



## RESEARCH ARTICLE

### STUDY OF DEVELOPMENT AND POPULATION STRUCTURE OF DAIRY COWS FRIESIAN HOLSTEIN IN ENREKANG, SOUTH SULAWESI, INDONESIA

\*<sup>1</sup>St. Aisyah, R., <sup>2</sup>Darmawan Salman, <sup>3</sup>Ahmad Ramadhan Siregar and <sup>3</sup>Syahdar Baba

<sup>1</sup>Lecturer of Muhammadiyah University, Doctorate Student of Department of Agriculture Sciences, Postgraduate School, UNHAS, Makassar, Indonesia

<sup>2</sup>Department of Agribusiness, Faculty of Agriculture, UNHAS, Makassar, Indonesia

<sup>3</sup>Departement of Socio-Economic, Faculty of Animal Husbandry, UNHAS, Makassar, Indonesia

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#### ABSTRACT

Indonesia's dairy cows population tends to increase with growth of 5.18%. The population growth of dairy cows in Java from 2013 to 2017 has decreased by 1.2% per year, while outside Java has increased 1.33% per year. Enrekang Regency is one of the areas in South Sulawesi that has suitable characteristics for the development of dairy cows. The uniqueness of the development of dairy cows in Enrekang namely the processing of fresh milk is made into Dangke. The data analysis method used in this study was analytical descriptive. The results showed that the development of the dairy cows population in Enrekang during the last five years (2013-2017) had increased where the dairy cow population structure consisted of 60.81% adult cows (up 272), male calf 10.37% (up 47), young females 9.47% (up 42), female calf 9.05% (40), young males 9.02% (up 40), and adult bulls 1.28% (up 5 tails). The dynamics of dairy cow population consisted of livestock expenditure percentage of 4.42% and livestock income 5.35%. Thus, the development of petroleum cows in supporting the steps of milk and animal milk in 2020 must begin with the revitalization of dairy cow production and promoting the development of dairy cows outside of Java, one of which is Enrekang. Efforts to achieve self-sufficiency in animal protein are not limited to the ability to provide adequate food for the community but must also be accompanied by an increase in the quality of community-based food consumption. With the existence of good cooperation among the central government, the regions and stakeholders can realize Indonesia as a World Food Barn in 2045.

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## INTRODUCTION

Based on data obtained from The United States Department of Agriculture (USDA), the world's cattle population in the last five years (2013 - 2017) averaged 139.18 million heads with an increase in growth reaching 1.39% per year. A fairly high surge occurred in 2014 with an increase of 1.9% compared to the previous year and the lowest in 2016 of 0.89% compared to 2015. In 1980 - 2017 Indonesia's dairy cattle population tended to increase with growth of 5.18%. The population growth of dairy cows in Java for the period 2013 - 2017 had decreased by 1.2% per year, while outside Java Island had increased 1.33% per year (Data Center and Agricultural Information System, 2017). The magnitude of Indonesia's potential for developing dairy cow business. Increasing the dairy population can be done in an area supported by the potential of the area. Regional potentials for the development of dairy cows can be increased by providing food availability, farmer knowledge, demand for milk, farmer income, market infrastructure, the role of lending

institutions and local government policies. Dairy farming is one of the most promising businesses and the opportunity is still widely open (Nurcahyanti, 2017; Santosa, et al, 2013). Geographical, ecological and fertility conditions in several regions of Indonesia have characteristics that are suitable for dairy agribusiness development. In addition, from the demand side, domestic milk production is still insufficient to cover domestic consumption needs (Data Center and Agricultural Information System, 2017). Dairy farming (milk production) is one of the important sectors in the agricultural economy, especially in milk supply and price demand (Paura and Arhipova, 2016). Major advances in environmental management of dairy cows in Indonesia cows include improved housing systems, increased ration formulation, improved reproductive performance using an insemination approach to avoid estrus detection, and the use of modified photoperiods to maximize lactation performance (Collier et al., 2006). The development of a dairy farming business outside of Java needs to be supported given the existing strength factors such as the market potential of fresh milk, climate suitability and fibrous feed sources. Both central and regional governments need to support this effort through facilities and

\*Corresponding author: St. Aisyah,

Lecturer of Muhammadiyah University, Doctorate Student of Department of Agriculture Sciences, Postgraduate School, UNHAS, Makassar, Indonesia

regulations, including easy access to capital with reasonable business credit rates. The utilization of the potential of land outside Java for the development of dairy cattle business has a great prospect in encouraging the realization of a milk self-sufficiency program. Among other things include the availability of land for increasing population and the provision of feed, especially fiber source feed, agro-ecosystem suitability for the development of dairy cows and animal feed crops. Thus the population of dairy cows outside Java is spread on the islands of Sumatra, Sulawesi, Kalimantan, Bali and Nusa Tenggara (Matondang, *et al.*). This can be seen from the average population experienced an increase over the last five years (2013-2017) outside Java, namely on the island of Sulawesi, especially South Sulawesi as many as 1494 cows (1410, 1464, 1515, 1529 and 1552), Sumatra island in particular North Sumatra as many as 1427 cows (1901, 1088, 1078, 1409 and 1663) and West Sumatra as many as 893 cows (1101, 674, 849, 891 and 953). Moreover, Kalimantan, Bali and Nusa Tenggara, the average of dairy cows population does not exceed 250 head (Directorate General of Animal Husbandry and Animal Health, 2017). Research on population structure has been carried out mainly in beef cattle and buffaloes (Kusuma, *et al.*, 2017; Marsudi, *et al.*, 2017; Ashari, 2012; Talib, *et al.*, 2017) but research on the development and structure of dairy cows populations is still limited to product superior area. Enrekang Regency is one of the regions having suitable characteristics for the development of dairy cows because of the mountains and the biggest milk producer in South Sulawesi Province. The uniqueness of the development of dairy cows in Enrekang, namely the processing of fresh milk is made into Dangke. Dangke is a leading commodity in Enrekang which is constantly being pushed to increase economic growth and welfare of the local community so that it needs to get special attention and become a priority to be developed through maximizing the results. Therefore, this study aims to describe the development and population structure of Holstein Friesian dairy cows in Enrekang. The description of the development and structure of the dairy cows population in Enrekang is used as a reference for efforts to improve productivity towards 2020 milk self-sufficiency and consideration and evaluation for determining central and regional government policies in facing the global free market.

## MATERIALS AND METHODS

This research was conducted from February 2017 to July 2018. This research was conducted in Enrekang District with the consideration that: (1) Enrekang is one of the largest milk-producing regions in South Sulawesi Province, (2) Enrekang has traditional specialties from cow's milk known as Dangke. The research approach used is a qualitative approach. The main data used in this study are secondary data and literature. Secondary data compiled is periodic data over a period of five years, from 2013 to 2017 sourced from several related institutions, among others, the Agricultural Information System and Data Center Secretariat General of the Ministry of Agriculture, Directorate General of Animal Husbandry and Health, Livestock and Health Service Animals of South Sulawesi, Animal Husbandry and Fisheries Service, and Enrekang Central Bureau of Statistics. Data collected through library studies is obtained through literature studies, scientific journals, and the results of previous studies. Research data collection uses techniques: observation, interviews with research informants, namely dairy farmers, Dangke collectors,

Livestock and Fisheries Service, and documentation. The data analysis method used in this study is descriptive analytical. This method is done by collecting data from various sources, then compiled and analyzed into information to explain. Data analysis in this study is descriptive analysis by describing the conditions of development and structure of the dairy population in the Enrekang.

## RESULTS AND DISCUSSION

### A. Development of Dairy Cattle Population in Enrekang:

One of the strategies for developing dairy cows in Indonesia is through revitalizing people's dairy cows outside Java. South Sulawesi is one of the provinces outside Java that has a dairy cow population. Enrekang has a strategic role in developing dairy cattle in South Sulawesi and outside Java which has been designated as a livestock area by the Ministry of the Republic of Indonesia. Enrekang is very suitable for the development of dairy cows because it is an agricultural and highland area (cold temperature). In 2002, the regional government initially proposed the inclusion of Java Holstein Friesian dairy cows from Enrekang. Procurement of dairy cattle business comes from local government assistance, and community self-help where the dairy cattle population has increased to reach 465 in 2011 and in 2017 the dairy cattle population reached 1.530 (Enrekang Central Bureau of Statistics, 2018). This is in line with the opinion of Nurcahyanti (2017) that the development of dairy farming is inseparable from the role of the Dairy Cooperative which seeks to improve the condition of livestock with planned programs, one of which is free treatment for sick cows and free artificial Insemination injections. The government provides assistance in the form of cattle credit channeled through the Dairy Cooperative. This result is also supported by Sanny (2011), in terms of opportunities, Indonesia is geographically very broad and has a strategic industry which is able to grow and develop and become independent. To be able to increase the productivity of dairy cows, there is a need to develop a program for farmers of cow milk, because 90% of cow's milk production is produced by farmers. In addition, the land is an important investment where each institution has its own pattern in land management and has real rules that apply from generation to generation and cannot be changed by anyone (Mappa *et al.*, 2018).

Feed is very important in increasing milk production. Feed potential in Enrekang consist mainly of green sources of grass in the central area more diverse than non-central regions, but the potential source of concentrates is more in the non-concentration area. Utilization of rice and corn straw is only carried out during the dry season. Peanut straw is used by all farmers when the harvest season (end of the rainy season) because it can increase milk production significantly. Utilization of plantation waste as a source of forage such as coffee peel, cocoa peel, papaya stems and banana stems is carried out by non-concentrated farmers only in the dry season, when elephant grass cannot be cut anymore. Horticultural waste can be used as a source of forage such as carrot and cabbage waste. Plant waste that has not been utilized by non-concentrate farmers is cassava waste, in the form of cassava leaves, the rest of the harvest. The source of feed concentrates in non-concentrated regions is more diverse than the central region. Farmers in the central area only use three types of concentrate sources, namely bran, tofu and corn. Farmers in the non-urban area have a source of concentrate besides the three sources, in the form of sweet potato and cassava,

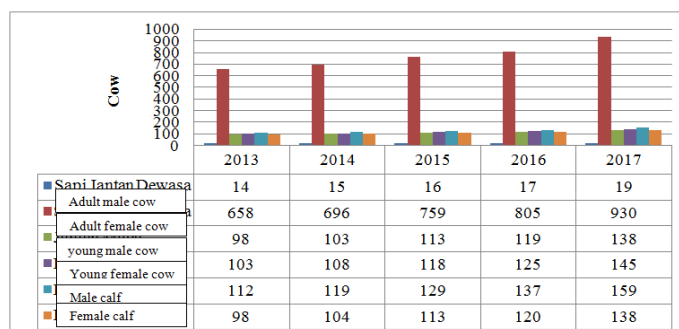
especially sorting products that are not consumed by the public. Sweet potato and cassava are very cheap (IDR 20,000 / 70 kg fresh) in the harvest season, and available in abundant quantities. Based on the experience of farmers, the provision of sweet potatoes and cassava can increase milk production and dangke compared to bran use (Baba *et al.*, 2011). Improvement of feed in lactating dairy cows through the provision of grass combined with fermented corn straw and the addition of concentrate reinforcing feed is very good for increasing milk production in lactating dairy cows (Nurhayu, 2017).

The interesting thing about the maintenance of dairy cows in Enrekang distinguishing it from other dairy cow development areas in Indonesia is all of milk production only intended to fulfill the raw material needs of processing dangke. Dangke, like most traditional dairy products in Indonesia, initially used buffalo milk as raw material. The intensification of the development of dairy cows and the increase in demand for dangke accompanied by a decline in the population and production of buffalo milk in Enrekang which have led to the production of dangke using cow's milk. The Dangke for Enrekang farmers' cheese has also been patented at the Directorate of Patent and Copyright of the Indonesian Ministry of Law and Human Rights. After Dangke was patented, the copyright of Cheese with a dangke can now only be used by farmers in BumiMasserempulu (Enrekang). Based on the opinion of Talib (2009) states that the decline in buffalo population in Indonesia, especially in areas dominated by cattle development. The causes include socialization of the development of cattle that is very intense, the amount of assistance for the development of beef and dairy cattle, the development of cattle development infrastructure, and the beef self-sufficiency program. Therefore, support for increasing productivity of dairy cows includes the increase of population needs. The process of making dangke is a local cultural and technological wealth that needs to be preserved. This culture is still a characteristic of the people in the Enrekang area. If the culture of eating is developed into the South Sulawesi region, increasing community nutrition through consumption can be done through the development of dairy cows. Based on the observation of the potential of absorbing milk to be used as dangke in the area, it is still open considering the high demand for these products.

This is in accordance with the opinion of Putra and Hendriani (2017), the application of a mixture of cow's milk products can provide a guarantee of the continuity of the company going forward, because the company has gained the trust and quality standards of products produced by the company. The product mix problem in the company lies in the name or trademark, product label, product design, guarantee and warranty. This is in line with Elida's findings (2016) stated that the relative condition of resources supports dairy cattle business by improving capital access for farmers, maximizing cultivation technology and increasing dairy cows populations. The increase of farmers' knowledge about diversification of dairy agro-industries, creating forage farms can improve product competitiveness, as well as promotion of processed products. Dairy farming business can still attract the interest of the community so that efforts to increase the quantity and quality of milk production still need to be assisted in terms of facilities and infrastructure followed by increased understanding and awareness to improve business management (Sulistyati *et al.*, 2013).

## B. Population structure of dairy cows

The structure of the dairy cow population must have accurate data so that it can be used as information in the future. The population structure needs to be known as a parameter in regulating the marriage system, maintenance management and the number of population in people's farms. It can be seen how many female and young females of cows are productive and the ratio between female and young females with males. The population structure in dairy cows includes adult female cows (age 2 - >6 years), adult bulls (aged > 2 years), young males and females (aged > 1-2 years) and male and female calves (0-1 years old) can be seen in Figure 1.



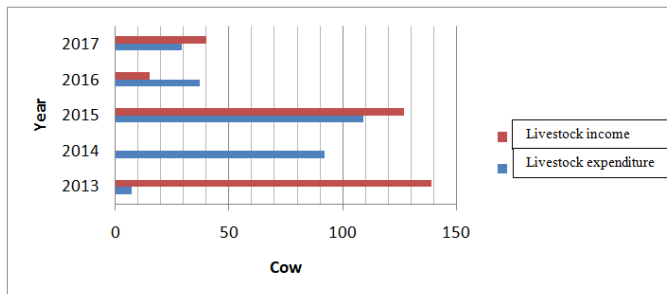
Source: Enrekang Regency Fisheries and Animal Husbandry Statistics

**Figure 1. Population Structure of Enrekang for the last five years (2013-2017)**

The graph shows that dynamics of dairy cattle population in Enrekang in the period of 2013 to 2017 has increased when converted to percent, the average percentage of the highest dairy cows population is in the population of adult female cattle 60.81% (up 272 animals), male calf 10.37% (up 47), young female 9.47% (up 42), female calf 9.05% (40), young males 9.02% (up 40), and adult male cows 1.28% (up 5 tails). The percentage of adult female cattle is higher than other population structures, because farmers keep dairy cows with the main goal of producing milk. Positive effects of the components of milk production take into account nutritional factors, maintenance management, feed management, reproductive and housing performance (Johnston and Devries, 2018; Kidane, 2018; Penry, 2017; Rearte, 2018; March, 2017). Intensive farming has a higher probability than expanding milk production where land availability is an important prerequisite (Samson, 2016). The low percentage of adult male and young male cow livestock populations is due to the efficiency of cages and feed and the low rate of birth (Calving Rate). The percentage of young male cattle is relatively low because of the high sales rate at birth. In addition, this is caused by differences in the seeds used by farmers during the artificial insemination process. The facts in the field prove that there have been many programs which have been rolled out by the central government as well as regions in encouraging the development of dairy cows in Enrekang, superior, IB technical staff, pregnancy inspection officers, reproductive technical assistance officers (ATR) in each sub-district mainly in the center for developing dairy cows and biogas. Other support is the collaboration of the Enrekang Government with the Indonesian Institute of Science and Knowledge, Hasanuddin University and the Ministry of Agriculture by establishing Enrekang which is a dairy cattle breeding area in Indonesia since 2013 which has the consequence of adding both imported and imported populations from Java. The cooperation

among Hasanuddin University, LIPI, Enrekang Techno Park and the Ministry of Research and Technology Ministry made the rest area a center of sales and price control in the Cendana region. Some Enrekang SME products are produced from dangkewhich have met modern market requirements (already have PIRTS, Halal certificates from the Indonesian Ulama Council, legal aspects of the company). Based on Fujun (2018) stated that the interaction relationship between Industry-University-Government promotion provides a reference for the collaboration mechanism of agricultural machinery science and technology innovation. International experience in developing agricultural insurance, government intervention and linking can support the expansion of China's agricultural insurance market (Dick, 2010).

**C. Dynamics of dairy cows population (rates of income and expenditure of dairy cows):** Population dynamics is a change in the population size of the type of livestock in a certain period of time consisting of livestock income and expenditure as shown in Figure 2.



Source: Livestock Statistics and Animal Health of South Sulawesi Province, 2018

**Figure 2. Dynamics of dairy cows population**

The graph shows that livestock income during the last five years (2013-2017) tends to decrease. The largest livestock income was 139 (12.83%) in 2013, in 2014 there was no livestock income, in 2015 livestock income amounted to 127 cows (10.18%), in 2016 dropped dramatically by 15 cows (1.13% ) and 2017 for 40 (2.61%). Based on the results of observations in the field, data on livestock income in Enrekang is generally only because most of farmers do not have a recording system so that the information obtained is also limited. The income of livestock in Enrekang consists of birth and purchase (parent or dairy cows). Factors that influence the birth rate include availability of food determines the individual's energy adequacy to reproduce, the reproductive age effective, birth interval, average number of children per birth, availability of straw cow seeds, marriage accuracy (IB) and farmer and government supervision of programs related to livestock pregnancy. This is in line with the opinion of the importance of the use of automatic detection to see the estrus detection system with short intervals between childbirth and first insemination (Gucht, 2017). The optimal proportion of pregnancies from the embryo transfer system (IVP-ET) produced in vitro and artificial insemination (AI) can maximize profitability in the range of embryo prices and excess dairy calves (Kaniyamattam, 2018). Efficiency based on eating behavior is a parameter on commercial farms (Meir, 2018). Optimizing housing design will improve reproductive performance in dairy cows (Martin, 2015; Shortall, 2018). Potential to increase milk production by considering the composition of supplements was given to cattle grazing (Auldlist, 2016). Producing milk in the future will reflect the

ongoing intensification that benefits animals, agroecosystems, and humans through the production of key nutrients for human consumption (Britt, 2018). Thus, attitudes, behavior of farmers and agricultural managers are able to detect the profitability of agriculture (O'Leary, 2018). In addition, livestock income comes from the purchase of prospective dairy cows imported from Java in the form of young females, wives ready for IB, or pregnant women. Thus the prospective mother of dairy cows is not as a production output, but rather the process of procuring production inputs for dairy cows business. The figure 2 also shows that the expenditure rates for dairy cows in Enrekang declined during the last five years (2013-2017). In 2015, the largest livestock expenditure was 109 (8.73%), in 2014 there were 92 animals (8.03%), in 2016 there were 37 animals (2.80%), 2017 as many as 29 (1.90%) and the lowest in 2013 was 7 (0.65%). Based on the results of observations in the field that livestock expenditure come from livestock deaths and the sale of livestock (cows, heifers and rejects). Factors of livestock death are caused by diseases, the length of the birth process will also result in death of the child and mother of cattle. Death is generally caused by a lack of supervision by farmers and the condition of children who are weak at birth as well as a lack of special handling from farmers to mothers of mothers before birth or newborns, predators, famine, natural and climate disasters. This is in accordance with Hansson (2016), Kristensen's (2011), VanWormer (2017) and Oliveira (2018) opinion that dairy farmers consider the welfare of dairy cows including biosecurity. The application of Wood's function in combination with second-level polynomials has the potential to be used as part of the mastitis detection system (Jensen, 2018). Periparturient hypocalcaemia is often observed and considered a disease associated with various health problems (Venjakob, 2018). Thus the use of new technology provides opportunities to increase agricultural productivity and address future agricultural challenges related to the environment, animal care, and socio-ethical issues (Gargiulo, 2018).

In addition, the sale of dairy cattle in Enrekang is caused by the urgent need of farmers due to economic factors such as the cost of children's education and the presence of several breeders raising livestock for adult males for fattening purposes. Thus, a recording system is needed that will make it easier to make the right decisions for the next program. Indeed there are many factors that must be noted, but if narrowed, there are three main factors that determine the most, namely: feed, seeds and maintenance management (environment). All three are interrelated, so they cannot ignore one of them. In addition, it is rare for dairy farmers to sell high-yielding dairy cows, except at very high prices. This is in line with the opinion of Bazzoli (2014), Sales of beef cattle contribute to the overall profit of dairy cattle. The value of beef cattle when cutting represents a source of income for dairy farming. The routine genotype of male calves or young cattle can be a cost-effective strategy to increase the genetic level of substitute femalecows on commercial dairy farms (Weigel, 2012).

**Conclusion**

1. The development of the dairy cows population in Enrekang for the past five years has increased from 2013 to 2017 (1083, 1145, 1248, 1323, 1530 cows) respectively. Enrekang Regency is an area in South Sulawesi Province which has a dairy cow population of 90%. The structure of the dairy cows population over

the past five years has increased where adult cows are 60.81% (up 272), male calf 10.37% (up 47), young females 9.47% (up 42), female calf 9.05% (40 cows), young males 9.02% (up 40 cows), and adult bulls 1.28% (up by 5). The dynamics of dairy cows population from livestock income over the past five years (2013-2017) tends to decline. Livestock income in 2015 was 127 (10.18%) but in 2016 it dropped dramatically by 15 (1.13%). Expenditures for dairy cows in Enrekang have increased until 2015 as many as 109 (8.73%) and in 2017 as many as 29 (1.90%).

- The development of the production of dairy cows in supporting the steps of milk and animal milk in 2020 must begin with the revitalization of dairy cattle production and promoting the development of dairy cows outside of Java, one of which is Enrekang. Efforts to achieve self-sufficiency in animal protein are not limited to the ability to provide adequate food for the community but must also be accompanied by an increase in the quality of community-based food consumption. With the existence of good cooperation among the central government, the regions and stakeholders can realize Indonesia as a World Food Barn in 2045.

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