Analysis of Determining Factors and Strategies in Dairy Cattle Agribusiness Improvement to Increase Milk Production in Central Java

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Abstract
This research aims to analyze factors and strategies in dairy cattle agribusiness improvement to increase milk production in Central Java. Survey method was used in this research, the research sites were selected by purposive sampling method, based on the potential development area for dairy cattle business in Central Java. The two sites were: Semarang Regency and Boyolali Regency. Sample of this research are 30 respondents. The data were analyzed descriptively and statistically. Factors in improvement of dairy cattle agribusiness to increase milk production were analyzed using multiple linear regression statistical model. The strategies of dairy cattle agribusiness improvement were analyzed using the Strength, Weakness, Opportunity, Threat (S.W.O.T) model. The result of this research showed that the independent factors overall significantly influenced (P<0.01) the production of milk, with a coefficient of determination (R²) value of 0.60. It was determined that the best strategy for dairy cattle agribusiness improvement was the SO strategy, which is to utilize strength to achieve business opportunity.

1. Introduction
Indonesia has the potential and comparative and competitive advantage of natural and human resources to develop dairy industry on community-based dairy cattle agribusiness model. However, the current efforts have not been adequately successful in creating a robust and strong competitiveness of Indonesian dairy farms in the industry. In fact, Indonesia is now at a position of a major importer of milk. The current market demand is met by 75% import milk, which leaves 25% of the market share for local dairy farms [1]. The volume of which milk processing industries (MPI) imports milk results in consequences such as: 1) local dairy farmers losing market share of local consumers, which in turn may reduce income of these farmers, and 2) the lower price point at which import milk is sold makes it difficult for farmers to compete and reduce business opportunities for the farmers. The low local production and productivity of milk is also caused, among others, by most dairy farms being relatively small scale, low quality and quantity of cattle food, low cattle pen hygiene and limited post-production and marketing management [2]. This situation in local dairy farm agribusiness in turn creates low investment, productivity, efficiency, farmer income and competitiveness.

Local dairy farm agribusiness, which mostly are still as side business and in traditional method, has not been able to significantly contribute toward meeting market demand for milk and being a main source of income for the farmers. The most local dairy farms only possess 2-4 productive cows, which is inadequate and steps need to be taken to increase the population of dairy cows to 5-7 cows per dairy farm [3]. Adding more cows to local dairy farms need capital sources and area development for dairy farmland and animal feed. The effort to develop the agribusiness can be performed through improving the business itself and followed by development strategies. The improvement is an effort to increase the ability of people in the community to convey their opinions, needs, options, and to participate, to negotiate, to influence and to responsibly manage in a communal manner the betterment of their lives [4]. This research aims were to analyze factors correlated to the improvement
of dairy cattle agribusiness which is expected to increase dairy milk productivity and to analyze the most appropriate strategy to develop the local industry to create more favorable situation for the local dairy farmers in Central Java.

2. Material and Methods
The research was conducted from May 2016 to August 2016. It took place in two regencies, namely Semarang Regency and Boyolali Regency, which were determined using purposive sampling. The sites were chosen due to its promising potential and number of dairy cattle out of all the regencies in Central Java province. Survey was used to conduct research. Two urban villages with the highest population of dairy cattle were selected. Three farmer groups from each urban village were then purposively selected based on the highest number of members and milk production capacity. Dairy farmers from each group were chosen randomly, with 15 dairy farmers from each regency. Moreover, 15 stakeholders related to dairy industry from each regency were selected in this research. In total, there were 60 respondents. Primary data collection was achieved through interview with the dairy farmers, based on the formatted questionnaires and observation on dairy cattle business. The secondary data were collected from Governmental Services and Offices/stakeholders relevant to the research subject.

The data were then analyzed both descriptively and statistically. The most influential factors in the development and development strategy of dairy industry were determined using multiple linear regression statistical model, in which the dependent factor was milk production (Y) and the independents factors were number of cattle (x1), age of the farmer (x2), occupation of the farmer (x3), business experience of the farmer (x4), price of milk (x5), price of milk (x6), formal education background of the farmer (x7), and business motivation (x8). In accordance to the formula used in Ghozali (2006), the factor analysis in this research used the following formula:

\[ Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + e, \]

where:
- \( Y \) = milk production (liter)
- \( X_1 \) = number of lactating cattle
- \( X_2 \) = age of the farmer (year)
- \( X_3 \) = main occupation of the farmer (dummy variable: dairy farmer = 1 and other = 0)
- \( X_4 \) = business experience of the farmer (year)
- \( X_5 \) = price of milk (Rp/liter)
- \( X_6 \) = number of dependents in the family
- \( X_7 \) = formal education background of the farmer (year)
- \( X_8 \) = business motivation (dummy variable: as a source of income= 1, as a side income=0)
- \( b_1, b_2, \ldots, b_8 \) = coefficient of regression, \( e \) = error

The business improvement strategies were analyzed using S.W.O.T (strengths, weaknesses, opportunities and threats) analysis [6]. This method was used to evaluate strengths, weaknesses, opportunities and threats in the local dairy cattle business to achieve improvement and development. The evaluation technique used is as followed:

a. Each S.W.O.T determining factor was given a 5-point Likert scale for its perceived importance with scales of “most important” = 5, “more important” = 4, “important” = 3, “less important” = 2, and “least important” = 1.

b. The rating was determined using a 5-point Likert scale with scales of strongly agree = 5, agree = 4, somewhat agree = 3, disagree = 2, strongly disagree = 1.

c. The weight was determined based on the significance and overall is amounted to one.

d. The final value was determined by weight times rating value of each indicator.

e. The strategy of dairy cattle improvement was on one of four positions in the strategic quadrant of: 1) Quadrant I, SO (strengths-opportunities), 2) Quadrant II, WO (weaknesses-opportunities), 3) Quadrant III, WT (weaknesses-threats), and 4) Quadrant IV, ST (strengths-threats).
3. Result and Discussion

3.1 General Description of Local Dairy Farm Agribusinesses in the Research Site

Boyolali and Semarang Regencies are areas in Central Java with great potential for dairy farm business development. In 2016, the population of dairy cattle in Boyolali was recorded as the highest in Central Java, with 61,887 cattle followed by Semarang Regency with 22,408 cattle. The condition and temperature of the area is relatively suitable for the development of dairy cattle agribusiness [7]. Temperature and environmental condition are vital for production and productivity of dairy cattle [8].

Milk production is the main objective of dairy cattle business. Based on the number of milk production in 2016, Boyolalai Regency produced 49,913,000 liters and Semarang Regency produced 3,264,000 liters, of which combined numbers accounted for more than 53.17% of total milk production in Central Java, which was 99,996,620 liters. The two regencies showed positive development in dairy cattle agribusiness in the two regencies between 2012 and 2016, with 2.99% growth in Semarang Regency and 6.51% growth in Boyolali Regency, whereas overall dairy cattle business development in Central Java showed negative growth of 0.71%. The data on dairy cattle population and milk production in the research sites are presented in Table 1.

Table 1. The Development of Dairy Cattle Population and Milk Production in Boyolali Regency and Semarang Regency from 2012 to 2016

| No. | Year   | Boyolali Regency | Semarang Regency |
|-----|--------|------------------|------------------|
| 1   | 2012   | 88,533           | 35,451           |
| 2   | 2013*  | 61,887           | 37,999           |
| 3   | 2014   | 72,123           | 36,962           |
| 4   | 2015   | 88,533           | 39,017           |
| 5   | 2016   | 61,887           | 22,408           |
| r (%)| 2.99   | 1.78             | (6.51)           |

Source: Animal Husbandry and Animal Heath Service of Central Java Province (2016)

*) From Agricultural Census ST 13

3.2 Identity of Respondents

Most respondents were in the age range of 31-55 years old, with 12 individuals (80.00%) in Boyolali Regency and 9 individuals (60.00%) in Semarang Regency belonging to the age range. Most of the respondents, 16 respondent graduated from high school. Dairy farmer was the main occupation of most respondents in in Boyolali Regency, with 9 respondents (60.00%). However, most of the respondents in Semarang Regency were farmers (46.67%). The average number of dairy cattle was 1-2 cattle/farmers, with 9 respondents (60.00%) in Boyolali Regency and 12 respondents (80.00%) in Semarang Regency. Most of the respondents, 11 respondents (73.33%) in Boyolali Regency and 8 respondents (53.33%) in Semarang Regency, reported an average milk production ranging between 5 and 8 liters/day/cattle. Most of respondents in Boyolali Regency, 11 respondents (73.33%), had been in the business for 1 to 10 years whereas most respondents in Semarang Regency, 7 respondents (46.67%), had been in the business for 11-20 years. The identity of the respondents is presented in Table 2.
| No. | Note | Regency Boyolali (n=15) | Regency Semarang (n=15) |
|-----|------|-------------------------|-------------------------|
| 1.  | Age (year) | | |
|     | 20-30 | 2 13.33% | 1 6.67% |
|     | 31-55 | 12 80.00% | 9 60.00% |
|     | > 55  | 1 6.67% | 5 33.33% |
| 2.  | Formal Education | | |
|     | Elementary School | 3 20.00% | 6 40.00% |
|     | Middle School | 1 6.67% | 2 13.33% |
|     | High School | 9 60.00% | 7 46.67% |
|     | Higher Education | 2 13.33% | - |
| 3.  | Main Occupation: | | |
|     | Farmer | 4 26.67% | 7 46.67% |
|     | Dairy Farmer | 9 60.00% | 6 40.00% |
|     | Others | 2 13.33% | 2 13.33% |
| 4.  | Average Number of Dairy Cattle Owned | | |
|     | 1-2 | 9 60.00% | 12 80.00% |
|     | 3-4 | 4 26.67% | 1 6.67% |
|     | >4  | 1 6.67% | 2 13.33% |
| 5.  | Milk Production (Liters/cattle/day): | | |
|     | 5 – 8 | 11 73.33% | 8 53.33% |
|     | 9 – 12 | 2 13.33% | 5 33.33% |
|     | >12  | 2 13.33% | 2 13.33% |
| 6.  | Years in the Dairy Cattle Business: | | |
|     | 1- 10 | 11 73.33% | 4 26.67% |
|     | 11– 20 | 2 13.33% | 7 46.67% |
|     | >20  | 2 13.33% | 4 26.67% |

3.3 Factor Analysis of Dairy Cattle Agribusiness Improvement in the Research Sites

Analysis of factors determining the improvement of dairy cattle agribusiness in the research sites was conducted using multiple linear regression statistical model. Milk production was the dependent factor (Y), while the independent factors were the number of lactating cattle (x1), age of the farmer (x2), main occupation of the farmer (x3), business experience of the farmer (x4), price of milk (x5), number of dependents in the family (x6), formal education background of the farmer (x7), and business motivation (x8). The independent factors had overall significantly influenced (P<0.01) milk production (Table 3). Partially influencing factors (P<0.05) were the number of lactating cattle, age of the farmer, and business experience of the farmer. These results show that the improvement aspect of the dairy agribusiness needs to take into account not only the technical factors, but also the social and economic factors related to the dairy farmers. This finding is in accordance to Soekartawi, who stated that the productivity of farms is influenced by technical and socio-economic factors [9]. In a broad sense, productivity means the correlation between output and input which is used to add value in the resources used in production. Not only does productivity serve as a measure of production output, it also measures the usage of resources in the effort to complete a mission or achievement [10].

The analysis showed that one additional cattle unit would result in an increase of 4.485 units in the milk unit. Farmer age was also an important factor, since the older the farmer, the less capacity he
has to perform strenuous physical task associated with running a dairy business. The coefficient of determination ($R^2$) of 0.60 means that the improvement factor of farmers through increased milk production of dairy cattle was significantly influenced by the overall factors of 60% and the remaining 40% were influenced by other factors outside of the model.

Table 3. Determining Factors in Dairy Cattle Agribusiness Improvement

| No. | Improvement Factor                          | Coefficient of Regression | Sign. |
|-----|---------------------------------------------|---------------------------|-------|
| 1.  | Constant                                    | -91.671                   |       |
| 2.  | Number of lactating cattle (x1)             | 4.485                     | 0.05*)|
| 3.  | Age (x2)                                    | -1.323                    | 0.05*)|
| 4.  | Main occupation (x3)                        | 8.945                     | 0.297 |
| 5.  | Business experience (x4)                    | 1.639                     | 0.026*)|
| 6.  | Price of milk (x5)                          | 0.021                     | 0.173 |
| 7.  | Number of dependents (x6)                   | 5.366                     | 0.141 |
| 8.  | Formal education (x7)                       | 2.149                     | 0.126 |
| 9.  | Motivation (x8)                             | 6.550                     | 0.489 |
| 10. | Fhit                                        | 3.152                     | 0.00**)|
|     | $R^2$                                       |                           | 0.60  |

Note: *) real (5%)

3.4 Analysis of Improvement Strategy to Develop Local Dairy Cattle Agribusiness in the Research Sites

Local dairy agribusiness improvement strategies were analyzed using the S.W.O.T (strengths, weaknesses, opportunities and threats) model. This method was used to evaluate strengths, weaknesses, opportunities and threats in the local dairy cattle business in order to strengthen the structure and development of investment in the business. The analysis result of internal (strengths and weaknesses) as well as external factors on local dairy farm agribusiness is as follows:

1) Strength Factors

Table 4. S.W.O.T Analysis of Strength Factors

| No. | Factor                                           | Weight Value | Rating | Weighed Value (Weight x Rating) |
|-----|--------------------------------------------------|--------------|--------|---------------------------------|
| 1.  | Business experience of farmers                   | 4.2          | 0.16   | 4.5                             | 0.71                           |
| 2.  | Geographical location of the dairy cattle        | 3.8          | 0.14   | 4.6                             | 0.66                           |
| 3.  | Institutional role of farmers in business development | 3.6        | 0.13   | 4.1                             | 0.54                           |
| 4.  | Motivation of farmers                            | 3.4          | 0.12   | 4.5                             | 0.57                           |
| 5.  | Institutional support for local dairy farm business | 3.6        | 0.13   | 4.0                             | 0.54                           |
| 6.  | Instructional and human resources support for local dairy farm business | 3.8        | 0.14   | 4.2                             | 0.60                           |
| 7.  | Knowledge and technological support for local dairy farm business | 4.2        | 0.16   | 4.5                             | 0.71                           |

1
2) Weakness Factors

Table 5. S.W.O.T Analysis of Weakness Factors

| No. | Factor                                                                 | Weight | Rating | Weighed value |
|-----|------------------------------------------------------------------------|--------|--------|---------------|
| 1.  | Distribution network and chain of milk marketing                       | 3.6    | 0.13   | 4.4           | 0.58 |
| 2.  | Milk price is not sufficient to cover production facilities cost, especially concentrate feed cost. | 4      | 0.14   | 4.5           | 0.66 |
| 3.  | Government policy for the development of local dairy farm business     | 4.6    | 0.17   | 4.1           | 0.69 |
| 4.  | Low-scale cattle ownership                                             | 3.6    | 0.13   | 4.1           | 0.54 |
| 5.  | Limited access to premium cattle seed                                  | 3.6    | 0.13   | 4.5           | 0.59 |
| 6.  | Limited land area for natural forage and feed                          | 3.8    | 0.14   | 4             | 0.55 |
| 7.  | Limited and relatively small-scale capital support for local dairy farm business | 4.2    | 0.14   | 4.5           | 0.69 |

1 4.29

3) Opportunity Factors

Table 6. S.W.O.T Analysis of Opportunity Factors

| No. | Factor                                                                 | Weight | Rating | Weighed value |
|-----|------------------------------------------------------------------------|--------|--------|---------------|
| 1.  | Umnent demands in the market from Processed Milk Industry             | 3.8    | 0.33   | 4.1           | 1.36 |
| 2.  | Increasing milk consumption due to the increase in population and community awareness on the importance of nutrition in milk | 4      | 0.35   | 4.1           | 1.40 |
| 3.  | Opportunities in developing processed milk products to meet demands for quality food | 3.6    | 0.31   | 4.5           | 1.42 |

1 4.19
4) Threat Factors

Table 7. S.W.O.T Analysis of Threat Factors

| No. | Factor                                                                 | Weight Value | Rating % | Weighed Value (Weight x Rating) |
|-----|------------------------------------------------------------------------|--------------|----------|---------------------------------|
| 1.  | The opening of ASEAN Economic Community (AEC) which allow free-flowing farming products | 3.4          | 0.36     | 1.26                            |
| 2.  | Other, more promising options in animal farming sector                 | 3            | 0.32     | 1.11                            |
| 3.  | Other, more prospectful business opportunities outside of dairy farm   | 3            | 0.32     | 1.21                            |

Analysis of the development strategy of dairy cattle agribusiness showed that the IFE matrix (strengths and weaknesses) was positive at 0.05 and the EFE matrix (opportunity - threat) was also positive at 0.6. These results indicated that local dairy cattle agribusiness had the strengths and opportunities for development. The recommended strategy was the Quadrant I, the SO strategy. The dominant aspects of strengths were business experience, business environment and dairy cattle business technology. All of these aspects need to be continuously supported so that the dairy cow business will achieve optimal production. The strongest opportunity aspects were the prospect of dairy products, and the demands of household and the dairy industry consumers.

4. Conclusion

The results of the study concluded that the condition of dairy cattle agribusiness in Central Java has the potential to be developed. The improvement factors in the effort to increase milk production were influenced by technical, social, economic and human resources of farmers, so these factors must be taken into account in the development effort. The best strategy to be used in developing dairy cattle agribusiness was determined to be of Quadrant I, SO. The most dominant strength aspects were business experience, business environment and dairy cattle business technology. All of these aspects need to be continuously supported in order to achieve optimal business development. On the other hand, the strongest opportunity aspects were the prospect of dairy products, and the demands of household and the dairy industry consumers. Efforts should be made to encourage various parties to increase and support dairy farmers, both related to education, training, business motivation, capital, and in access to the market in an effort to increase milk production.

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