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Analysis of Economic Efficiency on Applied of Synchronization Technology in Dairy Cows at Small Farmers

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Abstract

The purpose of this study is to analyze the economic efficiency of dairy cow businesses in small farmers who applied the mating system with precedence by synchronization. The study was conducted in the Pasirjambu Subdistrict, South Bandung Regency, West Java. The study used surveys, interviews, and questionnaires for 60 farmers and 10 inseminators. The 60 heads of female dairy cows belonging to farmer's which are synchronized with hormones. The 2 ml and 4 ml nano prostaglandin hormones supplied by the Indonesian Research Institute of Animal Production (IRIAP) are synchronized to each of the 20 dams of dairy cows and the 4 ml levels of capriglandin hormone provided by animal health team are also synchronized to others 20 dams of dairy cows. Primary and secondary data are analyzed descriptively, quantitatively, qualitatively, and economically. The use of IRIAP and Animal Health hormones can increase estrus in female dairy cows for 3-5 days. The price of the IRIAP hormone is lower than the price of the Animal Health hormone. Net benefits using 4 ml of IRIAP hormone amounted to IDR.4.654.935/month, NPV value of IDR.2.792.961, and B/C value of 1.11. Net benefits using 2 ml of IRIAP hormone amounted to IDR.4.407.912/month, NPV value of IDR.2.644.747.2, and B/C value of 1.1. The net benefit of using 4 ml hormone of Animal Health is IDR.3.855.549/month, the NPV value is IDR.2.313.329, and the B/C ratio value is 1.01. Economically the business of dairy cows using IRIAP and Animal Health hormones is worth a try again. The use of 4 ml and 2 ml hormones of IRIAP and the 4 ml hormone of Animal Health have NPV value >1 and B/C ratio >1, the dairy cow business is economically feasible to try again.

Keywords: economic analysis, eficiency, synchronization, dairy cows, farmers

Introduction

The pattern of developing dairy cows in thePasirjambu Subdistrict-South Bandung Regency is still dominated by farming practices by cows and calves, whose main purpose is to produce milk as a farmer's daily income. During this time, farmers do their business, in addition to being the traditional as well as the feed of poor quality and did not follow the growth of cows and the needs of the environment, so that the milk production in dairy cows low (Talib *et al*. 2002), Salman *et al*. 2016). The need for support from the Government, through the provision of livestock, artificial insemination (AI), synchronization hormones, capital, and feeding of a good quality. Increasing the production of dairy cows through synchronization can be produced by improving the program simultaneously for cows mating and calving. Nanoparticles hormone prostaglandin is a hormone produced by the name IRIAP and synchronization of estrus is one of the reproductive technologies are applied in dairy cows (Kusumaningrum, 2017).

Furthermore, as an impact, the dam will lactate together, so that the efficiency of dairy cow milk production increases. Saili *et al*. (2017) state that, cows undergoing AI that allow to regulate calf birth and milking simultaneously, and Gaughan *et al*. (2019) in the end the dam will adjust to this situation. Indirectly, farmers' incomes are increasing, and the requirements for cows milk consumption are fulfilled in the market. These problems can be solved through synchronization and breeding programs through AI. Currently, Holstein cows are dairy cows that meet genetic requirements in Indonesia and the synchronization with the AI method using superior male semen is the most effective way to increase genetic potential Holstein's milk production (Suji and Fitri, 2017; Talib *et al*., 2019). Moreover, estrus synchronization is also one

of the reproductive technologies applied to female cows to obtain several estrus animals simultaneously. It is estimated that there is currently a high level of diversity in the average consumption of animal protein from milk in the community.

Budi (2018) states that the level of population milk consumption in Indonesia has only reached 16.53 liters per person per year. This figure is still very low when compared to neighboring countries such as Malaysia, Thailand, Singapore, and the Philippines which have reached more than 20 liters per person per year. The low production of local dairy cows is caused by the management of dairy farming practices does not yet following the aim of milk production, for example, the use of dairy machines. By using dairy machines, milking cows become more practical, fast, and complete. The development of information and communication technologies that are getting faster directly or indirectly will affect the speed of information obtained by farmers. By using hormone synchronization technology on prospective female cows are expected to produce milk better. In other conditions, farmers generally have a narrow land area, many compliments, with limited skills and marketing.

The dairy cow business itself cannot be separated from the existence of supporting elements such as capital, land, food, labor, medicines, hormones, and AI. Rusdiana and Wahyuning (2009) stated that the development of dairy cows businesses by providing facilities and infrastructure by the ability of farmers, their impact on business progress can increase income. Opportunities to increase milk production are still quite large, both through the increasing population and livestock productivity. Many dairy cows are farmed by a small business scale of 2-4 cows/farmers, but can be maintained for their welfare (Rusdiana and Praharani, 2009; Rahayu, 2013). Milk production will be optimal if the use of production factors can be allocated efficiently using optimal production inputs. Efficiency is intended so that the maximum average production input efficiency so that maximum profits are also obtained. Efforts to achieve business efficiency and high business profitability in developing dairy cows agribusiness can be achieved by expanding the business (Mandaka and Hutagaol, 2005).

Dairy cows are one of the local resources whose distribution is very wide in West Java. Increasing the population of dairy cows can be done in an area if supported by the potential of the area itself for the development of dairy cows. Potential areas that can support the development of dairy cows include food availability, human resources, farmer's income, support facilities, and infrastructure. The government continues to encourage farmers to apply appropriate technology to improve the competitiveness of milk production and quality. According to Sulistyati *et al.* (2013), to increase the production of dairy cows, of course, improve the quality and quantity of feed as well as facilities and infrastructure. The dairy farming business is one of the businesses mostly run by small farmers in rural areas. The approach to developing integrated farming areas with dairy farming aims to increase total livestock production. Income is obtained not only from agricultural products but from the sale of milk, calves, and rejected livestock (Rusdiana and Praharani, 2009).

The expansion of the business will have an impact on fixed input costs and decreasing total costs due to an increase in the amount of output produced. The expansion of the scale of dairy cows businesses must be balanced with the effectiveness of the cooperative work system that handles the results of dairy cows production (Rusdiana and Wahyuning, 2009) to be sufficient to meet the economic needs of farmers. Dairy cows have a major contribution to the daily income of farmers and the community and milk have also contributed to public health (Barokah, 2009). Therefore, the business needs to be designed, so that the management can be calculated, both the production costs and marketing the results. This condition illustrates that farmers are faced with the limitations of supported factors for production, management, and simple maintenance technology (Astuti *et al*., 2010). Business planning will help farmers

in stepping and making decisions so that expenses and income can be calculated based on time for one year.

Pasirjambu Subdistrict, South Bandung Regency, West Java, the area is in the highlands, with low temperatures and sufficient humidity (Hertanto *et al*. 2012). Until now dairy cow business is still the main livelihood for the community and Holstein Indonesia (HI) dairy cows are very suitable to be in this area. Pasirjambu District can be used as a development area for dairy cow business and with the development of the government, the productivity of the dairy cows business in farmers can be improved. The dairy business has not considered the profit aspect at the farmer level. Need to increase milk production in dairy cows through synchronization, so that cows can breed quickly, AI, calving, and high milk production. The purpose of thisstudy was to analyze the economic efficiency of the dairy cow business in small farmers.

Materials and Methods

Research sites

The research was conducted in Pasirjambu Subdistrict, South Bandung-West Java Regency, 2017-September 2018. The research used to survey, interview, and questionnaire methods for 60 dairy farmers. Application of prostaglandin hormone nanoparticle technology from IRIAP and Animal Health capriglandin hormone in prospective cows and dams of dairy cows is expected to increase estrus for longer. The number of prospective dairy cows and dams which belonging to 60 farmers would be applied by hormone synchronization. The 2 ml and 4 ml nano prostaglandin hormones supplied by the Indonesian Research Institute of Animal Production (IRIAP) are synchronized to each of the 20 prospective cows and dams of dairy cows and the 4 ml of cloprostenol sodium (*synthetic prostaglandin*) levels in capriglandin hormone provided by animal health team is also synchronized to others 20 dairy cows. All of the 60 farmers are fostered by Staff of Animal Health and Pasirjambu inseminator.

The selection of research locations was carried out deliberately based on the consideration in Pasirjambu Subdistrict, Bandung Regency as one of the regencies in West Java. Almost all of its territory was in the highlands, as well as almost all the community's conducting agricultural and dairy cows businesses. The area is supported by plantation land, agriculture, rice fields, rainfed fields, vacant land that has not been tilled by the owner, so that dairy cows are very suitable to be cultivated and developed by the community. Pasirjambu District can be used as a location for the development of major dairy cows businesses. Also, judging from the elevation of the location that has a suitable temperature and humidity will be able to have an impact on increasing growth and milk production of dairy cows better (Salman, *et al*. 2015; Chase, 2019).

Method of research

This study uses a method (mixed method, economic), to get results that are consistent with the study. Ways of using descriptive, qualitative and quantitative techniques refer to the techniques reported (Sari *et al.*, 2017). Qualitative is the basics of philosophy used to examine objects. Quantitative uses a more objective approach to social, cultural and economic phenomena in farmers. According to Setianti *et al.*, (2015) that, dairy cow business is increasingly showing a good development, but the ability of milk production has not been able to meet consumer demand. So, Farmers need to be pushed towards better business, through improvement in technical guidance, business management, genetic potential and venture capital. These results can be exposed through symbols, tables and figures, so that they can be described by the actual conditions.

Data Analysis

Sampling method is based on the number of areas as center of sub-population of dairy cows in the Pasirjambu. Sampling of farmers as respondents by convenience is based on information from the staff of Animal Health, administrators of cooperatives/groups of farmers and inseminators. According to Astuti *et al.* (2010) purposive means that sampling is following the stated research objectives.

Convenience sampling means taking a sample that is under the conditions or sample requirements of a particular population that is most easily reached or obtained. Primary and secondary data are then analyzed descriptively, quantitatively, qualitatively, and analyzing financial economics, referring to the reported technique (Rusdiana *et al.*, 2017). The level of profits obtained by farmers using the benefit over cost ratio (B/C ratio), data interpretation is conducted by the unit of analysis per farmer (Utari *et al.*, 2016). Meanwhile, according to Maeanti *et al.* (2013) that, if a Net B/C value >1 is obtained, then the business is worth continuing.

But if the Net B/C value <1, then the business is not feasible to continue, but decision depends on the business manager, whether it will be continued or not. Then the results of these data are displayed in tables and sub sentences that are following the study of the impact of the application of the prostagladin hormone nanoparticle technology in the dairy farm business. Knowing the production of dairy cows business is used a simple statistical analyst, namely the transformation of the Cobb-Douglas function of multiple regression equations into a linear production function by transferring into logs or ln (Astuti *et al.*, 2010). Knowing the factors of farmer labor can be used to estimate multiple linear regression in the form of double natural logarithms (In) of the Cobb-Douglas production function (Sahara and Idris, 2007). Business planning will help farmers in stepping and making decisions, so that income expenditure can be calculated based on time for one year. The analysis calculated is that farmers have dairy cows. This sample is part of the number of respondents who are sources of data, sampling is done by stratified random sampling technique, with the formula:

$$n = \frac{N}{N.d^2 + 1}$$

where:
n= Number of samples analyzed
N= Number of dairy farmers
d2= The precision specified as a formula is (0,1)

Cochran two stage sampling analysis

To obtain the average income of farmers from the production of milk, calves, and culling dams, the Cochran Two-Stage Sampling analysis (Cochran, W.G. 1977; Ashari *et al.*, 2013;) was used. Price changes will be seen using models or assumptions either partially or simultaneously. Analysis continues to see the sensitivity or sensitivity of dairy cows businesses if there is a change in the calculation of costs or benefits. Knowing the feasibility of a dairy cow business in farmers, the B/C ratio economic analysis is used. Imran et al., (2006) and Rusdiana *et al.* (2014) similarly stated that income can be defined as the difference between revenue, total costs and total revenue can be calculated based on the B / C ratio. Maximizing optimal profits requires the allocation of factors of production efficiently and effectively in their use, not excessive. There is a market opportunity and increasing demand for cow's milk production and the price of cow's milk is sufficient. Also calculated based on income levels, production costs in the use of IRIAP and Animal Health Pasirjambu hormones, and other production costs. It is expected that farmers can increase their business well.

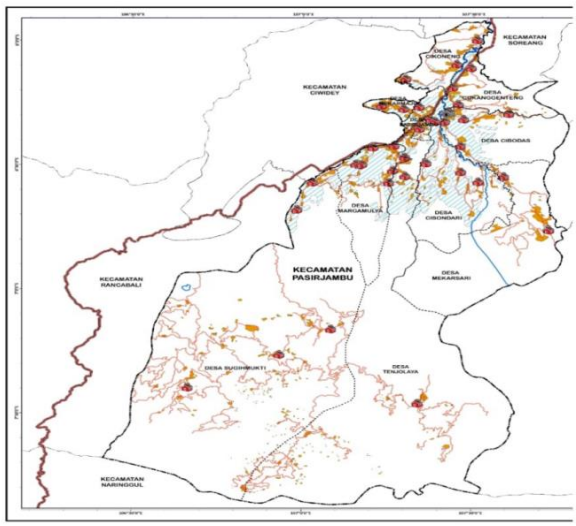
Sensitivity analysis

Sensitivity analysis is an analysis conducted to find out the effect of changes in variable factors that experience price fluctuations. The analysis can anticipate the consequences that may occur price changes every year. The analysis is based on investing changes in the value of the Net Present Value (NPV) and B / C in the dairy business by using the cost of producing IRIAP hormones. Net Present Value (NPV) focuses on the approach seen from the interests of dairy farmers who have venture capital. The profit generated from the dairy cow business is obtained for one year (project return) and profits. NPV-1 which is positive / rupiah and NPV-2 which is negative/rupiah. Interest rates that produce positive NPV / percent and interest rates that produce negative NPV/percent. The feasibility level of the dairy cows business

in farmers by applying hormones produced by IRIAP and Animal Health.

The sensitivity analysis indicator which includes the amount of NPV and B / C counts the effort for one year. Starting with the calculation of dairy cows business for one year, the NPV and B/C ratio are then calculated. To find out the NPV refers to the calculation of first- year revenue and first-year expenditure, the percentage value factor of 20%/year (0.2) or equal to 0.833. Thus, the economic age cannot be determined, because how farmers are sold is uncertain. Price changes, especially in output prices, can be caused by increased supply with large-scale businesses. Like the addition of dairy cow breeding-stocks in large quantities with a long economic life. Sensitivity analysis can be observed through analyzes that assess the feasibility of a business as a result of business changes so that it can affect the feasibility of a dairy cow business. The increase in the price of dairy feed ingredients such as concentrate, tofu pulp, cassava, and hormones can be assumed to be 17-20% according to the positive NPV and B/C values. If the value of NPV and B/C ratio respectively <0 then the business is not feasible and if NPV> 0 and B / C> 1 then the business is said to be feasible.

Results and Discussion



Profile and location of research
Figure 1. Map of dairy cows research areas

The study was conducted in Pasirjambu Subdistrict, South Bandung-West Java Regency, working under the coordination of the Pasirjambu Animal Health Post. Office of Animal Health Pasirjambu supervises and fosters three cooperatives namely KUD Pasirjambu, KUD Kaum, and KSU MJM whose working areas are in Pasirjambu and Rancabali Districts (Figure 1). Synchronization using prostaglandin nanoparticles has been carried out in the three work areas, which include Villages ie.: Cibodas Cisodari, Cikoneng, Cukanggenteng, Margamulya, Mekarmaju, Alamendah, and in the Pasirbambu UPTD Nursery. In 2017, many 218 head dairy cows were included in the estrus synchronization activity using prostaglandin nanoparticles and in 2018, there are 61 head dairy cows were included with getting similar treatment, so total female dairy cows contributed in the research are 279 head of promoted dam and dam of dairy cows.

The research location in Pasirjambu Subdistrict is a high-altitude region with a low temperature and suitable humidity which is almost ideal as a dairy cows development area. This region besides having environmental compatibility with livestock adaptability, also the availability of water and feed to support the development of dairy cows business. Support and the availability of agricultural waste, which is the remaining vegetables can be a source of forage in dairy farming. Based on this, many dairy cows businesses have been attempted by farmers in this region. Farmers are members of cooperatives, where animal health services and milk purchases are part of cooperative services. For Animal Health services including artificial insemination (AI), pregnancy detection and reproduction problems are the responsibility of the animal health department in the cooperative.

All inseminator officers have been certified as inseminators, but not all hold certificates. Inseminators has capabilities and also practices as inseminator and animal health workers. Health services including AI services have been calculated from the price of milk deposited to the cooperative so that farmers no longer think about the prices of medicines including hormones because they have become part of cooperative services.

Considering the health service model is centered on the animal health section, the socialization of the use of prostaglandin nanoparticles (the IRIAP hormone) is also centered on the inseminator and animal health staff of Pasirjambu. Farmers only carry out what is the policy of animal health workers and inseminators in matters relating to health and reproduction services. In certain services such as the occurrence of livestock, not estrus shortly after mating or cattle which are late estrus, and when hormones are not available (such as cases in 2016-2017), synchronizing hormones are provided through the SIWAB program, the availability of drugs or hormones is the responsibility of cooperatives although sometimes for certain cases hormones must be paid by farmers.

The staff or officer of Animal Health Post in Pasirjambu give fostering service to inseminators and farmers in the level of active, semi-active, and passive farmers. Active service, which means that it is done through making work programs to improve the welfare of farmers through coaching to farmers. Semi-active service, means the officer of Animal Health Post and inseminator make work programs according to the schedule of monitoring, an inspection of livestock, both for synchronizing hormones, AI, PKB, and others. In passive services, the inseminator only waits for information/calls from the farmer if the livestock needs treatment, such as cattle having estrus and need an AI, checking pregnancy, sick animals and cattle will give birth. There are 21 personnel involved in handling animal health in the Post and have a teamwork scope consisting of veterinarians, inseminators, extension workers and administrators who are spread in the post and the three cooperatives. Farmers have sought to increase income from dairy cows businesses.

Farmers have not considered many aspects of profit at the farmer level. According to Anggraeni and Elmy (2016), the health of dairy cows is a very important aspect for the success of a business so that dairy cows will produce optimal milk, if in a healthy condition. In regulating the synchronization of hormones and also mating with AI is a very important factor in the management of raising dairy cows. Mating program is an effort to continue the offspring and increase the population of dairy cows to increase milk production. Increasing milk production in dairy cows through the application of hormone synchronization technology, the livestock quickly estrus simultaneously, AI, calving and can produce milk well and simultaneously. In the dairy cow business that is cultivated by farmers in Pasirjambu District, Bandung Regency is still dominated by small and medium businesses. However, some have been commercial, most have depended on their livelihoods from dairy cows businesses that produce milk and calf production as well as agricultural products. The average milk production produced by each dairy cow in farmers during lactation is shown in Figure 2.

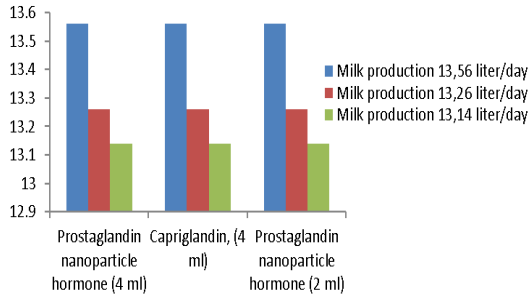


Figure 2. Average daily milk production of synchronized dairy cows during lactation.

Figure 2 shows that milk production produced by each dam is different from each other. The use of IRIAP and Animal Health hormones can increase estrus in female dairy cows for 3-5 days. But in terms of price, IRIAP hormones price is cheaper than Animal Health and also more effective and more efficient in dam and prospective dam of dairy cows and can increase estrus for 3 days. Another possibility is due to the different ways of feeding and the number of rations, the number of lactation periods, a month of lactation, and length of lactation, where the milk production began to decrease due to the old pregnant cows (*dry cage*). The dairy business is commercial, so one of the objectives is to obtain optimal profits. The allocation of resources owned by farmers is closely related to the level of benefits to be

achieved. The size of the profits obtained will largely be determined by the sale value of the production and production costs incurred (Mandaka and Hutagaol, 2005). The institutional support of animal health and cooperatives makes many farmers interested in rearing and maintaining their dairy businesses.

The results of the questionnaire survey and field visit obtained information that until now the dairy cows business is still going well. Most dairy cows are raised by farmers, which is 219 cows with average ownership of 3-7 cows. Then for the prospective dam for continued generation, female dairy cows >1.5 years old as many as 73 cows, young dairy 8-12 months as much as 58 cows. In the dams dairy cows and prospective dams retained by farmers for business continuity. Farmers have thought about cattle farming as a sustainable business which supports the lives of farmers. Ownership and condition of productive dams of dairy cows show a very close relationship with cattle ownership. The linkages include pregnant cows, lactation cows, and dry cows. While milk production, age of culled cow and livestock are related to production value and selling value of livestock production. The amount of milk produced by each farmer is highly dependent on the number of lactating cows and how they are maintained. Following the statement of Rahayu *et al.* (2002) the high and low milk production obtained depends on the number of dairy cows and how to maintain their productivity.

Descriptive of farmer's social economy

The survey results on dairy farmers showed that some absorption of production inputs was influenced by the number of livestock kept milk production, milk prices, calf prices and culled livestock prices. According to Andri (2014) that activities to increase productivity and expand business production can be conducted through direct assistance to farmers and the applied technology applications. On the economic side of research, the application of the hormone synchronization nanoparticle technology is expected to open the market with lower application costs. The same thing was stated by Chaudhry *et al.* (2008) and Silva *et al.* (2012) that nanotechnology had an impact on global market demand which had reached the US $ 1 trillion in 2020 from the nano industry worldwide. The maximum profit will be achieved if all factors of production have been used optimally and efficiently. Technical efficiency, price, and economic efficiency.

Farmers must optimize in using production inputs, to achieve high productivity as well as cost efficiency (Riyanto, 2013). Efforts to achieve economic efficiency of production in dairy cows can also be looked in more detail by farmers by expanding their business scale. The expansion of business scale in dairy cows will have an impact on decreasing fixed and total input costs which are declining due to an increase in the amount of output produced. Efforts to expand business scale require relatively large capital increases for farmers. At the level of efficiency, and the provision of additional facilities, the application of hormones can increase the productivity of dairy cows. The business of raising dairy cows requires high quality and work intensity so that it requires a large number of workers. In the animal husbandry business, it cannot be separated from technological advances and the availability of human and natural resources to support the development of business (Rusdiana and Maesya, 2016). During the rainy season and the dry season, dairy farmers in searching for grass in the field are very different in time. In the rainy season and dry season, farmers continue to do work activities in their dairy business. Farmers' expectations among others, are to get milk production, calves, and high selling values of products. Absorption of labor in farmers, families is labor-intensive that can be compared to capital intensive.

Absorption of production input in dairy cows business

The business of dairy cows absorbing livestock workers around 355.35-359.66 working days/year is assumed for the cost of farmer labor, calculated based on 8 hours/one working day is similar to Rp.12,500/working day/year. Farmer

working time is widely used to look for grass because dairy cows are very different in maintenance compared to beef cattle. According to Sahara and Idris (2007) that, farmers' labor during the production process will begin with preparatory activities to maintenance until the end of post-harvest. Farmer family labor can be seen from the age of the farmer, as well as the availability of work time used by the farmer (Rusdiana *et al.*, 2014). Farmers' working time can be adjusted to the number of livestock kept, so that it can affect the amount of time to take care of livestock (Taslim 2011) and (Rusdiana and Mahesya, 2016). In the business of dairy cows through the synchronization application of IRIAP and Animal Health hormones in Pasirjambu Subdistrict, Bandung Regency, it has been calculated well.

Some of the absorptions of production inputs using IRIAP and Animal Health hormones is strongly influenced by the number of livestock kept. To achieve potential productivity, it is still low, given the farmers' limited capital. It needs capital, technology support so that the dairy cow business will increase. The dairy cow business seen from competitors is said to be quite high. Reflected on the number of dairy farms in the District of Pasirjambu which is quite a lot. This information indicates the high interest of farmers to develop dairy cows businesses. A large number of farmers does not create too tight competition. Actors of cow milk producers inform each other if there are milk orders that are adjusted to the purchasing power of consumers. The average value of dairy products produced by farmers is shown in Figure 3.

Figure 3 shows that the selling price and production costs in dairy cows can be adjusted to the condition of dairy cows. The production value and selling value of dairy cows production, the quantity and quality of milk production produced are quite good. To get optimal profits, Farmers need to offset the production costs in their dairy cows businesses. Farmers 'income aside from the production of cow's milk, also from the sale of culled dams and calves. Whereas manure is not sold but is used for fertilizer for farmers' food crops. To find out the economic efficiency of the synchronization technology application in dairy cows, it can be done through the impact of the application of hormone technology. Production inputs, technology implementation costs, labor, and profits from technology applications will be calculated based on the amount of used hormone to obtain results.

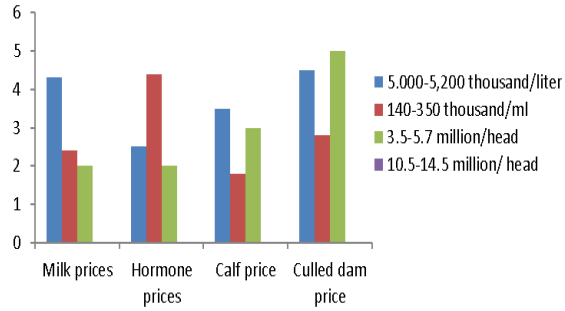


Figure 3. The average selling value of dairy products in farmers

Synchronization technology of IRIAP hormones in the dam and prospective dairy cows has begun in 2017. Since 2017 the IRIAP hormone has been applied in the estrus synchronization program in Pasirjambu, as many as 290 individuals. Involved in the estrus synchronization program using a dose of 4 ml (120 head) and a dose of 2 ml (117 head). While in 2018 as many as 60 dairy cows get the IRIAP hormone with a dose of 3 ml. A total of 298 female cattle have received the IRIAP hormone for estrus synchronization activities in 2017-2018. From 2017 to2018, the IRIAP prostaglandin hormone uses in the Pasirjambu, besides that, Animal health hormone is also used as a synthetic prostaglandin hormone derived from the assistance of the Bandung Regency Animal Husbandry Office through SIWAB program. The application of hormones from IRIAP of 4 ml/injection is equivalent to the hormone of animal health as much as 4 ml/injection (0.5 mg/ml of cloprostenol sodium per injection), while decreasing the dose to 4 ml and 2 ml affects the price of hormone use.

Estrus response obtained on the application of the IRIAP hormone at all doses (2, 3, and 4 ml) is very good which is equal to 90-100% (CL selection), with the degree of estrus ++ - +++ on a scale +++. At the reception of farmers and inseminators of

IRIAP hormones is very good, given the expected response of estrus, namely the occurrence of fast estrus with good estrus quality. The selling value and the price of using hormones both at the control dose (4 ml) are lower than similar hormones in the Animal Health Post. Reducing the dose to 2 ml and 4 ml with a good estrus response will be more beneficial when applied.

The economic value of dairy cows business

In the dairy cows business in Pasirjambu District, Bandung Regency, it can be seen from the competitors that the business is quite high. This is reflected in a large number of dairy farms that indicate the high interest of farmers to develop more dairy cows businesses. A large number of farmers does not create too tight competition, but the farmers are more enthusiastic to develop their farms to be business dairy farms. The competition is healthy and complementary through information from animal health officials and inseminators. Perpetrators of dairy cow milk producers inform each other if there are milk orders that are tailored to consumer purchasing power. An assessment of the level of production cost efficiency in a dairy cow business requires an economic analysis tool. Revenue can be defined as the difference between revenue, total costs and total gross income can be assessed with a B/C ratio, as long as the business is under conditions in the field (Mandaka and Hutagaol, 2005).

Production costs are difficult for any farmer to carry out, generally, the farmer buys the factors of production, unable to regulate the prices of the factors of production. Production costs incurred during the production period include fixed costs and variable costs (Andriati and Sudana, 2007). The fixed costs incurred by farmers include depreciation of livestock, depreciation of the cage, depreciation of equipment, and others. For variable costs incurred by farmers, including costs for feed, hormones, AI, equipment, and medicines (Rusdiana and Soeharsono, 2017). Financial analysis was carried out on dairy cows business using IRIAP and Animal Health Hormone which used through field surveys. Meanwhile according to Haloho et al. (2013); and Santoso et al. (2013) that the cost of feed in the dairy business can reach 62.5% of the total production cost. The business of dairy cows is quite diverse, both in the way of feeding and in maintenance. Fadhil *et al.* (2017) stated that farmers thought that forage feed was easily obtained around residential neighborhoods.

Business costs in dairy cows business farms during production periods are fixed costs and business costs. The fixed costs incurred by farmers includes depreciation of livestock, depreciation of cages, depreciation of equipment, and other cost funds. Variable costs incurred by farmers include feed costs, synchronization fees, IB costs, equipment costs, and medicines. To increase farmers' income, each farmer provides additional feed such as tofu waste and concentrate. Feeding forages for dairy cows must still be of good quality, so that productivity and milk production are high. Feeding for dairy cows in each breeder varies, depending on environmental conditions and costs for production. Efforts to raise dairy cows with the synchronization of IRIAP 4 ml hormones are an average of 2 adult lactation cows/farmers, the price of dams is IDR.16.753.300/head, so two dams are similar to IDR.33.506.660. Making animal houses on average is IDR.3.750.350/unit.

Depreciation of a parent for 5%/5 years of IDR. 1.675.330. The cost of depreciation of the cage is 5%/year in the amount of Rp.187,517. The farmer labor cost is 355.35 Mdw (man days worked)/year x IDR.12,500/day in the amount of IDR.4.441.875. The cost of purchasing tofu pulp as much as 18 kg x IDR.1,000/kg x 2 heads x year is IDR. 12,960,000. The cost of purchasing 0.5 kg of concentrate x price of IDR.4.100 x 2 heads x years is IDR.1,476,000. The cost of purchasing tofu pulp as much as 18 kg x 2 fish x price of IDR. 1,000 x year is IDR. 12,960,000. The cost of purchasing forage feed is 20 kg x 2 animals x the price of Rp. 150 x year is IDR. 2.160.000.

The cost of purchasing 30 kg of rice straw feed x 2 heads x price of IDR.50 x

year is IDR.1.080.000. The cost of purchasing onggok feed is 10 kg x 2 heads x the price of IDR.500 x a year, IDR. 3.600.000. The cost of purchasing 4 ml of IRIAP hormone products with a price of IDR.280,000. The cost of consumable cage equipment is IDR.175,000 and the cost of purchasing medicine packages is IDR.125.000. The total production costs are IDR.43.100.715. Revenue: proceeds from sales of milk production of 13.56 liters x 2 heads x price of IDR.4.875 x 7 months amounting to Rp.27,764,100. The results of the sale of rejects as many as 1 tail with a selling value of IDR.12.850.650 and the results of the sale of female and male calves as much as 2 tails with an average price of IDR.3.570.450, amounting to IDR.7,140,900. Total gross income of IDR.47.755.650.

Costs incurred during the production period include fixed costs and variable costs. The business of raising dairy cows with the synchronization of the 2 ml IRIAP hormone is an average of 2 lactation adult /farmers. The price of broodstock or seedlings is IDR 16.566.250/head, IDR 33.132.500. The average drum making is IDR.3.890.500/unit. Parent depreciation fee is 5%/5 years of IDR 1.656.625. The cost of depreciation of the cage is 5%/year in the amount of Rp.194,525. The cost of farmers, 356.66 Mdw/year x IDR.12,500/day is IDR.4.458.250. The cost of purchasing tofu pulp as much as 20 kg x Rp. 1,000/kg x 2 heads x year is IDR. 14,400,000. The cost of purchasing concentrates as much as 0.5 kg x the price of IDR. 4.100 x 2 heads x years in the amount of IDR.1.476.000. The cost of purchasing tofu pulp as much as 20 kg x 2 heads x price of IDR.1.000 x year is IDR. 14.400.000. The cost of purchasing forage feed is 15 kg x 2 heads x the price of Rp.150 x a year is IDR.1.620.000.

The cost of purchasing rice straw feed is 20 kg x 2 heads x the price of IDR.50 x year is IDR.720,000. The cost of purchasing onggok as much as 10 kg x 2 heads x the price of IDR.500 x a year is IDR.3.600.000. The cost of purchasing 2 ml of IRIAP hormone products at a price of IDR.140.000. The cost of consumable cage equipment is IDR.155.000 and the cost of purchasing medicine packages is IDR.130.000. The total production cost is IDR.41.491.400. Revenue: proceeds from the sale of milk production of 13.14 liters x 2 heads x with an average price of IDR.4.865 x 7 months of IDR.26.848.962. The sale of rejected apprentices is 1 animal with an average price of IDR.11.550,350. Sales of female and male calves as much as 2 animals with an average price of IDR. 3.750,200 amounting to IDR.7.500.000. Total gross income of IDR.45.899.312.

Costs incurred during the production period include fixed costs and variable costs. Efforts to raise dairy cows by synchronizing the 4 ml Animal Health hormone is an average of 2 lactation adult cows. The price of a dam or breeding stocks is IDR. 16.867.240/head, the second is IDR.33.734.480. Making animal houses on average IDR.4.102.200/unit. Depreciation of parent for 5%/5 years is IDR.1.686.724. Depreciation costs for animal houses are 5%/year in the amount of IDR.205.110. Farmer labor costs are 359.89 Mdw (man days worked)/year x IDR.12.500/day is Rp.4,498,625. The cost of purchasing tofu pulp as much as 20 kg x Rp. 1.000/kg x 2 heads x year is IDR.14.400.000. The cost of purchasing concentrates as much as 0.5 kg x the price of IDR. 4.100 x 2 heads x years amounting to IDR.1.476.000. The purchase cost of tofu pulp as much as 20 kg x 2 heads x price of IDR. 1.000 x year is IDR.14.400.000. The cost of purchasing forage feed is 16 kg x 2 heads x the price of IDR.150 x a year is IDR.1.728.000.

The cost of purchasing rice straw feed is 18 kg x 2 heads x the price of IDR.50 x year of IDR.648,000. The cost of purchasing onggok as much as 10 kg x 2 heads x the price of IDR.500 x a year is IDR.3.600,000. The cost of purchasing Animal Health hormone products as much as 4 ml with a price of IDR.350.000. The cost of consumable cage equipment is IDR.130.000 and the cost of purchasing medicine packages is IDR.120,000. The total production costs amounted to IDR.43.242.459. Revenue: proceeds from the sale of milk production of 13.26 liters x 2 heads x price with an average price of IDR.4.765 x 7 months of IDR.26.537.238.

The sale of culled dams is 1 head with an average price of IDR.12.850.350. Sales of female and male calves as much as 2 animals with an average price of Rp. 3,855,250 amounting to IDR.7.710.500. the gross income amounting to Rp.45,098,008. In dairy cows business in farmers using IRIAP hormone (dose 4 ml vs 2 ml) and 4 ml Animal Health hormone, shown in Table 1.

Table 1. Components of acceptance in dairy cows businesses in farmers

Description	IRIAP hormone prostaglandin 4ml	IRIAP hormone prostaglandin 2 ml	Health hormone capriglandin 4 ml
A.Production cost			
-Cost of depreciation	1.862.847	1.850.150	1.891.834
-Production cost	41.237.868	39.641.250	41.350.625
Amount	43.100.715	41.491.400	43.242.459
B.Revenue			
-Gross income/year	47.755.650	45.899.312	45.098.008
-Net income/mounth	4.654.935	4.407.912	3.855.549
-NPV value in first year	2.792.961	2.644.747,2	2.313.329,4
-B/C value	1,11	1,1	1,01

Table 1 shows that each expenditure for production costs in the dairy cow business using 4 ml of IRIAP hormone is IDR.43.100.715/year, a net profit of IDR. 4.654.935/month, the NPV value of IDR.2.792.961, it means that for each input (*cost*) incurred for the business, the benefits can be as much as a B/C of 1.11. Expenditures for production costs in dairy cows using 2 ml of IRIAP hormone is Rp.41,491,400/year, net profit of IDR.4.407.912/year in increase, the NPV value of IDR.2.644.747.2, means that for each input (*cost*) incurred for business costs can benefit (*benefit*) of B/C of 1.1. Expenditures for production costs in dairy cows business using the 4 ml animal health hormone amounted to IDR.43.242.459/year, net profit of IDR.3.855.549/month, NPV value of IDR.2.313.329.4, meaning that at each input (*cost*) incurred for business costs can benefit (benefit) of B/C 1.01. To see the economic value of each increase in NPV business and B/C value of dairy cows businesses using the IRIAP hormone and the Animal Health hormone can be seen in Figure 4.

Figure 4 shows that the NVP value and B/C ratio are positive and give a net benefit to each farmer. Financially the dairy cows business using IRIAP and Animal Health hormones is feasible to be cultivated again, seen from the farmer's income> from the local UMR (regional minimum wage) of Rp.2,250,000/month. Using the IRIAP hormone with 2 miles, the economic value is almost comparable to using the Animal Health hormone. This means that by using 2 ml of IRIAP hormone, the economic value of farmers can increase. The IRIAP hormone deserves to be reproduced because it is effective and efficient to increase estrus in dams and heifers. However, what can distinguish the economic value of each expenditure is the price of the hormone, the Animal Health hormone has a higher selling value compared to the IRIAP hormone, the selling value is lower.

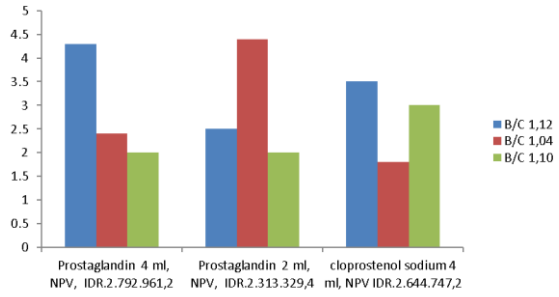


Figure 4. The economic value of the increase in NPV and B/C of dairy cows businesses in farmers

The higher the amount of milk produced, the higher the amount of milk to be sold, so that the revenue obtained will be higher. The cost of feed has a very real

effect on dairy cow business revenues. The cost of concentrate feed not only plays a role in terms of quantity and quality but is the biggest financing of all production costs. Continuity of feed availability and nutrition fulfillment according to the needs of milk cows, there is something that has not been able to be fulfilled by almost all farmers (Santoso *et al.,* 2013). The use of 2-4 ml IRIAP hormone and Animal Health's 4 ml NPV value of hormones >1 and B/C ratio >1, the effort of dairy farmers is economically feasible to tryagain. The results of Labodu et al. (2015) research on the business of dairy cowsdairy cows with a scale of 10 female cows, B/C value 2.88. Khafsah *et al.*, (2018) get the results showing an average annual income of IDR.141.669.425, with an average income of IDR.898.382.687 sourced from the sale of milk, male calves, culled dams, adult males, lactation cows, and manure. Considering that all investment criteria were achieved, NPV >1 was IDR.181.016.633, Net B/C >1 was 1.15, IRR was 12.3% greater than the discount rate used and for 7.2 years. The efficiency of production is declared efficient because the B/C value >1 is 1.18. Production costs in dairy cows businesses can be influenced by milk production produced and the number of dairy cows that are kept (Pasaribu *et al.,* 2015) and (Rusdiana *et al.,* 2019). Considering the use of IRIAP hormone can reduce production costs in the farmers in the dairy cows business, using IRIAP hormone can be reused.

Conclusion

Conclusion of the results of research on dairy cows businesses in farmers Pasirjambu District of South Bandung Regency, West Java was the use of IRIAP hormone and Animal Health hormone can increase estrus in female dairy cows for 3-5 days, but in terms of the price of IRIAP hormone is lower compared to the higher price of Animal Health hormone. IRIAP hormones are more effective and efficient in dairy cows and prospective dams can increase estrus for 3 days. Net benefits using 4 ml of IRIAP hormone amounting to IDR.4.654.935/ month, the NPV value of IDR.2.792.961 B/C value of 1.11. Net profit by using 2 ml of IRIAP hormone amounted to IDR.4.407.912/year in the increase, the NPV value of IDR.2.644.747.2 B/C value of 1.1.

Net profit by using Animal Health 4 ml hormone is IDR.3.855.549/month, NPV value is IDR.2.313.329.4 B/C ratio value is 1.01. In the financial business of diary cows using the hormone IRIAP and Animal Health hormones is decent, when viewed from the income of farmer's > from the local UMR of IDR.2.250.000/month. The use of IRIAP 4 ml - 2 ml hormone and Animal Health 4 ml hormone NPV value >1 and B/C ratio >1, the business of dairy farmers is economically feasible to try again.

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