Contribution of pig farming to household in Tenga Subdistrict, South Minahasa District

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Abstract. The people of Tenga Subdistrict, South Minahasa District have raised pigs as well as used them as a source of household income. Pig farming has been running for about 15 years, although sometimes it receives losses. This study aims to determine how much the contribution of pig farming to household income and the factors that affect the income of pig farming in Tenga Subdistrict, South Minahasa District. This research was conducted during March 2021, and the sample locations in Tenga Subdistrict, South Minahasa District in Tenga Village, Pakuweru Village, and Pakuure Village were determined using the purposive sampling method, with the consideration that these areas are areas that have a large population of pigs. The sample was determined by the total quota sampling method, namely all pig breeders in the three sample villages as many as 30 farmers. The analysis model used to estimate the factors that affect income is the multiple linear regression equation model. Pig farming was able to provide the income of IDR 17,431,281/year with an average of 26 pigs/farmer. Pig farming contributed 40% to household income. Pig farming has the largest contribution to the household income of pig breeders. The factors that influence the income of pig farming are the age of the farmer, the number of ownership of pigs, and the type of business combination. Farmers need to increase the number of sows, to increase household income. The government's policy is a program of providing assistance in the form of pigs, as broodstock for farmers.

1. Introduction
Pig is one of the livestock that is mostly kept as a meat producer in North Sulawesi. Pigs have great potential to be developed because they have the advantages of fast growth rate, prolific nature, carcass percentage, and good quality of pork as a source of animal protein [1]. Rural communities generally work in the agricultural sector. The community earns income from working on farming, including pig farming. There are several areas in North Sulawesi where pig farming is a side business for rural communities [2–6]. Pig farming provides benefits so that people continue to work on pig farming as a source of household income.

Tenga Subdistrict, South Minahasa District is one of the areas that have a large population of pigs in North Sulawesi, with a total population of 2,992 heads [7]. Communities in Tenga Village, Pakuweru Village, and Pakuure Village mostly raise pigs as well as serve as a source of household income. Pig farming has been running for about 15 years, sometimes farmers get losses and profits. The amount of labor time in pig farming ranges from 2–5 hours/day so that farmers still have time to work on farming, namely coconut, corn, and rice. Based on the amount of working time allocation, farmers get a certain amount of income from the business of raising pigs. In addition to the number of working hours that have variations, the age of farmers also varies. The age factor is directly related to the condition of...
farmers as human resources who work in pig farming. Human resources are related to the management of daily livestock maintenance and are closely related to labor productivity.

Pig farmers in Tenga Subdistrict, South Minahasa District have 2 business models of pigs, namely breeding and a combination of breeding and fattening. The breeding business only maintains the brood and then breeds and produces piglets to be sold at the age of 1 month, while the combination business is a combination of breeding and fattening businesses, with 2–6 sows per farmer. This situation is different from several previous studies [4,6] that pig farms in rural communities have 2–3 sows per farmer. The larger the scale of livestock ownership, the greater the income that will be received [8]. Increasing the amount of income from livestock business, its contribution to household income will also increase.

Pig farming is still potentially run by the people of Tenga Subdistrict, South Minahasa District, although sometimes they experience losses because the business has contributed to household income. Household income is contributed by livestock farming [9]. However, the amount of income that is contributed from pig farming to the household income of farmers and the factors that affect the income of pig farming is not yet known. Many of these businesses are run by households, but the amount of contribution from pig farming to household income is not known for certain. Therefore, a study was conducted to determine the contribution of pig farming to household income.

Research on the contribution of livestock farming income to household income has been carried out previously [8–13]. The use of descriptive analysis on the contribution of livestock farming was conducted by [8,10,12,13], while the use of multiple regression analysis was carried out by [9,11]. In particular, the factors that affect income use the variables of the number of pig ownership, cage costs and equipment, feed costs, and health costs [9].

The current research is different from previous research [11], especially in the use of work time allocation variables in pig farming, age of breeders, number of pigs, and combination businesses that affect pig farming income. The difference is in the variable allocation of working time in pig farming, the age of the farmer, and the business model of a combination of breeding and fattening.

Based on the description above, the formulation of the problem from this research is how the contribution of pig farming to household income and whether the factors of working time allocation in pig farming, farmer age, number of pigs, and a combination of breeding and fattening business affect the household income of pig farming. Based on the formulation of the problem, the purpose of this study was to analyze the contribution of pig farming to household income in Tenga Subdistrict, South Minahasa District, and to analyze the effect of working time allocation factors on pig farming, farmer age, number of pigs and the combination of breeding and fattening business on income. households in Tenga Subdistrict, South Minahasa District.

2. Materials and methods
   2.1. Materials
   The research material is pig farmers in Tenga Subdistrict, Minahasa District. This research was conducted during March 2021, with a sample of all pig farmers. The data used is cross-sectional data, in the form of experience in raising pigs, number of family dependents, working time on pig farming, number of pigs sold, costs of cages and pen equipment, cost of feed, health costs of pigs, farm income and non-farming income. The data were collected through in-depth interviews using a prepared questionnaire.

   2.2. Methods
   Determination of the location using the purposive sampling method [14], which is determined intentionally based on the consideration that the area is an area that has a large population of pigs, so that Tenga Village, Pakuweru Village, and Pakuure Village are located in Tenga Subdistrict, South Minahasa District. The sample of respondents from pig farmers was determined using the total quota sampling method [14], namely all pig farmers who are smallholder farms (had 2–4 sows/farm) and not company-scale farms, with a total of 30 farmers in all sample villages.
Pig farming income is calculated using the following formula [11]:

\[ \text{It} = \text{Rt} - \text{Ct} \]  \hspace{2cm} (1)

where \( \text{It} \) is income, \( \text{Rt} \) is total revenue and \( \text{Ct} \) is the total cost. The contribution of pig farming income to household income is calculated using the following formula [9]:

\[ K = \frac{\text{IPG}}{\text{HI}} \times 100\% \]  \hspace{2cm} (2)

where \( K \) is the contribution (%), \( \text{IPG} \) is the income of pig farming (IDR/year), and \( \text{HI} \) is the household income (IDR/year). Multiple regression analysis is then used to analyze the factors that affect the income of the pig farming business using the formula [15], which is then modified into a natural logarithm model to simplify the data analyzed, by using independent variables according to the state of pig farming as follows:

\[ \ln Y = a_0 + a_1 \ln X_1 + a_2 \ln X_2 + a_3 \ln X_3 + d_1 D + e \]  \hspace{2cm} (3)

where \( Y \) is the income of pigs (IDR/year), \( X_1 \) is the allocation of working time at pig farming (HOK/year; 1 HOK is equivalent to 8 hours working at non-farming), \( X_2 \) is the age of the farmer (years), \( X_3 \) is the number of pigs (heads/year), \( D \) is the business dummy variable combination of breeding and fattening (\( D = 1 \), business of the combination model of breeding and fattening; \( D = 0 \), business of other models).

3. Results and discussion

3.1. Contribution of pig farming to household income

Pig farming is a business that is mostly occupied by farmer households in Tenga Subdistrict, South Minahasa District. Pig farming income is the difference between the total revenue and the total cost of pig farming. Total revenues and total costs are important components of income [11]. The average costs and revenues of pig farming are described in Table 1.

Table 1. Cost, revenue, and income of pig farming in Tenga Subdistrict, South Minahasa District (2021).

| Component                              | Total (IDR/year) | Percentage (%) |
|----------------------------------------|------------------|---------------|
| A. Cost                                |                  |               |
| Feed                                   | 16,815,032       | 62.70         |
| Labor                                  | 6,410,473        | 24.00         |
| Depreciation of cages and equipment    | 2,092,538        | 7.80          |
| Pig stud rental                        | 1,491,892        | 5.50          |
| Total Cost                             | 26,809,935       | 100.00        |
| B. Revenue                             |                  |               |
| Pig sales                              | 44,241,216       |               |
| Income (B–A)                           | 17,431,281       |               |

Table 1 shows the income from pig farming of 17,431,281 IDR/year. The cost component is that the cost of feed is 16,815,032 IDR/year or 62.70% greater than the cost of labor, the cost of depreciation of cages and equipment, and the cost of renting a stud. This situation is in line with the results of a previous study [6] which showed that the cost of feed for pigs was 59.7% of the total production cost. The results of the research by Suranjaya et al. [16] stated that the cost of feed for pigs reached 67.60% of the total production cost. The average number of sows owned by farmers is 2.98 heads with an average feed consumption of 2.24 kg/head/day. The feed given by farmers to sows consisted of bran (57.23%), corn (28.45%), concentrate (14.06%) and minerals (0.27%). The average number of fattening pigs owned by farmers was 15.66 heads with an average feed consumption of 2.66 kg/head/day. The feed given by farmers to fattening pigs consisted of bran (57.00%), corn (28.50%), concentrate (14.00%) and minerals (0.50%). The price of bran was IDR 2,300, the price of corn was IDR 5,000, the price of concentrate was IDR 10,200 and the price of minerals was IDR 12,000.

The results of this analysis indicate that pig farming in Tenga Subdistrict, South Minahasa District provides benefits for farming households. This is because the revenue is greater than the costs sacrificed.
in pig farming. For this reason, this business needs to be developed because it sees opportunities in the area that makes pigs a menu in restaurants around the area. Based on Table 2, it is known that the largest contribution to household income is obtained from pig farming by 40%, farming by 38%, and non-farming business by 22%.

**Table 2.** Business income and contribution to household income in Tenga Subdistrict, South Minahasa District (2021).

| Type of business | Total (IDR/year) | Percentage (%) |
|------------------|------------------|----------------|
| Pig farming      | 17,431,281       | 40.00          |
| On farming       | 16,364,595       | 38.00          |
| Non-farming      | 9,329,189        | 22.00          |
| Total            | 43,125,064       | 100.00         |

3.2. Factors affecting pig farming income

Factors affecting pig farming income using multiple linear analysis, where the independent variables (independent) are the allocation of working time in pig farming ($X_1$), breeder age ($X_2$), number of pigs ($X_3$), business combination (D) to dependent variable (dependent) income ($Y$), with the results of the regression described in Table 3 below.

**Table 3.** Results of regression analysis of factors affecting pig farming income in Tenga Subdistrict, South Minahasa District (2021).

| Variable                                                | Coefficient |
|---------------------------------------------------------|-------------|
| Constant                                                | 6.9297      |
| The allocation of working time                          | 0.5446      |
| Age of the farmer                                       | 0.9829***   |
| The number of pigs                                      | 1.0533***   |
| The combination model of breeding and fattening         | -0.502***   |

Note: *** significant at $\alpha = 1\%$, * significant at $\alpha = 10\%$

Based on the results of the regression in Table 3, it is known that the equation model built based on the R-square value of the regression results is 0.9033, meaning that the variation of the working time allocation variable in the pig business ($X_1$), the age of the breeder ($X_2$), the number of pigs ($X_3$), the combination business (D) can explain the variation of the pig farm income variable (Y) by 90.33% and the rest of 9.67% is explained by variations in other variables outside the model or variables not examined by researchers between the length of raising and the number of family dependents that jointly affect the income of the pig farming business. The results of the calculation of the F-count value, which is 74.6941, shows that the number is greater than the F-table value, which is 4.51 which means that the variable allocation of working time in pig farming ($X_1$), breeder age ($X_2$), number of pigs ($X_3$), combined business (D) together significantly affect the income variable of pig farming (Y). Based on Table 3, there are 3 significant independent variables from a total of 4 independent variables used in the model. The factors that affect the income of pig farming in the Tenga Subdistrict, South Minahasa District, are explained as follows.

3.2.1. Farmer's age. Farmer's age variable has a significant effect on pig farming income ($P<0.01$) with a regression coefficient of 0.9829. The regression coefficient of the farmer's age variable is positive following the sign of hope, meaning that for every 1% increase in the age of the farmer, the farmer will receive an increase in income of 0.98%. The results of this study differ from those of [17,18] that the age of the farmer does not affect the income of pig farming. This is because in the research area most of the farmers are productive, namely 20–64 years old following Law No. 13 of 2003, so that at that age
farmers are more optimal in their work. It should be noted that for those ages who are no longer productive, of course, the physical ability of farmers will experience a decline.

3.2.2. The number of pigs. The variable number of pigs significantly affected the income of pig farming (P<0.01) with a regression coefficient of 1.0533. The regression coefficient for the variable number of pigs is positive following the expectation sign, meaning that for every 1% increase in the number of pigs, farmers will receive an increase in pig farming income of 1.05%. The results of this study are in line with research [11] that the number of pigs has a significant effect on income. The more number of pigs owned by farmers in Tenga Subdistrict, South Minahasa District, the more pigs that can be sold so that the income from pig farming can increase.

3.2.3. The combination model of breeding and fattening. The combination of breeding and fattening business variables had a significant effect on pig farming income (P<0.01) with a regression coefficient of -0.502 meaning that in the combination business (breeding and fattening) and breeding business there was a difference in income level, where the combined business income was smaller than nursery business with a difference of 0.50%.

Pig farming model combination of seedling and fattening is closely related to the price of feed. If the price of feed increases continuously, then farmers tend to sell free-weaned piglets. This situation is following research [6] that when the price of feed rises, farmers will reduce the number of livestock by selling weaned pigs.

3.2.4. The allocation of working time. Variable working time allocation in the pig farming business had no significant effect on pig farming income (P>0.05). Although the working time on pig farming increases, it will not affect the amount of pig farming income. The range of working time in pig farming is 2–5 hours/day. The results of this study differ from research [19] that the outpouring of working time has a significant effect on income. The current allocation of working time is sufficient to be used in pig farming.

4. Conclusions

Pig farming was able to provide an income of 17,431,281 IDR/year with average ownership of 26 pigs/breeder. Pig farming business contributes 40.00%, farming business is 38.00% and non-farm business is 22.00% to household income. Pig farming has the largest contribution to the household income of pig farmers. The factors that affect the income of pig farming are the age of the farmer, the number of pigs, and the combination of breeding and fattening. Farmers need to increase the number of pigs owned to increase household income. The allocation of working time on pig farming can increase according to the increase in the number of pig ownership. Pig farming is a business that has the potential to be developed by the community in South Minahasa District, because it is in accordance with local culture and market potential. Therefore, the government's policy for pig farming is the assistance program for providing pigs as broodstock for farmers.

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