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Allocation of Male and Female Family Labor Resources in Cattle Livestock Businesses in West Kawangkoan District, Minahasa Regency: A Simultaneous Approach

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Abstract. Labor production is an important production factor in the production process. This study aims to identify the allocation of male and female labor in the family and conduct a simultaneous analysis on the contributing factors to male and female labor allocation resources in family cattle business in West Kawangkoan District, Minahasa Regency. A survey involving interviews was undertaken to family cattle ranches, and the obtained data were subjected to econometric approach using a simultaneous equation model and SAS 9.4 software. The results showed that male and female family members in family cattle business were assessed as the labor supply for the cattle business. The outpouring of male and female labor in the family was significantly influenced by labor wages, allocation of capital assistance, the number of reared cattle, the number of sold cattle, and household income. Farm households will respond the outpouring positively by allocating male labor in the family for the cattle business if there is an increase in labor wages, capital assistance, and household income.

Keywords: Labor production, Male labor, Female labor, Econometric, Cattle business

Abstrak. Faktor produksi tenaga kerja merupakan faktor produksi yang penting dan perlu diperhitungkan dalam proses produksi. Penelitian ini bertujuan untuk mengetahui seberapa besar alokasi tenaga kerja laki-laki dan perempuan dalam keluarga serta menganalisis secara simultan faktor-faktor yang mempengaruhi alokasi sumber daya tenaga kerja laki-laki dan perempuan dalam keluarga pada usaha ternak sapi di Kecamatan Kawangkoan Barat Kabupaten Minahasa. Metode penelitian yang digunakan yaitu survei dengan teknik wawancara terhadap responden rumah tangga peternak sapi, pendekatan ekonometrika dengan model persamaan simultan dan analisis perangkat lunak SAS 9.4. Hasil penelitian menunjukkan tenaga kerja laki-laki dan perempuan dalam keluarga di usaha ternak sapi dinilai sebagai suplai tenaga kerja. Kesimpulannya, tenaga kerja laki-laki dan perempuan dalam keluarga sangat dipengaruhi oleh upah tenaga kerja, alokasi bantuan modal, jumlah sapi yang dipelihara, jumlah sapi yang dijual, dan pendapatan rumah tangga. Rumah tangga petani akan merespon positif dengan mengalokasikan tenaga kerja laki-laki dalam keluarga untuk usaha ternak sapi jika terjadi peningkatan tingkat upah tenaga kerja, bantuan modal, dan pendapatan rumah tangga.

Kata kunci: Tenaga kerja, Tenaga kerja laki-laki, Tenaga kerja perempuan, Ekonometrika, Usaha ternak

Introduction

Farm households have a limited number of resources by which they make decisions to achieve a certain equilibrium. In achieving the goal of maximizing satisfaction, farm households can produce one unit of product (single product) or various products (multiple products) for their own direct consumptions or partial sale to meet their needs. In producing food crops or livestock, the households can either labor their own family members or hire outsiders depending on the type of subsistence or semi-subsistence household, or they can sell out family labor to earn income. In this case, the farm household is perceived as an economic unit, and their decision to allocate resources (labor, capital and time) are directed to activities in the production sector (Yasmeen et al. 2011; Ramos. 2021; Abadi et al. 2022).

Cattle farming in West Kawangkoan District, Minahasa Regency are dominated by small-scale businesses where family labor force still plays an important role in the cattle farming management Generally, family cattle business involves all members of the family in cattle management, namely feeding pattern of either moving tie system or grazed rearing system. In

the moving tie system, the livestock are tied to a certain place where sources of feed, especially grass, are available, then after some time (hours) moved to another place. In this system, breeders usually add some more feed, especially leguminous and others. In the grazed rearing system, livestock (especially cows) are released to graze in a field and a shepherd standby to provide water for the livestock and to keep them safe. The grazing system has clear boundaries between farming land and grazing land.

Based on these conditions, labor plays an important role in an effort to increase family production and income. The quality and quantity of labor used in cattle farming activities has an impact on the business success. Therefore, in yielding optimum productions, labor production which refers to labor availability and simultaneous contribution of male and female workers in the business simultaneously is crucial. This study aims to identify the allocation of male and female labor in the family cattle business, and conduct a simultaneous analysis of the contributing factors to the allocation of male and female labor resources in family cattle business in West Kawangkoan District, Minahasa Regency.

Materials and Methods

This research was conducted in West Kawangkoan District, Minahasa Regency. A survey method involving interviews was undertaken to the respondents who were part of family cattle business. The sample location was determined through purposive sampling, and eventually Kanonang Lima Village was selected because (1) it is one of cattle population centers in the Minahasa Regency and (2) it is the recipient of the largest cattle assistance in West Kawangkoan District, Minahasa Regency. The farmer samples were also determined through purposive sampling, i.e., the population of households of cattle breeders who received capital assistance for cattle farming. The selection of respondents' household was based on the criterion that it must be the recipient of capital assistance who had sold the cattle assistance. A total of 30 farmers were used as our respondents.

Definition and Measurement of Variables

1. A household is a group of people who live in some parts of or the entire building, and they generally cohabit and eat from the same kitchen (Household).

2. Capital assistance is business capital provided by other parties (government and non-government) to farming households, either cash or in kind with the intention to increase production activities. For analysis purposes, this capital assistance was set as a value adjusted to the value/price at the time the capital assistance was given (IDR/year).

3. Farmer households that receive capital assistance are farmer households that receive production capital assistance (cash or in kind) that have sold the cow assistance (Household).

4. The allocation of labor for the cattle business is the number of working hours devoted to all household members aged 15 years and over in the analysis period for the cattle business (HOK/year).

5. The allocation of male family labor for the cattle business is the number of working hours devoted to male household members aged 15 years and over in the analysis period in the cattle business (HOK/year).

6. The allocation of female family labor for the cattle business is the number of working hours devoted to female household members aged 15 years and over in the analysis period in the cattle business (HOK/year).

7. The allocation of family labor for businesses other than cattle farming is the number of working hours spent by household members aged 15 years and over in the analysis period in businesses other than cattle farming (HOK/year).

8. Wages are the price of labor outside the family for the cattle business (IDR/HOK).

9. Household income is household income available for spending, i.e., total household income minus household taxes (IDR/year).

Analysis Methods

This study used an econometric approach with a simultaneous equation model and was analyzed with SAS 9.4 software. A model equation from deRosari et al., (2014) was employed as follows:

Male Labor in the Family for Cattle Livestock Business

MFLC = A0 + A1PLCB + A2ACCF + A3FFLC + A4NOCS + A5HICB + U1

Hypothesis: A3< 0; A1, A2, A4, A5 > 0

Female Workforce in the Family for Cattle Livestock Business

FFLC = B0 + B1PLCB + B2ACCF + B3MFLC + B4NOCK + B5HICB + U2

Hypothesis: B3 < 0; B1, B2, B4, B5 > 0

Where MFLC is the Total outpouring of Male Family Labor for Cattle Farming (HOK/year), FFWC is the Total Outpouring of Female Family Workers for the Cattle Business (HOK/year), PLCB is The Price of Labor Outside The Family for The Cattle Business (IDR/HOK), ACCF is the Total Allocation of Capital Assistance for Cattle Farming (IDR), NOCK is the number of Cows Kept (heads), NOCS is the Number of Cows Sold (heads), and HICB is the Household Income that is ready to be spent (IDR/year).

Results and Discussion

The average family labor in the cattle business for 1 year was 504.47 HOK divided into 78.05% HOK male labor (393.97) and 21.94% female labor or 110.50 HOK (Table 1). The average family labor was 1,021.83 HOK, including 49.37% for cattle farming and 50.63% for non-cattle farming.

The simultaneous equations are a form of equation in which the dependent variable in one or more equations is the independent variable in other equations, in other words, one variable can have dual roles as a dependent variable and independent variable. In this case, the dependent variable Y is determined by the independent variable X, and in turn, variable X can also be determined by Y, and therefore, X and Y values are determined jointly. This analysis ran the F test (Simultaneous Test), T Test (Partial Test), and R-square.

Labor in the cattle business refers to the number of family labor needed in one production cycle in the cattle business. Male and female workers in family cattle business were assessed as the supply or outpouring male and female workers for the cattle business. The variables included in the equation for the outpouring male and female family labor for beef cattle business aligned with economic theory with statistical significance values for all variables. The following equations were based on the analysis:

MFLC = 281.0935 + 0.000785 PLCB + 0.00000229 ACCF - 1.06770 FFLC - 0.40861 NOCS + 0.0000003327 HICB……..(1)

FFLC= 285.5735 + 0.000700 PLCB + 00.0000189 ACCF - 1.03256 MFLC + 1.06501 NOCK + 0.0000003 HICB……(2)

Table 1. Average Allocation of Male and Female Labor in the Family for Cattle Farming Business

Allocation of cattle business	Male	female
HOK/Year	393.9707	110.50
	(78.05%)	(21.94%)

Table 2. Estimation results of the family labor outpouring equation in the cattle business

Variable	Estimation Parameters	t-hit Value	Pr>(t)
Outpouring of Male Labor in the Family (MFLC)			
Intercept	281.0935	15.85	0.0126
PLCB	0.000785	2.36	0.0815**
FFLC	-1.06770	-7.66	0.0510*
ACCF	2.29E-6	3.43	0.0337*
NOCS	-0.40861	-3.17	0.0975**
HICB	3.327E-7	2.54	0.0801**
Outpouring of Female Labor in the Family (FFLC)			
Intercept	285.5735	4.80	0.0635
PLCB	0.000700	2.57	0.0799**
ACCF	1.89E-6	1.97	0.0845**
MFLC	-1.03256	-14.41	0.0072*
NOCK	1.06501	3.08	0.0975**
HICB	3.721E-7	14.84	0.0883**

Notes: * significant at $\propto$ 0.05, ** significant at $\propto$ 0.10

Family workers, both men and women were in a condition to supply labor to the cattle business that respond positively to the influence of wages. The increase in labor wages for the cattle business has reduced the demand for outside-family labor, thus encouraging farm households to allocate more family labor for the cattle business. Male workers in the family do the work of collecting data of livestock feed and health status.

The position of capital assistance in the cattle business was statistically significant (Kristjanson et al. 2014) and the importance of capital assistance in the use of labor can be studied from two sides, i.e., direct influence and indirect influence on the use of labor. Allegedly, capital assistance had an indirect effect on the use of labor. Capital assistance was allocated to purchase calves, thus representing the managerial ability of farm households to achieve successful cattle production. Capital assistance must be spent on purchasing calves to achieve optimal production.

Factors Affecting the Allocation of Male Labor in the Family for Cattle Livestock Businesses

Based on the analysis results, p-value for the partial test of the price of outside-family labor (PLCB) affected the outpouring male family labor (MFLC) of 0.0815, and the decision was to reject H0 ($0.0815 < \propto = 0.10$). The results of the analysis show that every IDR 100,000 increase in wages will increase in the total outpouring of male labor in the family for the cattle business by 78 HOK or as much as 624 hours per year. This result confirms Elly et al. (2008) and deRosari et al. (2014) that wages positively affect the supply of male labor in the family.

Farm households will respond positively by allocating male labor in the family for the cattle business if there was an increase in the level of labor wages (Osuji et al. 2021). The elasticity of the wage variable was inelastic, indicating that the effect of wages was statistically and significantly positive on the allocation of male labor in family for the cattle business. This implies that if the household considers other factors in the allocation of male labor to the influence of wages, it can use other workers, including workers from outside. Furthermore, it was found that the p-value for the partial test of the effect of outpouring of female labor in the

family (FFLC) had an effect on the outpouring of male labor in the family (MFLC) with a probability value of 0.0510<0.10. The results of the analysis show that every increase in the number of female workers in family cattle business by 1 HOK will decrease the number of male workers in family cattle business by 1.06 HOK. This result confirms Priyanti et al. (2007), Elly et al. (2008) and deRosari et al. (2014). Male and female workers in the cattle business are substitutes. This means that the type of work in the cattle business can be done by men or women with relatively equal productivity, but in certain cases the choice of type of work for the cattle business was still carried out by male workers. Women work in the cattle business if the farming household does not have male workers.

Regarding the effect of the allocation of capital assistance to the cattle business on the outpouring of male family labor for the cattle business, it was found that the number of outpouring male family labor to the cattle business was significantly influenced by the allocation of capital assistance to the cattle business. Based on the analysis results, it was known that the p-value for the partial test of the effect of the allocation of capital assistance for the cattle business (ACCF) affected the outpouring of male family labor (MFLC) of $0.0337 < \propto = 0.10$. Each increase in the allocation of capital assistance for the cattle business of IDR 1,000,000 would increase in the total outpouring of male labor in the family by 2.29 HOK. This phenomenon explains the behavior of farm households in using their own labor and illustrates the responsibility for capital assistance received which was allocated to the cattle business. Farming households that receive capital assistance will mobilize both male and female family workers to be involved in cattle farming activities. This result was in accordance with Rusdiana et al., (2010) that the existence of capital assistance encourages farmers to increase the scale of the business which causes an increase in the outpouring of male family labor in the cattle business.

The number of cattle sold (NOCS) had a negative effect on the outpouring of male family labor in the cattle business. If the number of cattle sold increased by 1 head, it would reduce the outpouring of male family labor by 0.40 HOK. The results of the analysis showed that the p-value for the partial test of the effect of the number of cattle sold (NOCS) has an effect on the number of outpouring male family labor (MFLC) of $0.0975 < \propto = 0.10$. This result is in line with the results of Christian et al. (2011) and deRosari et al. (2014).

Increasing household income (HICB) also encouraged family labor to increase the outpouring labor for the cattle business. Based on the analysis results, it was known that the p-value for the partial test of the influence of household income (HICB) affected the number of outpouring male family labor (MFLC) of $0.0801 < \propto = 0.10$. Every increase in household income (HICB) of IDR 1,000,000 would increase the outpouring male family workers by 0.33 HOK. This condition supports the findings by Elly et al. (2008), Hoddi et al. (2011) and Wantasen et al. (2012).

Factors Influencing the Allocation of Female Labor in the Family for Cattle Livestock Businesses

Farm household decisions to devote female workers to cattle business activities, generally take into account the level of wages for cattle business, allocation of capital assistance for cattle business, as well as household income. The variables affecting the outpouring female family labor for the cattle business are similar to the equation for their male counterparts. The increase in wages, the allocation of capital assistance for the cattle business, and household income will increase the outpouring of female workers in the family for the cattle business (Hajjar et al. 2020; Rusdiana et al. 2020).

Households that receive capital assistance will statistically affect the outpouring of female labor in family cattle business significantly. The purpose of providing capital assistance was to increase the cattle business, so that households that receive capital assistance have the opportunity and at the same time the responsibility to utilize capital assistance for cattle farming. More capital assistance will increase the demand for female workers in the family cattle business. Increased income motivates female workers in the family to devote their energy to the cattle business (Balgah et al. 2019; Nurmayasari et al. 2020). Based on the analysis, the regression model was as follows:

FFLC=285.5735 + 0.000700 PLCB + 0.0000189 ACCF + 1.03256 MFLC + 1.06501 NOCK + 0.0000003721 HICB

Based on the F test or simultaneous test, a p-value of 0.0927 was obtained and if ∝ was determined at 0.10 and because 0.0927 <0.10, it was shown that the independent variable affected the dependent variables. The provision for decision making was to compare the significance value (probability) with the specified decision error rate limit (∝). If the significance value was less than ∝, then the decision taken was to reject the hypothesis H0, i.e., a partial effect (using the t test of each independent variable on the dependent variable).

Based on the analysis results, it was known that the p-value for the simultaneous test of the price of outside-family labor (PLCB) affected the outpouring of female labor in the family (FFLC) of 0.0799, so the decision was to reject H0 (0.0799 < ∝ = 0.10). The results of the analysis show that for every IDR 100,000 increase in wages, there will be an increase in the total outpouring of female labor in the family for the cattle business by 70 HOK or as much as 560 hours per year. This confirms Elly et al. (2008) and deRosari et al. (2014) that wages have a positive effect on the supply of female labor in the family. Farm households will respond positively by allocating female workers in the family for the cattle business if there was an increase in the level of labor wages (Azizah et al. 2023). The elasticity of the wage variable was inelastic, indicating that the effect of wages was statistically significant and positive but inelastic on the allocation of female labor in the family for the cattle business. This implies that if the household considers other factors in the allocation of male labor to the influence of wages, it can use other workers, including workers from outside of the family.

Regarding the effect of allocating capital assistance to cattle business on the outpouring female family labor for the cattle business, it was found that the number of outpouring female family labor to the cattle business (FFLC) was significantly influenced by the allocation of capital assistance to the cattle business (ACCF). Based on the analysis results, it was known that the p-value for the simultaneous test of the effect of the allocation of capital assistance for the cattle business (ACCF) has an effect on the outpouring of female family labor (FFLC) of 0.0845 < ∝ = 0.10. Each increase in the allocation of capital assistance for the cattle business of IDR 1,000,000 will increase in the total outpouring of female workers in the family by 1.89 HOK. This phenomenon explains the behavior of farm households in using their own labor, as well as illustrates the responsibility for capital assistance received which was allocated to the cattle business. Farming households that receive capital assistance will mobilize both male and female family workers to be involved in cattle farming activities (Shibata et al. 2020; Bullock and Crane. 2021).

Furthermore, it was found that the p-value for the simultaneous test of the effect of the outpouring of male labor in the family (MFLC) had an effect on the outpouring of female labor in the family (FFLC) with a probability value of 0.0072 <0.10. The analysis results show that

every increase in the outpouring of male labor in family cattle business (MFLC) by 1 HOK will decrease the number of female workers in family cattle business (FFLC) by 1.03 HOK. This result aligns with Priyanti et al. (2007), Elly et al. (2008) and deRosari et al. (2014). Male and female workers in the cattle business are substitutable. This means that the type of work in the cattle business can be done by men or women with relatively equal productivity, but in certain cases, the male workers are the one to decide which types of work they want to do. Women work in the cattle business if the farming household does not have male workers.

The number of cows kept (NOCK) has a positive effect on the outpouring of female family workers in the cattle business (FFLC). The analysis results showed that the p-value for the simultaneous test of the effect of the number of cattle kept (NOCK) affected the number of outpouring female family labor (FFLC) of $0.0975 < \propto = 0.10$. If the number of cows kept increases by 1 head, the outpouring of female family labor will increase by 1.06 HOK. This result is in accordance with Rusdiana et al. (2010) that the more livestock raised, the higher the outpouring family labor in the cattle business, including female labor.

Based on the results, the p-value for the partial test of the influence of household income (HICB) affected the number of outpouring male family labor (MFLC) of $0.0801 < \propto = 0.10$. Every increase in household income (HICB) of IDR 1,000,000 will increase in the outpouring male family labor by 0.37 HOK. This condition confirms Christian et al. (2011), Hoddi et al. (2011) and Wantasen et al. (2013).

Conclusions

The outpouring of male and female labor in the family was significantly influenced by labor wages, allocation of capital assistance, number of cows reared, number of cattle sold, and household income. Farm households will respond positively by allocating male labor in the family for the cattle business if there was an increase in the level of labor wages, capital assistance, and household income. Things tend to be the same for the allocation of female workers, where farming households will respond positively by allocating female workers in the family for the cattle business if there was an increase in the level of labor wages, capital assistance, the number of cows kept, and household income.

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