Journal Homepage: -www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI:10.21474/IJAR01/1423
DOI URL: http://dx.doi.org/10.21474/IJAR01/1423
ISSN NO. 2320-5407

*RESEARCH ARTICLE*

# DETERMINING THE KEY FACTORS OF DAIRY CATTLE BUSINESS SUSTAINABILITY IN BATU CITY USING PARTICIPATORY PROSPECTIVE ANALYSIS.

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## *Manuscript Info*

***Manuscript History***

Received: 12 June 2016
Final Accepted: 16 July 2016
Published: August 2016

***Key words:-***
Dairy cattle business, sustainability, participatory prospective analysis, Batu City.

## *Abstract*

Dairy cattle with a population of 11,060, which is cultivated by 2,181 farmers constitute the largest population of ruminant livestock and as featured in Batu which is one of the drivers of the economy is important for some people in Kota Batu. The main objective of this study was Determining the Key Factors of Dairy Cattle Business Sustainability in Batu City using Participatory Prospective Analysis with Participatory Prospective Analysis. This research was conducted in four villages in the area of dairy cattle business development, namely: Tlekung village, the village of Oro-oro Ombo, Pesanggrahan Village and Village Gunungsari which conducted from September 2014 until May 2015. The data was analysis research MICMAC prospective analysis method (matrice d'Impacts Croisés-multipication Applique and Classment) called Participatory Prospective Analysis (PPA) to analysis and determine the key factor effected on dairy cattle business. Based on the prospective analysis found six critical factors that influence pada dairy cattle business, namely: (1) three important factors had much effect on the performance of the system with a low level of dependence between factor (the price of milk, IPS, Labour); and, (2) three important factors had much effect on system performance with a high level of dependency between factor (Feed Technology, Forage, Profit).



## Introduction:-

Indonesian government launched a sovereign dairy in 2025, which means the needs of fresh milk to the domestic industry as well as community needs have been met. Although the demand for milk in the country continue to rise, driven by population growth, increase in public revenue as well as public awareness of the importance of nutrition, national milk production still can not keep pace with growth in demand for milk in the country. The need for national consumption of milk today is 8 million liters/day while the domestic milk production would only cover about 1.6 to 1.7 million liters/day. While the need per year to reach 3.3 million tons with domestic stocks of only 690 thousand tons/year (21%) and the remaining 2.61 million tons/year (79%) still have to be imported (Bappeda Jatim, 2014).

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Dependence on imported milk the government made efforts to encourage the development of dairy cattle business in the areas of national milk producers in the hope of meeting the needs of the domestic milk with self-sufficiency. The regions in Indonesia which is designated as a development area of dairy cattle business in the next five years are: Bandung Regency, West Bandung Regency, Regency Semarang, Salatiga, Malang and Batu. Kota Batu be featured Tourism City in East Java. The rapid development of tourism a significant impact on society and the environment in Kota Batu, dairy cattle business is no exception. The positive impact of the dairy cattle business is the increasing number of consumers rating as market milk sales, while its negative impact is increasingly shrinking of open land to graze as well as with the increasing residential and tourist area. Development of dairy cattle business is seen as an agribusiness system, requires modeling activities with a systems approach. Modeling System (agribusiness) dairy cattle business by applying sustainable concepts are expected to increase the production and productivity of milk, increase the income and welfare of farmers and maintain its existence in accordance with the purpose of farm development that embodies the farm sustained by optimizing the utilization of local resources to realize the supply and safety of livestock products and improving the welfare of farmers.

The main objective of this study is to determine the key factors that significantly affect the sustainability of dairy cattle business in Batu City using participatory prospective analysis (PPA). PPA objects to generate the key factors and to describe the influence of factors and levels of interest among these factors due to the effect on the system. Based on the results, it is expected to be done the correct handling of the key factors of dairy cattle sustainability by the government in Batu City. In addition, similar studies have not been done so that the results of this study are expected to be a reference for further research that need to be managed better to aim the creation of a sustainable system of dairy cattle business into the future.

## Methodology:-

### Description of Kota Batu:-

Kota Batu, geographically located in 70°44'- 80°26 'south latitude and 122°17'-122°57' East Longitude with an area of 19,908.72 hectares or 0.42% of the total area of Java Timur. Almost half of the population residing in Kota Batu Batu subdistrict (46.56%), while the other half residing in Bumiaji (28.76%) and Junrejo (24.68%). The density and the rate of population growth in the research locations shown in Figure 1 and 2.

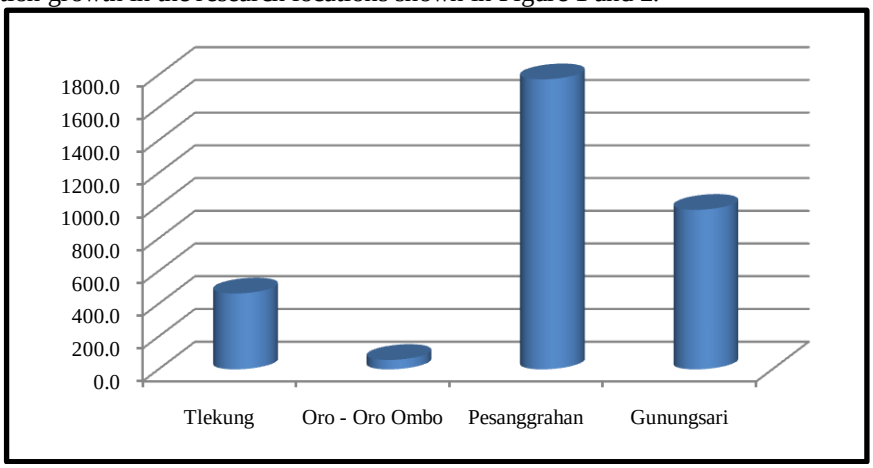


**Figure 1:-** Population Density in Rural Area Research.

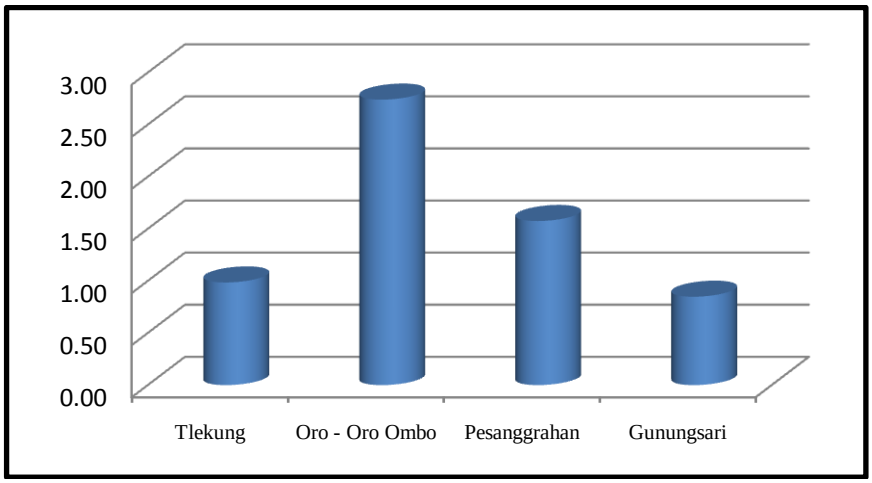


**Figure 2:-** Comparison of Population Growth Rate in Rural Research.

In economic terms, the sectors that could be developed to improve the welfare of the community in addition to the tourism sector is agriculture and livestock sector which is the livelihood of most of the population and in accordance with the environmental carrying capacity Batu fertile and rich in natural resources.

**Characteristics of Dairy Cow in Batu City:-**

Livestock population in Batu City presented in Figure 3. Most large livestock population is as much as 11,060 head of dairy cattle, followed by beef cattle, horses and buffaloes respectively 2,700 tails, 52 tails and 17 tails. Dairy cows are scattered in the Junrejo (25%), Bumiaji (31%), and Batu (44%) districts, as described in Figure 5. Dairy farm has been developed in Batu City since the Dutch era because their needs of milk. Batu cold air is considered very suitable for livestock farming because according to the climate of the country of origin of the dairy cow is a country with a subtropical climate.

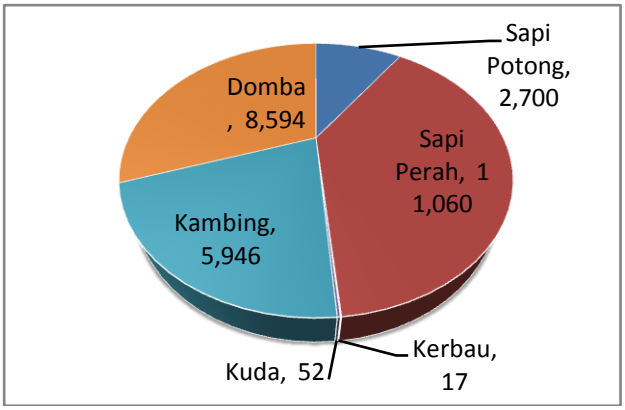


**Figure 3:-** Large livestock population in the Batu City 2014
Source: BPS Batu City 2014

Batu City as a domestic supplier of fresh milk to the dairy processing industry (IPS) have a significant role, namely the average milk production of 35 tons/day of 11,060 dairy cows were cultivated by 2,181 farmer households. Dairy cattle business position (USP) of Batu City is based on the population of dairy cattle and milk production compared to other regions in East Java Province can be seen in Figure 4. The milk production of Batu City is ranked sixth by volume reached 15,730,198 tons/year.

Dairy cattle business development areas (USP) is centered in four villages namely Tlekung, Oro-oro Ombo, Pesanggrahan and Gunungsari because the four villages have a population of dairy cows is higher than the other villages in the Batu City as shown in Figure 5.8. Fourth this village as well as a research location dairy cattle business because each village has its natural characteristics and different social conditions and to represent the condition of Batu City in general so as a village representative sample.

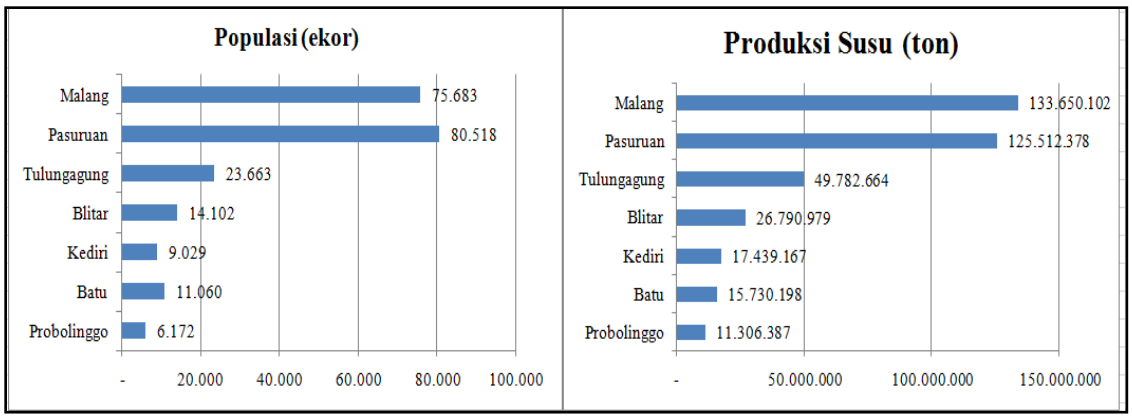


**Figure 4:-** The Population and Production of Dairy Cow in Some Regions of East Java.
Source: BPS Jawa Timur 2014

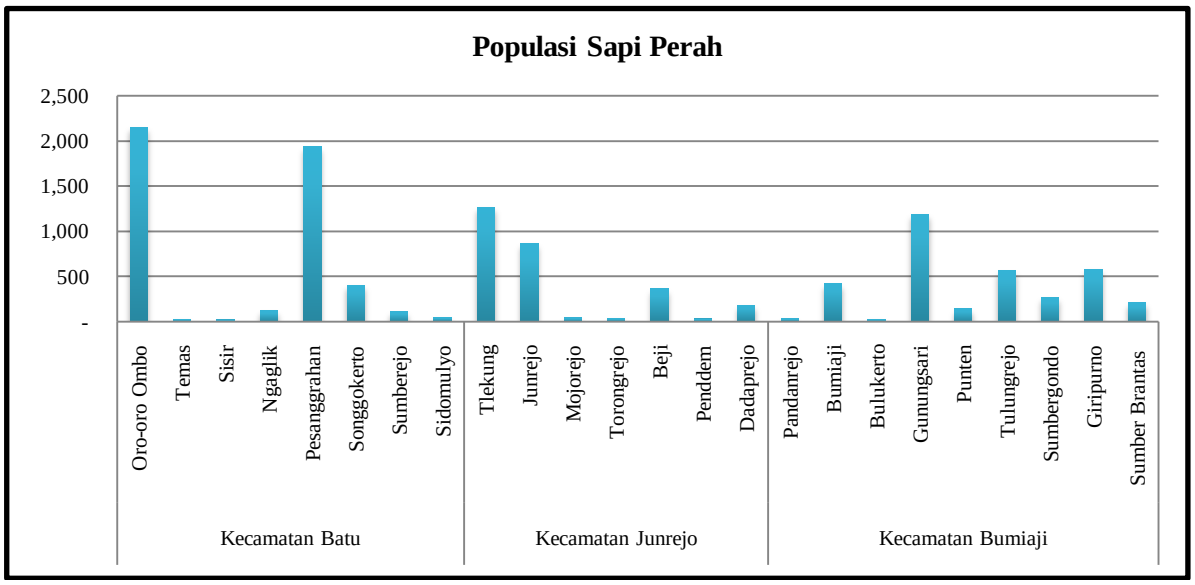


**Figure 5:-** The Population of Dairy Cow in Villages of Batu City.
Source: BPS Jawa Timur 2014

Results of agricultural census 2013 (Central Bureau of Statistics, 2014) reported the number of Household breeder dairy cattle business (RT USP) based on the number of dairy cows that are kept consists of: 1,016 RT (47%) maintain 1-2 tails, RT 671 (31%) maintain 3- 4 heads, 420 RT (19%) maintain 5-9 tails, RT 65 (3%) maintain 10-19 tail and 9 RT (0.4%) maintains 20 fish over the total Households USP is 2,181 RT. So the ownership of dairy cattle by farmers on average is 1-4 dairy cows. Based on data from KUD "Batu", the number of households dairy cattle business, population and ownership of dairy cows in the study areas presented in Table 1.

**Table 1:-** Characteristics of Dairy Cow in the Village Research.

| Description | Tlekung Vill. | Oro-oro Ombo Vill. | Pesanggrahan Vill. | Gunungsari Vill. |
|---|---|---|---|---|
| RT USP (KK) | 93 | 155 | 215 | 68 |
| Population (tail) | 439 | 806 | 1159 | 257 |
| Live vestock ownership flats (tail) | 2 | 4 | 4 | 3 |
| Live vestock ownership flats (ST) | 1,25 | 1,5 | 2 | 2 |

Source : Primary data (processed), 2014

Number of Domestic Enterprises Dairy Cattle (RT USP) in the study villages highest one is in Pesanggrahan Village, reaching 215 families with a population of dairy cattle and 1,159 head of cattle kememilikan average is 4 tails or 2 ST. USP in this village has lasted for generations, especially in the Toyomerto where nearly 70 percent of the population are dairy farmers.

## Prospective Analysis:-

Prospective analysis or Participatory Prospective Analysis (PPA) is the key factor analysis to look for using MICMAC (*Matrice d'Impacts Croises-Multipication Applique' and Classment*). A key factor is the factors that play an important role for the sustainability of the dairy cattle business. These factors should be prioritized in public policy so that dairy cattle business ongoing and even increasing its sustainability status.

PPA Analysis at USP in Batu obtained from analysis of the PPA leverage factor (A) and PPA need factor analysis (B). Need factor (B) starting from tabulate the factors required by stakeholders. Factors that the needs of stakeholders called by a factor needs or need factor. Need factor will be sorted for further been important. Factors that have a common will be merged into one factor alone. Having identified the factors need to be analyzed PPA to find the key factors of the needs of stakeholders. Table 6, lists the key factors of the analytical results PPA. Analysis PPA leverage factor (A) produces seven key factors and analysis of PPA need factor (B) to produce 8 key factors. A key factor analysis results and analysis PPA A and B which has similarities to the next combined. This factor hereinafter referred to as key factors compound consisting of nine factors. The final step is to analyze the key factors combined use PPA to produce USP key factor in Batu City and the result is 6 USP key factor in Batu City.

**Leverage Factor of PPA:-**

Leverage factors obtained from analysis of Rap-USPE (previous) on the existing condition of dairy cattle business in Batu City described into Table 2.

**Table. 2:-** Leverage factor of the existing condition

| NO | LONG LABEL | SHORT LABEL |
|---|---|---|
| 1 | Availability of forage feed | Forage Feed |
| 2 | Handling manure | Manure |
| 3 | Price of milk | Price of milk |
| 4 | Profit | Profit |
| 5 | Grass land ownership | Grass land |
| 6 | Labor participation family | Labor |
| 7 | Training frequencies | Training |
| 8 | Frequency group meetings | Group meeting |
| 9 | Frequency extention | Extention |
| 10 | Coordination meeting agencies | Coordination |
| 11 | The Role of KUD | KUD |
| 12 | Quality Concentrate | Consentrate |
| 13 | Adoption of Feed Technology | Feed technology |
| 14 | Number of feeding forages | Total forage |

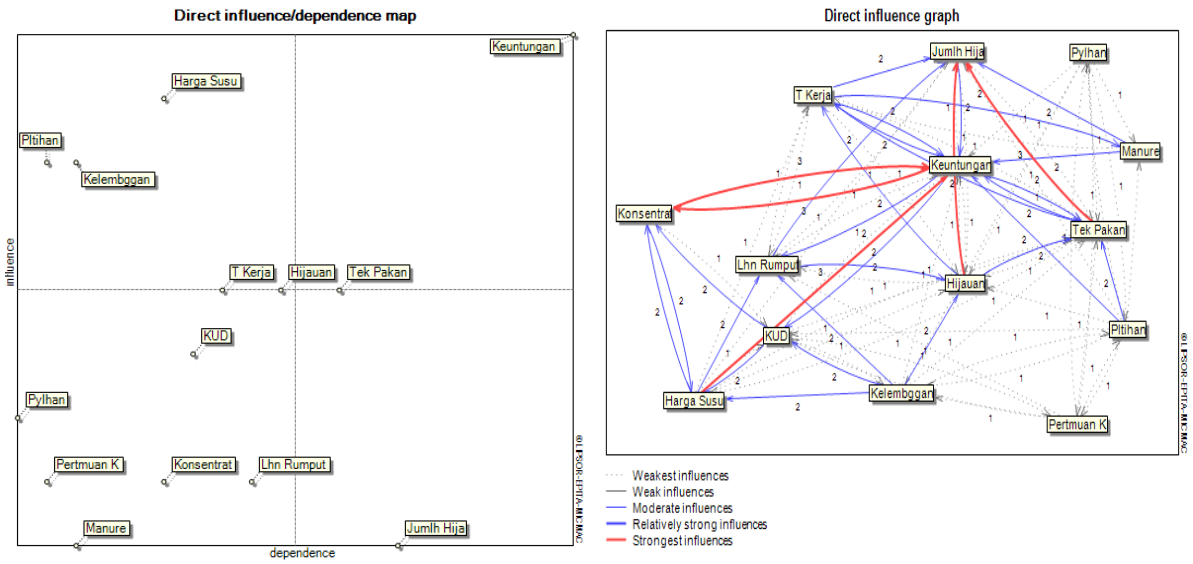


**Figure 6:-** Result *Leverage factors* of PPA.

**Factor of PPA:-**

Analysis need PPA analysis on factors derived from the needs of stakeholders such as the Y table below. Factors that are important and similar stakeholders of the need for further analysis coupled PPA (Table 3).

**Table 3:-** List Stakeholder Needs Factors of PPA.

| No | *Stakeholder* | Needs |
|---|---|---|
| 1 | Breeder | 1. Increased business profits<br>2. Availability of sufficient forage<br>3. The increase in the price of milk<br>4. The decline in the price of concentrate<br>5. Addition trained to improve the skills and knowledge of dairy cattle breeding<br>6. Availability of feed technology affordable for farmers.<br>7. Services IB and good animal health. |
| 2 | Government | 1.Improvement cattle population<br>2. To increase the production and productivity of dairy<br>3. Increasing the welfare of farmers<br>4. The price of milk is beneficial breeder<br>5. Increasing the role of government in the dairy cattle business with (counseling and training, subsidies, establish a modern dairy factory, expansion of marketing of dairy products, the establishment of feed mills and create a unified enclosure)<br>6. Improved coordination with related institutions<br>7. The absorption of labor<br>8. Increased regional income |
| 3 | Milk Cooperation | 1.The favorable milk prices farmers<br>2. Increased production and productivity of dairy<br>3. Improved coordination and cooperation with government institutions, IPS and stakeholders<br>4. Prices of raw materials are cheap concentrates<br>5. Organizing channel trade system and coordinated the milk is good for milk quality security<br>6. Recovery of bad debts from farmers<br>7. Equalization subsidies and waste feed technology to farmers<br>8. Improved service to farmers (IB, animal health, Savings and Loans, |

| | | |
|---|---|---|
| | | concentrates and other).<br>9. Improving the welfare of members |
| 4 | Milk processing industry | 1. Increase the number of quality fresh milk supply and continuous<br>2. Producing quality milk products<br>3. The price of fresh milk cost<br>4. The profit margin is huge<br>5. The strong partnership and mutual benefit<br>6. Increased aid to farmers (Biogas, food technology) to improve the quality and quantity of milk support market and conducive |
| 5 | Community | 1. A clean environment and healthy<br>2. Dairy products are good quality and affordable<br>3. There is a conflict (sewage or land use)<br>4. Educational facilities and travel |
| 6 | Universities | 1. Beneficial partnerships<br>2. Means of education<br>3. Application of science |
| 7 | Non-governmental organization | 1.The natural environment that is sustainable,<br>2. Natural resources maintained,<br>3. There is no pollution and environmental destruction is good and wise. |

**Table 4:-** Factors based on the needs of stakeholders (Need Factors)

| NO | LONG LABEL | SHORT LABEL |
|---|---|---|
| 1 | Forage | Forage |
| 2 | Natural resources | Natural resources |
| 3 | Income | Income |
| 4 | Milk prices | Milk prices |
| 5 | Livestock population | Pop livstk |
| 6 | Production of milk productivity | Milk Productivity |
| 7 | Subsidy | Subsidy |
| 8 | Labor | Labor |
| 9 | Training | Training |
| 10 | Enabling environment | Enabling environment |
| 11 | Institutional cooperation | Institution cooperation |
| 12 | Marketing of milk | Milk market |
| 13 | Price concentrates | Const |
| 14 | Local IPS | IPS |
| 15 | Adoption of feed technology of livestock population | Feed Tech. |

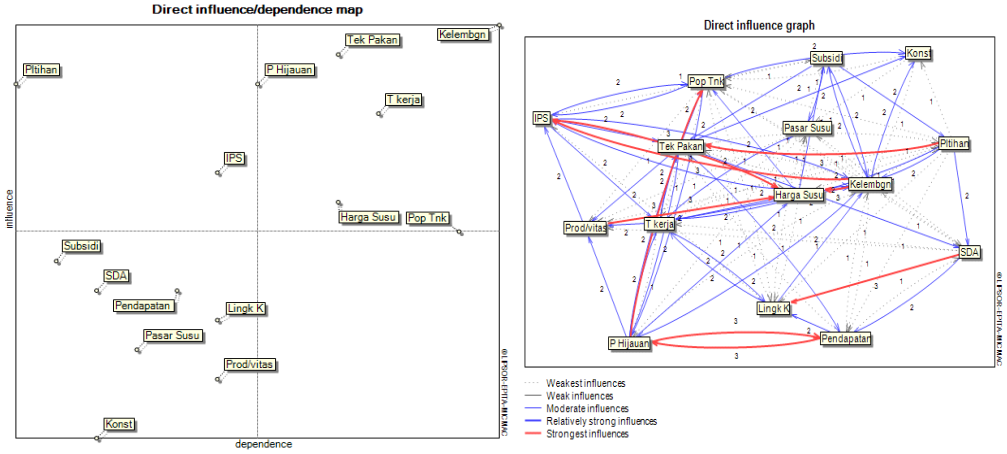


**Figure 7:-** Result Need Factors Of PPA.

**Analysis Combine leverage and Need Factors of PPA:-**

**Table 5:-** Analysis of Combined Leverage Factor Factor PPA and Need Factors

| NO | LONG LABEL | SHORT LABEL |
|---|---|---|
| 1 | Profit | Profit |
| 2 | Price of milk | Price of milk |
| 3 | Training | Training |
| 4 | Labor | Labor |
| 5 | Institutional | Institutional |
| 6 | Forage | Forage |
| 7 | Technology of feed | Technology of feed |
| 8 | IPS | IPS |
| 9 | Livestock population | Livestock population |

Diagram analysis results or the combined key factors and leverage Factors analysis of dairy cattle business in Batu City contained in Figure 7.

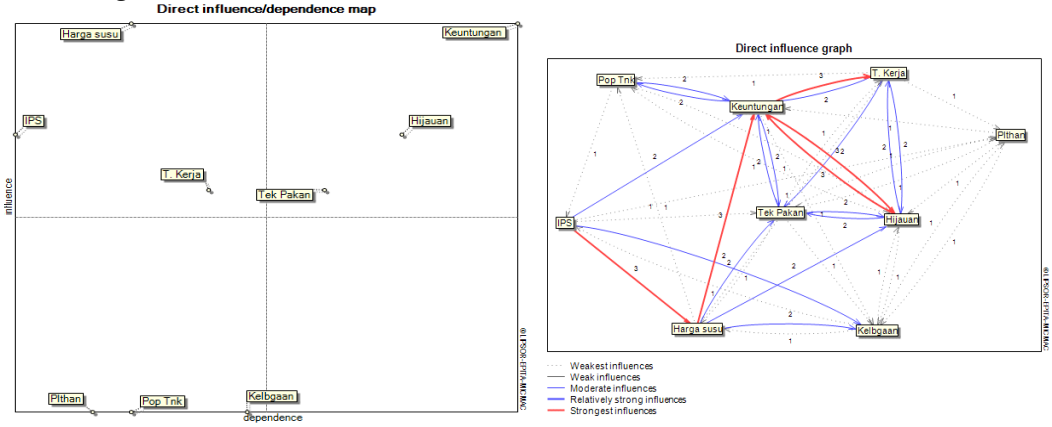


**Figure 8:-** Analysis on Key Factors Combined PPA and Effect Diagram Inter Factors.

The results of this analysis (Figure 8) shows that there are six important factors in the system. Important factor in quadrant I, had much effect on system performance with a low degree of interfactor dependence is the price of milk, IPS (Milk Processing Industry) Local and Labor. In quadrant II yielded important factor had much effect on system performance with a high level of interfactor dependency that profit, Forage and feed technology. While institutional factors, the population of livestock and training are in quadrant IV are the factors that have an influence as well as a small dependence on the system so it is not a key factor. Six important factors affect the dairy cattle business system is a recommendation for the sustainability of dairy cattle business in Batu City that need to be managed better to aim the creation of a sustainable system of dairy cattle business into the future.

PPA analysis in addition to generating a key factor was also able to describe the influence of factors and levels of interest among these factors is based on the effect on the system. The order of the factors based on the level of interest and influence in dairy cattle business systems respectively are: Profit, Price of milk, Forage, Milk Processing Industry, Labor and Feed Technology.

**Table 6:-** Key Factors Analysis Results PPA.

| No | *Leverage factors* | *Need factors* | *Combined factors* | *Key factors* |
|---|---|---|---|---|
| 1 | Training | Training | Training | Price of milk |
| 2 | Price of milk | Milk prices | Price of milk | Labor |
| 3 | Labor | Labor | Labor | Profit |
| 4 | Institutional | Institutional | Institutional | Feed technology |
| 5 | Feed technology | Feed technology | Feed technology | Forage |
| 6 | Forage | forage feed | forage feed | IPS |
| 7 | Profit | Profit | Profit | |
| 8 | | IPS | IPS | |
| 9 | | Livestock population | Livestock population | |

A key factor in the USP in Kota Batu is the price of milk, labor, profit, feed technology, forage feed and Milk Processing Industry.

**Description of each of these key factors, as follows:-**

**Profit:-**

Gains or profits derived by farmers based on the results of the economic analysis of dairy cattle business ranges from 6-9 million/year/ST if properly maintained. Problems in the field are farmers not applying financial management and cultivation so well that profits not maximized. Profits of farmers are not all for the purpose of dairy cattle business, but also be used for other purposes so as if the dairy cattle business profits slightly. The solution to these problems is to encourage farmers to be able to implement financial management and good farming management in dairy cattle business so that the benefits could be maximized. How that can be done, among others, is that using and processing into fertilizer or manure to biogas to provide added value and increase the profits of farmers of dairy cattle business, in addition to the environment also becomes more clear.

Good profit growth reflects that the company's performance is also good. Therefore, profit is a measure of the performance of a company, the higher the profit achieved by the company, indicating the better the performance of the company.

**Price of Milk:-**

Milk prices are set by the cooperative in the period of last five years tend to have lower price increase, is not comparable with other cost increases such as concentrates and fuel. The low price increases caused by: (1) pricing of IPS to KUD tend to be lower than the price of other cooperatives, which are still weak bargaining position KUD in determining the selling price of milk to IPS because IPS unilaterally determine prices; and, (2) the quality of fresh milk sold to IPS is not as good as the quality of milk from other cooperatives. During the first month of sales of milk to the IPS, the quality of milk KUD BATU not all in Grade A and even been rejected for containing antibiotics, so the price of milk and the income received by KUD also lower. Consequently, the price paid to the farmer after deducting operating costs are also low.

The condition of the poor quality of milk (Grade B) due to the mixing of Grade A milk quality with low-quality milk, especially the high bacteria content. While the milk is mixed antibiotic caused the breeder did not tell the officers that their cows just got an injection of antibiotics so that the milk containing antibiotics and eventually contaminate other milk.

Milk prices applied KUD is already well by providing incentives to farmers who deposit the milk with good quality. It encourages farmers to continue to maintain and improve the quality of milk, with always maintain and improve maintenance management and pananganan good milk. With these actions are expected to be good milk quality (Grade A) so that the selling price of milk to the IPS will be higher. Lack of awareness of farmers in applying Good Farming Practices (GFP) reduce the quality of fresh milk in the country (Bamualim et al., 2008).

Nugroho (2011) argues that the government should provide incentives for farmers to improve the productivity and quality of fresh milk. Besides, the necessary repairs bargaining position (bargaining), economies of scale and

economies of scope of the entire cooperative fresh milk in Indonesia by way of effecting the performance of the role of external parties associated with the agribusiness system of national milk, covering GKSI, councils of national dairy, universities and NGOs.

**Feed Forage**

Livestock feed is a major factor in producing good quality milk. Livestock forage needed on average is 10 percent of their body weight. Dairy cattle population continues to increase require the supply of green feed. Limitations of forage becomes a major problem in the dairy cattle business in Batu City. These problems affect not optimal milk production and feed costs. Average production of Batu's dairy farmers only ranges around 10-12 liters/cow/day. The figure is small when compared with the dairy company that is able to produce up to twice as much.

Limited land as the grass forage feed is claimed as the main trigger limitations. As a solution to these problems, farmers rent land to forestry in the area of forest to plant grass under the pine trees. At the farmers adjacent to the forest it would not be a problem, but for farmers, which are located closer to the city as in the Oro-Oro Ombo village that increase transportation costs and labor time. This makes the dairy cattle business less attractive to farmers or communities so that farmers are turning to tourism sector.

Solutions for continuous availability and sufficient forage, the city government should strengthen coordination with relevant agencies to protect the interests of farmers by providing an area (of land owned by the government) to use plant grass. It never happened on land owned by Perhutani, which can be used ranchers graze before the tourist complex built into a vehicle Jatim Park. One of the problems commonly faced by dairy farmers in Indonesia are low quality and continuity of supply of forage (Prawiradiputra and Priyanti, 2008). Limited land result in: (1) the difficulty of increasing the ownership of cattle because farmers can not afford to look for forage more; (2) Forage be imported from distant places that require high korbanan time; so, (3) requires a high transportation costs so hijuan be expensive and lead to high production costs that reduce the income of farmers (Martindah and Saptati, 2006).

**Local Dairy Processing Industry:-**

Local Social Development in Batu City has long been on the agenda of the City Government but not yet realized. IPS development is one solution to the sustainability of dairy cattle business in Batu City. Keberdaan Local IPS, will reduce operational costs of KUD such as transportation and other so they can raise the price of milk, maintaining the quality of the milk as quickly processed, employment and shorten the marketing channels of milk. It is if it can be realized, ranchers, cooperatives and community will benefit from dairy cattle business. With so dairy cattle business will be more attractive to be developed by the breeder.

The central government, namely the Department of Industry (2009) in the Roadmap Dairy Industry in Indonesia stated that to develop the dairy processing industry (diversification) is to utilize the potential of raw materials. For the purpose of long-term development, the thing to do is increasing mastery of technology in the effort: (1) the quality of processed milk .peningkatan small and medium scale; (2) To develop a diversified dairy products which have high competitiveness; and, (3) Enhanced cooperation in the development of process technology and product diversification.

**Labor:-**

The intense of Batu City development in the travel sector also attract labor, especially the young ones. The labor force participation in Household farmers mostly only two people are fathers and mothers, while children only help occasionally when requested. Most children and parents want children to work in other fields, especially travel that is cleaner and less troublesome as well as prestigious addition they found that dairy cattle business income is less attractive. It continues to grow along with the growth of tourism in Batu City. If the Government and the people did not leave the next generation of business solutions dairy cows will decrease.

Steps that can be taken is to raise interest in dairy cattle business is to increase profits at the USP that can be done through the increase in milk prices, the availability of forage feed sufficient and implement clean management in dairy cattle business so the environment has also become more clean and sustainable in maintaining the dairy cattle business is supported by the use of family labor optimally

Riswara, Nurlina and Sulistyati (2015) that the use of family labor allows each job in dairy cattle breeding business is done with a sense of responsibility and a high sense. Dairy cattle business does require considerable power and

are routine. Farmers who lack the support of a family, it would be difficult to develop the dairy cattle business. This could hamper the sustainability of the dairy cattle business.

**Feed Technology:-**

Food technology is one solution to increase milk production and save on feed costs both forage and concentrates. The production of milk before farmers adopt the technology of feed an average of only 10-12 liters/cow/day and thereafter increases 1-2 liters. Food technology adopted is the use of engine chopper, for chopping grass, making it easier for cattle to eat and reduce residual forage that forage that save costs, increase forage intake so that milk production is better. The second technology adoption is the use of ad-libitum water where the animals can drink freely so as to increase milk production. This technology coupled with the delivery technology of the concentrated dry or not dikombor (wet). Award of the concentrated dry relieve farmers work, concentrate not scattered making it more efficient and cleaner cages, as well as odorless manure mostly based on field observations.

The main purpose of feeding in dairy cattle rations is to provide an economical yet to meet basic living needs, pregnancy, and the mother's milk production, and the need for growth for the young animals. In order for optimal production it is necessary that there is enough food, both quality and quantity. Low temperatures in the highlands according to the physiological conditions of dairy cows that feed intake is high. In the highlands of scores of dairy cows can consume as much as 50-60 kg / day (Bamualim, Kusmartono and Kuswandi 2008). The cost of feed could reach 62.5% of the total cost of the dairy cattle business that benefits farmers also rely heavily on the amount of feed costs incurred (Yusdja 2005 in Bamualim et al., 2008). Therefore, adoption of the technology of feed is an important factor for the sustainability of the dairy cattle business.

## Conclusions:-

Based on the PPA, it is found six critical factors that importantly influenced the sustainability of dairy business, namely: (1) three important factors had much effect on the performance of the system with a low level of interfactor dependence (the price of milk, IPS, Labour); and, (2) three important factors had much effect on system performance with a high level of interfactor dependency (Feed Technology, Forage, Profit).

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