest	selected	selected	selected
	buying land for planting fodder forage (HMT)	selected	selected	selected
	buying urine and feces other livestock	selected	selected	not selected
	doing other farm coop sanitation periodically	selected	not selected	not selected
	takes fodder forage that grew into the roads, fields, and dikes on the embankment	selected	selected	selected

3.2.1 The strategy of learning technology feed. The three groups of beef cattle farmers: Ammasanggeng (Pammase Dewata), Anugrah and Budidaya, participated actively in the training activities undertaken by the Department of agriculture and animal husbandry Pinrang Regency. Breeder group was represented by the Chairman of the group to follow the training. From the training, they learn about technology making animal feed, forage feed types, feeding method. Furthermore, the Chairman of the group will split the feed technology knowledge to the other group members, as well as applied technology feed together in groups. If there are things that are not yet in the know, they will be asked to Field extension officers Officer (PPL). The selection of strategies by the three groups aims to improve livestock maintenance efficiency, this is by [23], that the increase in efficiency can be done by making use of existing resources such as technology resources livestock and human resources namely farmers as managers and workers.

3.2.2 The strategy of making feed fermentation. Knowledge technology feed has been obtained by the three groups of beef cattle breeders of further applied in the strategy of making the feed. The three groups (Ammasanggeng (Pammase Dewata), Anugrah and Budidaya), make the fermented feed from rice straw or corn straw. The appropriate technology for preservation of feed is one of the smartest solutions to overcome the problem of limited feed [24,25]. Nutritional value of rice straw can be upgraded with various methods of treatment. Preservation of fodder can be done with ease, fun, safe and profitable, as long as the steps meet the requirements. Therefore, when the availability of resources is abundant, i.e. after harvesting rice in the fields or harvesting corn, farmers make as much fermented straw bait as possible., i.e., after harvesting rice in the rice fields or harvest corn, straw fermentation feed making breeders as much as possible. The feed is then stored in a warehouse, then feed given to cattle every day. So, feeding forage systems are done there are two, namely, feed fresh forage and fodder fermented. To spur the growth of livestock, the three groups of dairy farmers make feed concentrates which serve as feeding booster. The composition of the feed material concentrates that are created varies, depending on the availability of existing materials. The materials used such as rice bran, corn husks, milled out.

3.2.3 The strategy of livestock pasturing in the rice fields after the harvest. The three groups of ranchers beef cattle, using an intensive feeding system. It is aimed, urine and feces sewage accommodated to the maximum in the waste treatment unit. However, after the rice harvest, breeders in selecting feed cattle in the fields, in the morning until the afternoon. Feeding strategies change because breeders are adjusting to changes in the external environment. After the rice harvest, the open breeders access to the assets of the paddy fields and the availability of fresh rice straw and forage abundant in rice fields. The selection of this strategy was aimed at optimizing the resources of agricultural waste, making efficient use of feed using local raw materials feed manifest per kg rice harvest may produce 1-1.5 kg hay[23, 25].

3.2.4 The strategy of buying land for planting fodder forage (HMT). The three groups of breeders do the same thing, namely the results of sales of cattle and livestock waste savings. These funds are used to buy assets in the form of land planted with fodder forage (HMT). The grass is one type of multipurpose plant, serves as the staple feed of ruminant livestock, crop and the prevention of erosion [26]. The low productivity of forage feed the local open opportunities for the introduction of forage feed is superior so that the needs of the ruminant animal feed developed can be fulfilled. The type of fodder forage (HMT) is planted grass have high productivity and favored by livestock, such as elephant grass (*Pennisetum purpureum*), grass King (*Pennisetum purposes*), Setaria (*Setaria sphacelata*). The seeds are used on early planting is obtained from the Department of agriculture and animal husbandry, Pinrang Regency next to rejuvenation of plant using their plants from cuttings.

3.2.5 The strategy of buying urine and feces other livestock. Two groups use this strategy, namely the Group of breeders Ammasangeng (Pammase Dewata) and Budidaya. This group offers cooperation to other breeders, such as the purchase of feces or urine. The model of collaboration that does both groups have differences. The Group Ammasangeng (Pammase Dewata) bought the urine in the form of raw materials (not processed), at a price of Rp 400.000,-/1000 liters. The Feces and urine processed into organic fertilizer in the Group Ammasangeng (Pammase Dewata). Meanwhile, Budidaya, the group, bought the feces in the form has been processed (solid organic fertilizers) in the way of precipitation that is ready to be marketed.

3.2.6 The strategy of doing other farm coop sanitation periodically. Sanitation is routine work that must be done by the breeder[13], sanitation aims to destroy disease-causing organisms. Sanitation can be done by cleaning the enclosure. Required power and time to do it, so breeders sometimes lazy to do it. Another important thing, many breeders are not yet using waste treatment technology of livestock, so that feces and urine on his ranch are not processed. This phenomenon, seen as an opportunity by a group of ranchers Ammasanggeng (Pammase Dewata). They then do a partnership with offered his services to another farm coop sanitation, but the feces and urine of the ranch fully belong to the Group of breeders Ammasanggeng (Pammase Dewata). The consequences of this collaboration, a group of breeders Ammasanggeng (Pammase Dewata) clean the Coop partners regularly 1 x/week, feces and urine was taken to his ranch to be processed into solid and liquid organic fertilizer.

3.2.7 The strategy takes fodder forage that grew into the roads, fields, and dikes on the embankment. The three groups of breeders take fodder forage (HMT) that grows with the lush roadside dikes, in the fields and fishponds, schoolyard, as well as various other locations, covered forage. The breeder chose this strategy because feeding cattle forage (HMT) is natural, its availability throughout the year, not purchased, endeared by cattle and is considered a weed by the community. According to [19], the forage feed local adaptive ability has to grow and develop, by existing environmental conditions. Many types of natural forage to grow grass, namely needle grass (Andropogon aciculate), Teki grass (*Cyperus rotundus* L), were grass (*Eleusine indica* (l.) Gaertn), Alang-Alang (*Imperata cylindrical).*

3.3. The factors that underlie the selection strategy

Based on the previous description, then the factors underlying the election strategy group of breeders is shown in table 2.

Table 2. The context of vulnerability, adaptive strategies, and factors that underlie the selection strategy

The Context Of Vulnerability	Adaptive Strategies	The Factors That Underlie The Selection Strategy
1. Reduction of pasture grazing *(trend)* 2. Conversion of agricultural land*(trend)* 3. Seasons change (seasonality	learn the feed technology	The existence of a learning room facilitated by the government and the motivation of the breeder to forward and to develop
	make fermented feed and concentrate feed	Adoption of the technology supported by the availability of resources, easily applied, does not need a huge cost
	livestock pasturing in the rice fields after the harvest	Access to resources is open at a given period
	buying land for planting fodder forage (HMT)	Availability of funds for livestock sales results and waste products used to buy assets, the land purchased can be multi-functional (land of HMT and investment)
	buying urine and feces other livestock	Cooperation between the Group of breeders to increase revenues
	doing other farm coop sanitation periodically	Other lazy ranchers do sanitary cages, the cost is not great, due to the use of labor from his ranch yourself
	takes fodder forage that grew into the roads, fields, and dikes on the embankment	the availability of fodder forage naturally (HMT) throughout the year, not purchased, the palatability of high cattle and is considered a weed by the community.

4. Conclusion

Adaptive strategy in dealing with the breeders performed a vulnerability the availability of livestock feed, namely: learn the feed technology, making feed fermentation (silage), making the feed concentrates, feed cattle in rice fields after harvest, purchase of land for planting with HMT, feces and urine bought another farm, cleaning kennels breeders of other periodically, and take the HMT that grows on the roadside, in the fields and fishponds dikes.

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