Strengthening the Farmers' Intellectual Capital of Kebumen Ongole Grade Cattle Related to Livestock Productions to Face the Industrial Revolution Era 4.0

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Abstract. Intellectual capital is the farmers' intangible asset related to human, relational and structural capital. Human capital is in the form of knowledge and skills; relational capital is the ability to interact with markets, consumers, and others; while structural capital is the ability to develop innovations and to manage the household organizations. This research aims at identifying the farmers' intellectual capital of Kebumen Ongole grade cattle related to the livestock productions and analyzing the factors strengthening the farmers' intellectual capital. The survey was conducted on 147 farmers of Kebumen Ongole grade cattle through a multistage sampling method. The obtained data were then analyzed using the descriptive statistical and spearman ranking correlation test. The results showed that the farmers have already had adequate intellectual capital with the score of 116.92. The farmers' ability related to information access and education are important factors to strengthen the farmers' intellectual capital (P<0.01). The farmers' ability to access information and education are considered essential in order to strengthen the farmers' intellectual capital.

Keywords: education, information access, intellectual capital

1. Introduction
Livestock development is the locomotive of rural development in Indonesia through production and distribution activities on livestock commodities. Optimizing local genetic resources is conducted to increase the cattle production. Kebumen ongole grade cattle are local genetic resources that have a business potential to encourage the development of the rural economy. Since 2010, the development of Kebumen ongole grade cattle has been intensively made in Kebumen Regency through the development of Kebumen ongole grade cattle breeding groups. Until 2018, the development of Kebumen ongole grade cattle involved 29 major breeding farmers groups spread across 6 districts: Puring, Petanahan, Klirong, Mirit, Ambal, and Bulus Pesantren.

The development of Kebumen ongole grade cattle farming is an integrated effort in term of cattle production and distribution aspects. The business dynamics of Kebumen ongole grade cattle cannot be separated from the farmers' entrepreneurial ability including the technical, economic and marketing aspects. Entrepreneurial ability is greatly important to ensure the business sustainability of Kebumen
ongole grade cattle because entrepreneurial ability will encourage the farmers to obtain business opportunities from both internal and external changes. Agricultural sector is dominated by the small-scale family businesses with many competitors. However, agricultural activities provide more opportunities, such as the development of new products and business process innovation, distribution and marketing [1].

The farmers’ innovative ability is greatly required to increase the agricultural productivity [2] and to face the tighter competitions in the industrial revolution era 4.0. It is supported [3] industrial revolution era 4.0 marked with the use of Internet to access and explore many agricultural systems, dynamic value chains, and organizational automation. This revolution uses some digital practices like open innovation, cooperation and mobility.

The innovation required in beef cattle farming in the industrial revolution era 4.0 greatly depends on the availability of business intellectual capital. Intellectual capital allows organizations to be more innovative [4]. In a company, intellectual capital shows the value of ideas and ability to innovate for a longer period. In livestock business, intellectual capital is one intangibly important asset for livestock businesses to improve the economic performance along with the existence of the others. According to [5] intellectual capital is one business important asset which includes human, structural and relational capital related to the embedded knowledge of each individual; organizational structures, processes and systems; as well as relationships or networks.

Efforts to strengthen the intellectual capital have become highly strategic to increase the business innovation of Kebumen ongole grade cattle which further may enhance its competitiveness. Therefore, this study aims at identifying the internal factors to strengthen the farmers’ intellectual capital in Kebumen ongole grade cattle farming.

2. Methodology
The study on strengthening the farmers’ intellectual capital in Kebumen ongole grade cattle farming was conducted by a survey method using questionnaires and in-depth interviews to 147 Kebumen ongole grade cattle farmers. The respondents were selected using a multistage sampling. In the first stage, the district areas were purposively selected based on the existence of Kebumen ongole grade cattle population. Second, 50 percent of the breeding farmers groups in each district were randomly selected and then 20 percent of respondents in each selected group were taken as the research samples.

The collected data were analyzed using a descriptive statistical method to describe the farmers’ intellectual capital.

\[
\bar{X} = \frac{\Sigma X}{n},
\]

Where:
\[
\bar{X} = \text{Mean} \\
\Sigma X = \text{Sum of score} \\
n = \text{number of farmers}
\]

Spearman rank correlation analysis is used to identify the relationship of education, farming experience, length of group membership, and ability to access information with intellectual capital.

\[
\rho = 1 - \frac{6 \Sigma d_i^2}{n(n^2 - 1)}
\]

Where:
\[
\rho = \text{coefficient of correlation} \\
d_i = \text{difference between a pair of rank} \\
n = \text{number of farmers}
\]
When the significance value (p) is <0.05, there is a relationship of education, farming experiences, length of group membership, and ability to access information with intellectual capital.

3. Result and Discussion

Kebumen Ongole grade cattle breeding farm is conducted with a group approach on a limited scale of business. Small-scale Kebumen Ongole grade cattle farming must be creative and innovative in developing strategies to maintain the competitive advantages from the weaknesses of the business scale. The existence of intellectual capital which includes information and knowledge resources is believed to be able to facilitate the internal factors to develop the economic performance of the increasingly strong Kebumen Ongole grade farming.

Profile of Respondents

The average age of those 147 Kebumen Ongole grade cattle farmers was 50.41 and still classified into the productive age. Their raising experiences were also quite long with an average of 24.46 years. For farmers, raising beef cattle is not only intended to earn a living but has become their way of life.

| Tabel 1. Profile of Kebumen Ongole Grade Cattle Farmers |
|---------------------------------|
| **Minimum** | **Maximum** | **Mean** |
| Farmers’ age | 22.00 | 73.00 | 50.41 |
| Farm size (Animal Units) | 1.00 | 7.00 | 2.15 |
| Number of family members | 1.00 | 6.00 | 3.38 |
| Length of membership | 1.00 | 27.00 | 7.81 |
| Farmers’ Educational level | 6.00 | 16.00 | 9.14 |
| Farming experience | 1.00 | 61.00 | 24.46 |

Based on Table 1, Kebumen Ongole grade cattle farmers have an average farm size of 2 Animal Units. That number is considered very limited for beef cattle farming. Kebumen Angole cattle farmers have an experience of being a group member with an average of 7.8 years. Their educational level is considered quite potential with an average of 9.1 years. It means that the Kebumen Ongole grade cattle farmers have averagely graduated from Junior high schools.

Farmers’ Intellectual Capital

Intellectual capital is an asset owned by a business unit and can provide the business unit with new capabilities to compete and win [6]. These assets tend to be classified into 3: human capital, structural capital and relational capital. In this study, the intellectual capital is measured using 40 questions consisting of 20 questions for human capital, 10 questions for structural capital and 10 questions for relational capital.

Table 2 shows that Kebumen Ongole grade cattle farmers have sufficient intellectual capital with a score of 116.92. Intellectual capital is the accumulation of human, structural, and relational capital. Human capital reflects the livestock business collective abilities to produce the best cultivation systems based on the knowledge belonging to the farmers. Human capital may increase if the Kebumen Ongole grade cattle farmers are able to use their knowledge, expertise, skills, motivation, innovation, adaptability and entrepreneurial spirit. The Kebumen Ongole grade cattle farmers have adequate human capital score of 56.85. Human capital is one main key to strengthen intellectual capital and mediate the relationship of structural capital with relational capital [7]. Furthermore, structural and relational capital simultaneously mediates the relationship between human capital and innovation.

Structural capital is the Kebumen Ongole grade cattle farming ability to run a business system and its structure to support the farmers in producing their optimal economic performance. The existence of farmer household interactions and members’ structure involvement in livestock farming influence the structural capital level. The existence of systems and procedures in farmers’ households affects the
farmers’ performance. Based on Table 2, Kebumen Ongole grade cattle farming have a good structural capital with a score of 30.73.

**Table 2. Ongole Grade Cattle Farmers’ Intellectual Capital**

| Components       | Minimum | Maximum | Mean  | Category |
|------------------|---------|---------|-------|----------|
| Human capital    | 44.00   | 73.00   | 56.85 | moderate |
| Structural capital | 27.00   | 39.00   | 30.73 | good     |
| Relational capital | 17.00   | 38.00   | 29.16 | moderate |
| Intellectual capital | 95.00   | 147.00  | 116.92| moderate |

Relational capital is an intellectual capital component which describes the harmonious network relationships between farmers and their partners, both reliable and qualified suppliers, originated from the farmers’ relationships with the government and the surrounding communities. Kebumen Ongole grade farmers have sufficient relational capital score of 29.16 to provide the added value to Kebumen Ongole grade cattle farming.

**The Influence of Demographic Social Factors on the Cattle Farmers’ Intellectual Capital**

Efforts to strengthen the intellectual capital are expected to strengthen the competitiveness of Kebumen Ongole grade cattle farming. Based on the Spearman ranking correlation analysis in Table 3, it can be identified that the farmers’ education level and information accessibility are the driving factors to strengthen the Kebumen Ongole grade cattle farmers’ intellectual capital (P <0.05).

**Table 3. The relationship of length of membership, education, farming experience, and information accessibility with farmers’ intellectual capital**

| Variables            | t     | Significance (p) |
|----------------------|-------|------------------|
| Length of membership | -0.058| 0.487            |
| Farmers’ Education   | 0.332 | 0.001**          |
| Farming experience   | -0.057| 0.496            |
| Information accessibility | 0.238 | 0.004**         |

**significant at level 0.01**

Improving the farmers’ education may increase the farmers’ knowledge, expertise, competence and motivation. Informal education really needs to be given to Kebumen Ongole grade cattle farmers through systematic trainings and counseling. Likewise, the farmers’ ability to access information has increased that the farmers may comfortably obtain livestock technical information, marketing information, and others. the qualified educational institutions, formal education, agricultural trainings have a close relationship with the formation of intellectual capital to strengthen the agricultural [8]. The ability to obtain market information (competitions and demands) connected through internet access may affect the intellectual capital in agricultural businesses. An adequate link between farmers and consumers combined with education may increase the transmission of intellectual capital to rural areas [9].

**4. Conclusion**

Kebumen Ongole grade cattle farmers as the farmer group members have adequate intellectual capital characterized by their adequate human capital, structural capital and relational capital. Education and information accessibility are important and strategic factors to increase the farmers’ intellectual capital in Kebumen Ongole grade cattle farming.
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