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Intellectual capital to support goat farming profitability in a rural area of Banjarnegara Regency, Indonesia

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ABSTRACT. Goat farming in Banjarnegara Regency, Indonesia has become a driver of the rural economy. Banjarnegara is a mountainous area which is divided into three agroecological zones, namely highland, middle land, and lowland. The research was conducted to (1) identify the levels of goat farmers' intellectual capital and goat farming profitability; and (2) analyze the relationship between goat farmers' intellectual capital and goat farming profitability. A multistage sampling method was conducted to collect data from 180 goat farmers. The research on goat farmers' intellectual capital was conducted using interviews and observations. The dependent variable was goat farming profitability, while the independent variables were goat farmers' intellectual capital elements, such as human capital, relational capital, and structural capital. Spearman Rank Correlation Test was used to analyze the relationship between the goat farmers' intellectual capital and the goat farming profitability. The goat farmers in Banjarnegara Regency are considered to have moderate intellectual capital. The descriptive statistical analysis showed that the goat farmers had an average of 0.47 Animal Unit (AU) and generated revenue of IDR 2,225,033.52 (USD 155.07) annually. The goat farmers' intellectual capital had a significant influence on increasing profitability. Human capital and structural capital should be strongly considered to improve goat farming profitability. Increasing the quantity of training for goat farmers and developing farmers' groups must be carried out to increase the intellectual capital of goat farmers.

Keywords: *Intellectual capital, profitability, smallholder goat farmers*

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INTRODUCTION

Agriculture is the building block of the Banjarnegara Regency's economy. Banjarnegara is a mountainous area which is divided into three agroecological zones: highland (>1000 m above sea level), middle land (500-1000 m above sea level), and lowland (<500 m above sea level). Since 2018, the development of small ruminants in Banjarnegara has been very slow. The population of goats during this period had increased by 4% per year due to low-level farming management (Central Bureau of Statistics Banjarnegara Regency, 2021). The low growth of the goat population must be overcome to take advantage of increasingly large market opportunities. Namonje-Kapembwa et al. (2022) stated that the rapid rural development has led to a rapid increase in the demand for livestock products, and thus expanding new market opportunities for small ruminant producers to invest in. Goats are valuable for various purposes including consumption, traditions, marriages, and as gifts. The problems regarding the small ruminants in developing countries are mostly due to inefficient use of production inputs, which eventually lead to issues on competitiveness, business performance, and farmer's family welfare (Nin et al., 2007).

The availability of natural resources for goat farming in Banjarnegara Regency could be optimized by improving farmers' knowledge. Farmers with better capability are highly essential to improve production and optimize assets, especially in facing competitions and changes in the external environment. Goat farming in the future will move from subsistence to commercial, and this change requires the availability of human resources with capacity, ability to interact, and strong leadership. dos Santos Souza et al. (2019) note that goat farming depicted a slow evolution of production dynamics and was associated with low productivity, low income, little use of technologies, and being raised by poor farmers.

Innovative farmers are urgently needed in the Banjarnegara Regency to improve goat farming management to be more productive, efficient and competitive. Cavicchi and Vagnoni (2018) note that, in the face of uncertainty, innovation has become highly important in the agricultural industry. Intellectual capital is important in strengthening innovations. However, its use in smallholder farming remains limited. Intellectual capital has not been significantly discussed pertaining to agricultural activities owing to the largely traditional nature of agricultural businesses. Discourse on intellectual capital on goat business development is limited. In Indonesia, goat farming is mostly carried out using a simple management system, namely on a small scale and does not use technology. According to Morand-Fehr et al. (2004), goat farming in developing countries is more frequently found in small farms and is

managed by landless and poor farmers. Small farm size leads to farmers managing their farm with a lack of knowledge and technology in the farming system.

Economic pressures, business competitions, and limited natural resources push goat farming to be more efficiently organized. Farmers' ability to explore knowledge, develop cooperation, business networking, and livestock business management systems become an important variable in improving goat farming competitiveness and efficiency. Niwash et al. (2022) note that due to the rapid environmental changes, knowledge, skills, and innovation in the farming system should effectively maintain competitiveness. Knowledge is the intellectual capital base that may eventually result in organizational capabilities. The smallholder goat farmers who are weak in human and institutional resources must be assisted. Human resources include human skills and creativity enhanced through investment in training programs. Human resources include the skills and expertise of employees in an organization. Structural capital is a component of intellectual capital which includes non-human assets in an organization. It consists of procedures and rules, and organizational policies that help in decision making. Relational capital refers to the relationship of the organization with external stakeholders. This includes trust, experience and knowledge that form an important relationship between a business and a customer (Abdulaali, 2018).

Success in strengthening intellectual capital may improve goat farmers' adoption of innovations in productive and efficient business systems. The development of goat farming in Banjarnegara Regency can be carried out effectively when supported by the availability of tangible assets (buildings, equipment, machines) and intangible assets (knowledge and information). Increasing the production of smallholder goat farming is doable by improving animal feed nutrition, livestock health, and genetics (Mataveia et al., 2018; Mayberry et al., 2018). This move will enhance farmers' capacity to weather future challenges.

Aside from the technical aspects of goat production, another important challenge is enhancing farmers' human resource capacity. In the future, livestock development will place greater emphasis on the role of knowledge and intellectual capital in the livestock system, rather than on physical inputs and labor. In addition to the financial and social capital, livestock operations are also concerned with the farmers' response toward knowledge and innovation. Adequate knowledge capital may encourage farmers to have creativity and innovation ability. Muda et al. (2020) note that the present development of human capital, organizational structure, or group relations helps people improve intellectual capital in small scale enterprises. The importance of intellectual capital is key to improving

organizational competitiveness. The success of any organization depends on its ability to manage its assets. Ornelas-Villarreal et al. (2022) note that sustainable goat production in the future requires more production and processing technologies to strengthen product competitiveness (low cost, high value, and high quality). As regards the market aspect, the issue is goat farmers have limited access due to lack of human resource capacity relating to acquiring information, knowledge, and building marketing relationships (Namonje-Kapembwa et al., 2022). This research aims to (1) identify the levels of goat farmers' intellectual capital and goat farming profitability; and (2) analyze the relationship between goat farmers' intellectual capital and goat farming profitability.

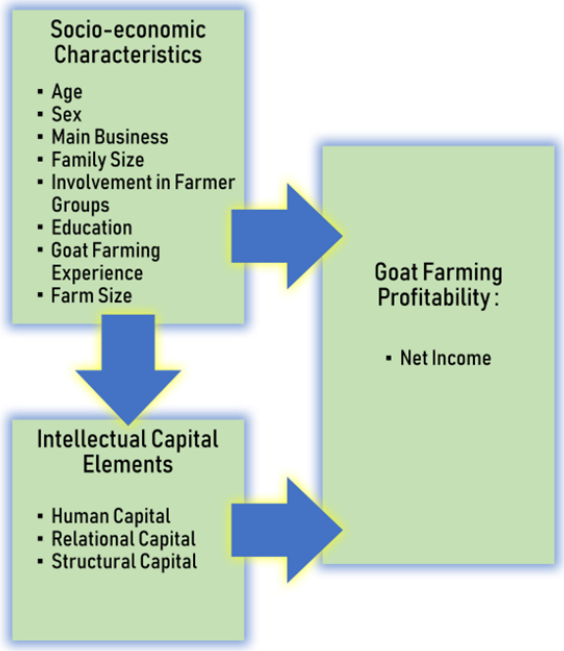
METHODOLOGY

This study analyzed the interplay of socioeconomic characteristics, intellectual capital elements, and goat farming profitability. The respondents' socioeconomic characteristics pertain to their age, sex, main business, family size, involvement in farmer groups, education, goat farming experiences, and farm size. The intellectual capital elements are human capital, relational capital, and structural capital. Goat farming profitability is the net income earned from goat production. This study focuses on identifying the role of intellectual capital on the income of goat farmers. Goat farmers' income is the final picture of the welfare of the goat farmers. Goat development in rural areas is accelerated by improving intellectual capital to increase production and income. In other words, intellectual capital in this research does not aim to determine its relationship to farmer welfare or farmer satisfaction, but is limited to its relationship to production and income.

Farmers' socio-economic characteristics influence their intellectual capital, which in turn affects their goat farming profitability. Likewise, these socio-economic characteristics directly impact goat farming profitability. Hence, the movements on goat farm's net income may be attributed to socioeconomic status and levels of the intellectual capital of farmers.

This research employed a survey method and observations among goat farmers in Banjarnegara. The survey focused on collecting social and economic data relating to goat farmers' intellectual capital. Kelley et al. (2003) note that a survey may ask a large number of people (commonly called respondents) regarding their trusts, opinions, characteristics, and behaviors both in the past and present. Based on the survey conducted, descriptive information and hypothesis testing can be obtained to answer problem statements.

Figure 1
The links among intellectual capital, farmers' socioeconomic characteristic, and goat farming profitability



A multistage sampling method was employed to select the respondents from among 180 goat farmers. In the first step, the research sample areas were selected through a stratified random sampling based on agroecological zones (>1000 m above the sea level, 500-1000 m above the sea level, and <500 m above the sea level). Twenty percent of sub-districts were selected from each stratified agroecological sampling zone. In the second step, respondents were chosen using a quota sampling method whereby 20 farmers from each selected sub-district were considered.

The variables observed in this research were goat farming profitability and intellectual capital, including the elements of human capital, relationship capital, and structural capital. Goat profitability is the ability of goat farming to generate profits in a year. Profits are obtained by subtracting total revenue from total production costs.

Total revenue – Total production costs = Goat farming profitability

On the other hand, intellectual capital was obtained by getting the sum of scores from the components of human capital, relationship capital, and structural capital. Intellectual capital scores were obtained from 40 close-ended questions using a Likert scale. The data were analyzed using descriptive statistics (mean) and the Spearman Rank Correlation Test to determine the relationship between intellectual capital (X) and profitability (Y). The formula used was as follows (Knapp, 2020):

$$r_s = 1 - \frac{6\sum d_i^2}{n\left(n^2 - 1\right)}$$

r_s = coefficient of Spearman correlation
d_i = difference between ranks
n = number of data

If the value of $r_s > 0$, it means that there is a positive linear relationship, i.e., the greater the value of variable X (independent), the greater the value of variable Y (dependent). Moreover, if the value of $r_s < 0$, it means that there is a negative linear relationship, i.e., the greater the value of variable X (independent), the smaller the value of variable Y (dependent). When the p-value is smaller than 0.05, it means that there is a significant correlation between intellectual capital (X) and profitability (Y). When the p-value is greater than 0.05, it means that there is no significant correlation between the intellectual capital (X) and profitability (Y).

RESULTS AND DISCUSSION

Goat Farmers' Socio-economic Characteristics

Goat farmers are classified based on their productive age. The average age of the farmers was 48 years old (Table 1). The productive age determines the goat farmers' level of creativity and innovation. Being in the productive age range, farmers are more enthusiastic about looking for grass, raising goats, and seeking knowledge related to farming development. All the hard work of farmers is believed to increase production and income. Offor et al. (2019) note that age and rearing experience significantly influence small ruminant production. The goat farming system is mostly organized by male farmers (93%) as heads of their respective families. Goat farming in Banjarnegara is a side business as the farmers' main business is crop production (77%). Sugiarto and Ahmad (2015) mentioned that goat farming as a sideline business contributes only 29% of the household total profitability. The non-goat farming business still dominates the structure of the household profitability by 71%.

Table 1
Goat farmers' socioeconomic characteristics in Banjarnegara Regency

Variable	Mean
Age (year)	47.76
Sex (male)	93.00%
Main business (farmers)	77.00%
Family size (persons)	4
Involvement in farmer groups	52.80%
Formal education (year)	7.07
Goat farming experience (year)	9.09
Farm size (animal unit)	0.47

Family members are the most important assets, especially with respect to them being the source of the workforce. Goat farmers have a family size ranging from 2-4 people. The presence of goat farmer groups becomes highly essential, especially in disseminating information. Farmer groups help improve farmers' welfare by educating them about reducing technical inefficiency in input use, holding regular member meetings, cooperating with partners, and assisting members (Ainembabazi et al., 2017; Sugeng Desyanty, 2019). However, only 53% of respondents were members of farmer groups.

Education is an important requirement in developing human resources. Past studies have shown that most farmers only finished basic education. Šūmane et al. (2018) note farmers can get knowledge from various sources such as through networks, collaborations, and formal education. Knowledge plays crucial roles in constructing and strengthening farming sustainability and resilience. Goat farmers remained dominated by those who finished basic education. However, farmers had a long farming experience (9-10 years). Farming experience can affect the willingness and speed of technology adoption. The goats owned by the farmers have mostly been sourced from their own business (own purchase) instead of family inheritance or government assistance. Goat farmers only had a relatively small number of livestock, i.e., 0.47 AU or 3-4 goats.

Goat Farmers' Intellectual Capital

In this study, intellectual capital, i.e., human, structural, and relational is measured using a total of 40 questions with a Likert scale of 1-5 (ordinal data) (Appendix A). Table 2 shows the results of the interviews.

Table 2
The values of goat farmers' intellectual capital in Banjarnegara Regency

Intellectual Capital Element	Mean
Human capital	67.24
Relational capital	33.41
Structural capital	37.56
Intellectual capital	138.21

The interviews were used in identifying intellectual capital classification values. It shows the intellectual capital classification of low (<132.67), moderate (132.67 - 161.33), and high (> 161.33). Table 2 shows that the goat farmers in Banjarnegara Regency had sufficient/moderate intellectual capital. From these three main elements, goat farmers in Banjarnegara scored high on human and structural capital. The human capital element is measured using 20 questions: low (<27), moderate (27-54), and high (>54). Meanwhile, the classification of structural and relational capital is based on an element score from 10 questions in each element of structural and relational capital: high if the score >37, moderate if it is in the range of 23-37, and low if the score is <23.

The farmers have adequate expertise and experience on goat farming techniques. They have experience selecting doe and buck, mate goats, and are skilled to make additional feed (concentrate), even with simple technology. In relational capital, goat farmers are only in the sufficient/moderate category (score 33.41). They have moderate capacity to initiate and develop a relationship with any stakeholder or organization in the farming system (customers, intermediaries, suppliers, alliance partners, local governments, communities, and creditors). Goat farmers are constrained by their confidence to communicate with external parties. Limited communication skills and self-confidence make it difficult for them to interact with external parties, including the government, banks and customers.

In addition, goat farmers may create strategies, internal networks (farmers and families), and farming processes and design some innovations such as the use of natural ingredients for the treatment of goats, mating calendars, and the use of complete feeds. Sharabati et al. (2010) and McDowell et al. (2018) mentioned three sub-constructs of mutual intellectual capital (human, relational, and structural) that have a positive and substantive association with business performance.

Goat Farming Profitability

Goat farming in Banjarnegara Regency is a side business for farmers with a limited number of goats and reared with a semi-intensive type. However, through technological developments, economic demands, and government support, goat farming started to shift towards commercial orientation. Efforts to increase profits through business development and cost efficiency must be carried out continuously.

Profitability is the ability of goat farming to produce profits within a year of production. The calculation of profitability is approached with a gross margin analysis, which calculates total revenue and total cost (fixed and variable cost). Gross margin analysis is used to calculate profitability by considering production costs and revenue (Manirakiza et al., 2021). The availability of capital is among the challenges to increase the scale of the goat business. The goat farming in Banjarnegara Regency is carried out by farmers with an average farm size of 0.47 Animal Unit and requires a total cost of IDR 2,030,553.07 (USD 141.51) with the revenue obtained amounting to IDR 4,255,586.59 (USD 296.58) during the 1-year production period. Goat farming in Banjarnegara Regency can generate a profit of IDR 2,225,033.52 (USD 155.07), i.e., USD 1 = IDR 14,349.00 (Central Bureau of Statistics of Indonesia, 2023).

The Relationship Between Intellectual Capital and Profitability

The role of intellectual capital may become an important element to consider in developing a goat farming system and supporting government regulations. The goat farming intellectual capital is considered as human capital (experience, knowledge, skill, and motivation), structural capital (family working systems and procedures in the livestock business), and relational capital (cooperation with consumers, extension workers, and government).

Based on the Spearman Rank Correlation Test, the goat farmers' intellectual capital had a significant role in improving the goat farming profitability ($P<0.01$). Improving goat farmers' intellectual capital score

Table 3
The relationship between goat farmers' intellectual capital and profitability

Variables	Correlation Coefficient
Human capital	.179*
Relational capital	.285**
Structural capital	.043
Intellectual capital	.242**

Note. *Correlation is significant at the level of 0.05 (2-tailed)
** Correlation is significant at the level of 0.01 (2-tailed)

could increase profits in goat farming. Accelerating the goat farming profitability in Banjarnegara Regency is related to the goat farmers' intellectual capital development efforts. Andreeva et al. (2021) added that intellectual capital helps in developing business performance related to economy and profitability. Knowledge is a strategic resource that influences business firm performance.

Human capital had a significant relationship with goat farming profitability ($P<0.05$). Increasing farmers' knowledge and skills can improve farmers' ability to use other methods to solve technical problems in goat production. Success in solving these technical problems can increase efficiency in goat farming and enhance farmers' welfare. The application of knowledge that a business owner has can contribute to business innovation and the discovery of new ways of solving business problems (Ode & Ayavoo, 2020). Meanwhile, farming experience helps farmers make adoption decisions relating to production technologies. Adopting technologies will facilitate solving technical problems in agricultural production.

The relational capital significantly became the driving factor in improving the goat farming profitability ($P<0.01$). The profitability of goat farming cannot be separated from the ability of goat farmers to dominate the market. Goat farmers' ability to interact with suppliers and consumers and intermediaries can ensure that the goats will be bought at a fair price. In addition, the ability to develop relationships with various entities in the market can enable farmers to obtain updated information on prices and consumer preference. The ability to build social relationships can increase market networks, obtain market prices according to the specifications of the goats being sold, and obtain information on changes in consumers' preferences and needs for goats. Strong relational capital means more

intensive collaboration with suppliers and customers and ultimately improves marketing performance, which includes sales volume, sales growth, market share (Febrian et al., 2020).

CONCLUSION AND RECOMMENDATIONS

Intellectual capital has become an essential and unique element in the development of goat farming. The vital contribution of intellectual capital to the development of goat farming performance is significant to improve farmers' knowledge in increasing profit as well as adopting innovation processes. Goat farmers in Banjarnegara Regency have been running a profitable business attributed mainly to moderate intellectual capital. The development of intellectual capital resulted in goat farmers' higher profitability, while human capital and relational capital were also essential elements to improve goat farming profitability.

The ability of goat farmers to interact with external stakeholders is still not optimal. Goat farmers need farmers' group to increase their confidence in interacting with external stakeholders. The success of goat farmers in establishing relationships with external stakeholders such as banks, the government, and customers will be able to increase intellectual capital. It can further increase the production and profits of goat farming.

Based on the research conclusions, the following recommendations are being advanced:

1. The Ministry of Agriculture and the Banjarnegara district government should increase the quantity and quality of training related to goat farming production techniques, entrepreneurship and business motivation, and livestock technology. Goat farmer groups should take a more active role in carrying out the training required by farmers. In this systematic training, the synergy between private companies and extension workers and also the market actors must be improved. Private companies and key market players should be involved. Training of higher quality, more organized, and involving relevant stakeholders is believed to increase goat farmers' knowledge, skills, innovation ability, and business attitudes in running their goat farming business. Universities, private companies, and agricultural extension workers must perform their respective roles and be coordinated by the Banjarnegara district government to improve the human resources of goat farmers through training such as on optimizing local resources for goat feed and establishing a goat farmers corporation to increase rural livestock business.

2. The role of extension workers to accelerate technology adoption by goat farmers in Banjarnegara must be highlighted. Extension workers are encouraged to disseminate technologies to goat farmers. Agricultural extension workers should be targeted to improve the quality of the goat farming group. Improving the quality of farmer groups should be the key performance indicator for agricultural extension workers in Banjarnegara District.

3. Goat farmer groups must have WhatsApp groups (WAg) and other social media and have 1-2 extension workers involved in the groups to accelerate the increase in the distribution of information and knowledge of farmers. The presence of extension workers from the district government and universities should be increased to increase connectivity and collaboration.

4. Extension workers should provide more orientation to goat farmers regarding the roles and responsibilities of group members. In addition, group orientation must be emphasized among farmer -members. Group orientation is believed to increase the confidence of goat farmers and their linkages with farmer groups and external stakeholders, including goat marketers (customers) and the local government.

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APPENDIX A

Questionnaire on Intellectual Capital of Goat Farmers in Banjarnegara Regency

Village : .....
Subdistrict : .....

A. RESPONDENT PROFILE

1. Name of respondent : .....
2. Address : .....
3. Age : ..... (years)
4. Sex : .....
5. Educational attainment : .....
6. Number of goats : ..... (heads)
7. Main business : .....
8. Family size : ..... (heads)
9. Goat farming experience : ..... (years)
10. Name of farmers group : .....

B. INTELLECTUAL CAPITAL

Give your comments on the statements provided by crossing (X) in columns 1 – 5. Score 1 = strongly disagree, 2 = disagree, 3 = doubtful, 4 = agree, 5 = strongly agree.

No	Statements	Assessments				
I. *Human Capital (HC)*		Score				
		1	2	3	4	5
1	I have knowledge in choosing goat to be raised					
2	I am skilled in selecting quality of goats					
3	I am experienced in selecting quality of goats					
4	I have knowledge in mating goats					
5	I am skilled in mating goats					
6	I am experienced and successful in mating goats					
7	I have knowledge in selling goats					
8	I am skilled in selling goats profitably					
9	I am experienced in selling goats profitably					
10	I have knowledge in making quality goat feed					
11	I am skilled in making quality goat feed					
	I am experienced in making quality goat feed					
12	I have knowledge in maintaining the health of goats					
13	I am skilled in treating sick goats					
14	I am experienced in treating sick goats and getting well					
15	I have an age that is still capable of running a goat farming					
16	I have sufficient time to maintain a goat farming					
17	I have experience and received training before raising goats					
18	I have strong motivation to maintain a goat farming continuously and make a progress					
19	I want to open and own a business other than goat farming					
20	I have strong support from my family to raise goats					

No	Statements	Assessments				
2. *Customer/Relationship Capital (RC)*		Score				
		1	2	3	4	5
1	I have a good relationship with goat traders or consumers who need goats					
2	I understand the character and personality of the goat traders					
3	It's very easy for me to sell goats and it's very easy to get lamb in the market because I know/familiar/understand the people in the market					
4	I have quite a long experience with traders in the market in buying and selling goats					
5	I easily invite goat traders to visit my goat farm					
6	I easily ask traders about "what kind of goat do you need" in the market					
7	I have a good and continuous relationship with livestock extension officers and sub-district officers					
8	I am easy to get along with and communicate with other goat farmers in the same village or outside the village					
9	I find it easy to get funds/capital assistance to develop goat farming					
10	I have a good relationship and easily communicate with neighbors in the community					
3. *Structural Capital (SC)*		Score				
		1	2	3	4	5
1	I can carry out the process of rearing goats sequentially, starting with routine cleaning of the cage every day					
2	I have the main authority in raising goats and sheep in the family					
3	I ordered family members to help raise goats when needed					
4	I have always been supported by my family to learn new things when faced with failure					
5	I am given family support to always move forward and become a source of family income					
6	I always supervise the goats and this has become a habit even at night					
7	I can manage myself to be able to complete the goat farming without disturbing household activities and activities in the fields/others					
8	I can work with my children and wife and family members in completing the task of raising goats					
9	I am very supported by a good atmosphere in the household and provide time for discussion					
10	I can raise goats with my family using simple technology					

C. ECONOMIC PROFILE

1. Investment cost

No.	Investment	Units	Initial price (IDR)	End price (IDR)	Economic period (months)	Depreciation (IDR) / month
1	Land (m^2)					
2	Cage/housing (unit)					
3	Warehouse (unit)					
4	Feeder					
5	Bucket					
6	Lights					
7	Others					
	Total					

2. Fixed cost

No	Fixed cost components	Cost (IDR/year)
1	Land lease	
2	Building/cage rent	
3	Property taxes	
4	Vehicle tax	
5	Electricity	
6	Permanent workforce	
7	Maintenance of equipment and buildings	
8	Depreciation of equipment and buildings	
Total		

3. Variable costs
   a. Feeds

No	Type of feeds	Quantity		Price (IDR/kg)	Total (IDR)
		Kg/day	Kg/year		
1					
2					
3					

b. Artificial insemination : IDR ..... /year
c. Transportation : IDR ..... /year
d. Oil : IDR ...../year
e. Non-permanent workers : IDR..... /year
f. Livestock health : IDR..... /year

4. Revenue
   a. Selling goats/year

Month	Number of goats sold (heads)	Selling price/head (IDR)	Total Revenue (IDR)
Total			