Original Research

Income Determinants of Dairy Cattle Farmers Participants in the Insurance Program in Ngajum District, Malang Regency, Indonesia

Retno Furi Sekarsari, Agnes Quartina Pudjiastuti[1] , Cakti Indra Gunawan
Department of Agricultural Economics, Tribhuwana Tungga Dewi University, Malang, Indonesia

Abstract

Livestock businesses have various risks of death that can occur due to accidents, natural disasters, and disease outbreaks. To anticipate the risks that occur, the government seeks to help farmers through agricultural insurance, including the cattle and buffalo business insurance program (AUTSK= Asuransi Usaha ternak Sapi/Kerbau). This study aims to analyze the implementation of the AUTSK program and the factors that affect the income of dairy farmers. The research was conducted in Ngajum District, Malang Regency with the consideration that this area is a center for dairy cows. Data were collected from 40 dairy farmers obtained by simple random sampling. Furthermore, the data was edited and compiled, and then analyzed using the multiple linear analysis method (which was transformed from Cobb Douglas function). The results showed that implementation of the AUTSK program in Malang Regency tended to be less attractive to farmers because the fulfillment of claims was not timely (the period of disbursement of funds was too long). Farmer education, livestock ownership and the cost of concentrate feed have a significant effect on the income of dairy farmers. Government needs to re-evaluate implementation of livestock insurance so that farmers can continue their business. Limitation of this study is difficulty of separating cost of production facilities for each cow, so that the expenditure for lactating cows is also difficult to calculate correctly.

Keywords: Income, livestock insurance, implementation, dairy cattle.

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[1] *Corresponding author's Email: agnespudjiastuti@yahoo.com*

Introduction

Livestock business has various risks of livestock death which can be caused by accidents, natural disasters, and disease outbreaks. The risk, which is difficult to predict, will affect the income of farmers, including the dairy business. The high risk causes many farmers to decide to leave the dairy farming business. Bragg & Dalton (2004) states that there are four variables that significantly influence the decision, namely older producers, higher off-farm income, lower returns on variable costs, and greater diversification of agricultural income. Several years later, (Tadesse et al., 2016) found that the decision to enter the dairy market was strongly and significantly influenced by family size, number of cross breeds and local dairy cattle owned, access to credit and distance from the center of the dairy market. Meanwhile, the volume of marketable milk is significantly influenced by the number of breed and local dairy cows owned, family size, and other sources of income. Sidawi et al. (2021) detect the problems and difficulties faced by small-scale farmers in rural areas, so that there is a gap between farmers and government and private organizations. Muriithi et al. (2014) added that the interaction of farmers with extension service providers has a positive impact on the income of dairy farmers. Joint ventures between dairy farming and horticulture are also beneficial for farmers because of their complementary nature through the use of manure for horticulture. Meanwhile, Bekele (2021) conveyed the need for internal and external interventions in milk marketing.

In addition to risk, farmer's income is also determined by the inputs and technology used. Sulistyorini et al. (2019) revealed that the dairy cattle business in Malang Regency is still profitable even though feed prices have increased by 5% and milk prices have fallen by 5%. The return on capital from the dairy cattle business reached 99.28%. It is a great opportunity for the development of dairy cattle. However, breeders also need to pay attention to the existing technology in dairy cattle cultivation. Factors that have a significant effect on the income of the dairy farming business are the number of lactating cattle, the amount of milk production, the price of livestock, labor wages, and the price of additional feed (Ervina et al., 2019), livestock management, number of livestock, livestock experience and drugs/vaccines (Wibowo et al., 2020). In Semarang, Anindyasari et al. (2019) also discover that there is a close relationship between production costs, amount of milk production, investment capital, and selling price of milk on income. However, Dhuyvetter (2011) states that the volatility of milk prices from year to year has increased significantly, but the correlation between profitability and milk prices over time is not very strong because of the effect of costs on profits. In addition, (Paraffin et al., 2018) mentions that farmers' perceptions of milk quality depend on the production system, cleanliness, breed, and farmer's age.

The various results of the studies that have been stated show the complexity of the problems faced by dairy farmers. Putro et al. (2021) asserted that motivation, behavior, decisions, and interactions of dairy farmers will affect the output of the dairy industry system as a whole; and to implement policy scenarios such as insurance. Previously, Insyafiah & Wardhani (2014) extended that livestock insurance in other countries is intended to protect cattle, pigs, and chickens from livestock deaths originating from non-epidemic outbreaks, fires, natural hazards and accidents. Livestock insurance practice has been implemented in Germany. Animal deaths in Germany are largely covered by local Animal Health Funds, which are financed from a levy paid by farmers.

Indonesian government has tried to help farmers to minimize this risk by enacting Law no. 19 of 2013 concerning the Protection and Empowerment of Farmers and the Minister of Agriculture Regulation No. 40/Permentan/SR/.230/7/2015 concerning Facilitation of Agricultural Insurance (Kementan, 2017). Agricultural insurance is a transfer of risk by providing compensation due to losses in farming so that the continuity of farming can be guaranteed. The regulation also shows that it is very important for farmers to protect their farming business. Insurance consists of rice farming insurance and cattle insurance. The last-mentioned insurance is implemented in two scenarios, i.e. premium assistance and self-help. The policy continues to change according to changes in the situation on the ground. In 2019, the Ministry of Agriculture through the Directorate General of Agricultural Infrastructure and Facilities allocated facilitation activities for Cattle and Buffalo Business Insurance (AUTSK) and provided assistance in paying insurance premiums for breeding and/or breeding cattle/buffalo business (Kementan, 2020). Farmers who experience losses in their livestock cultivation will get insurance compensation that can be used as capital to continue their business. Main target of the AUTSK program is smallholder dairy farming. Total population of this farm covers 90% of the entire population of dairy cattle in Indonesia. Their business is just traditional with simple maintenance management and low productivity. It is correlated with the income received by farmers. In fact, there have been many changes in the field, so this policy has been updated again (Kementan, 2021).

The program has also been implemented in a dairy cattle business in Ngajum District, Malang Regency. If the technical aspects of the AUTSK program are implemented properly, it will have an impact on production costs and income. Farmers' income will increase through business continuity and increase in livestock production by reducing the risk of death to the livestock population. The study aims to analyze the determinants of income of dairy farmers participating in AUTSK in Ngajum District, Malang Regency.

Research Method

The research was conducted in Ngajum District, Malang Regency with consideration that this area is one of the centers for dairy cattle in East Java Province (BPS, 2021). In addition, this sub-district has many farmers who receive insurance premium assistance for the AUTSK program.

Population in this study were all dairy farmers in Ngajum District who were insurance participants. Based on existing data, there are 86 dairy farmers who are insurance participants. Because there is no variation in the number of livestock insured by each farmer, the research respondents were selected using simple random sampling. Respondents were set at 40 farmers.

Primary data consist of respondent characteristics, milk production, costs incurred by farmers in raising lactating cows, milk prices, farmer income, and obstacles faced by farmers, were collected through interviews and observations. The instrument used to collect primary data is a questionnaire. Secondary data involve of the AUTSK program and its implementation provisions, empirical data related to factors that affect the income of dairy farmers, the development of dairy farmers from time to time, obtained from several previous studies that have been published in national and international journals,

as well as document data published by BPS , Ministry of Agriculture, and other secondary data sources.

Data that has been collected and has been edited and compiled, analyzed quantitatively. First, test the validity and reliability of the data first. This test was conducted to see the accuracy of the measuring instruments used in this study. The level of validity is known by doing a correlation between the score of the question item and the score of the variable item. An item is declared valid if it is significantly correlated with the total score. According to Ghozali (2012), the minimum requirement that must be met, so that the instrument used can be declared valid is r count > 0.361. Reliability of the research instrument was based on the criteria of Cronbach Alpha > 0.60. Second, to identify the determinants of income of dairy farmers participating in insurance with multiple linear regression. The regression equation uses the Cobb Douglas function which is mathematically stated:

$$Y = aX1^{b1}X2^{b2}X3^{b3}X4^{b4}X5^{b5}X6^{b6}X7^{b7} \qquad (1)$$

where, Y = income (IDR), X_1 = farmer's age (years), X_2 = farmer's education, X_3 = number of livestock owned (heads), X_4 = number of family members (person), X_5 = livestock experience (years), X_6 = cost of concentrate feed (IDR), X_7 = cost of forage feed (IDR), a = constant, bi = regression coefficient of each variable to i.

This equation must be transformed into a linear function first so that the form of the equation becomes:

$$LnY = Ln\ a + b_1LnX_1 + b_2LnX_2 + b_3LnX_3 + b_4LnX_4 + b_5LnX_5 + b_6LnX_6 + b_7LnX_7 \qquad (2)$$

Several series of tests related to this analysis were also carried out, namely the classical assumption test (normality, multicollinearity, and heteroscedasticity), goodness of fit model, F test, and t test.

Results and Discussions

Implementation of Cattle and Buffalo Business Insurance (AUTSK)

Ngajum District, which is astronomically located between 112.3140 to 112.3429 East Longitude and 8.0630 to 8.0198 South Latitude, is one of 33 sub-districts in Malang Regency. The area of this sub-district reaches 60.06 km2 or 2.02 percent of the area of Malang Regency. The sub-district chosen as the location of this research has 86 farmers who are participants in the AUTSK program and the number of policies is more than 172 units. The number is greater than participants in the districts of Bantur, Gondanglegi, Pagelaran, Wagir, Karangploso, Pujon, Wonosari, Tumpang, Lawang, Kasembon, Dau, Kepanjen, Kalipare, Wajak, Poncokusumo, Ngantang, Pakis and Jabung (BPS, 2021).

AUTSK has been facilitated by the government since 2016 by the Ministry of Agriculture through the Directorate General of Agricultural Infrastructure and Facilities. This insurance is part of agricultural insurance as a protection strategy for farmers in the form of compensation for crop failure due to extraordinary events. It is contained in the Law on the Protection and Empowerment of Farmers (UU P-3 No 19/2013) articles 7 and

37. More specifically, government facilitates agricultural insurance participants which include: (1) easy registration to become a participant, (2) easy access to insurance companies, (3) socialization of insurance programs to farmers and insurance companies, and/or (4) premium payment assistance. Specifically for premium assistance, regulation no. 40/Permentan/ SR.230/7/2015 states that the premium payment pattern is 80% paid by government and 20% paid by farmers through farmer groups.

In Malang Regency, including in Ngajum District, this insurance has been implemented since 2017 in accordance with applicable regulations. Criteria for participants: (1) cattle breeders who conduct nursery and/or breeding businesses; (2) cows in a healthy condition at least one year old and still productive; and (3) small-scale cattle breeders, in accordance with the provisions of laws and regulations. Requirements that must be met: (1) the cow has a clear marking/identity (eartag, micro-chip or other); (2) cattle breeders are willing to pay a self-help premium of 20% of the premium value; and (3) cattle breeders are willing to fulfill the terms and conditions of the insurance policy.

The AUTS features are described below. Insured are cattle breeders either individually, in groups, joined in cooperatives. Guarantor is PT Jasindo. Each insured will receive an insurance policy. Insurance period is one year starting from issuance of the policy for breeding orientation cattle. Insured value is set at 10 million rupiah with a 2% premium rate. Proportion of the premium is 200 thousand rupiah, 160 thousand rupiah is paid by government and 40 thousand rupiah is paid by the farmer. The risks covered include: (1) cow death caused by disease; (2) the death of a cow due to an accident and childbirth; and (3) cows lost due to theft. Requirements for submitting a claim: (1) there is death due to illness, accident and childbirth, (2) the premium has been paid, (3) the death is examined by a veterinarian, and reported to the implementing insurance company, (4) there is an official report on the loss from the competent authority. district/city office, (5) payment approval. Payment of claims: (1) 14 days after approval of the amount of loss, (2) claims paid to the account of the cattle farmer. Detailed registration mechanism can be seen in Figure 1 and the claim payment process is presented in Figure 2.
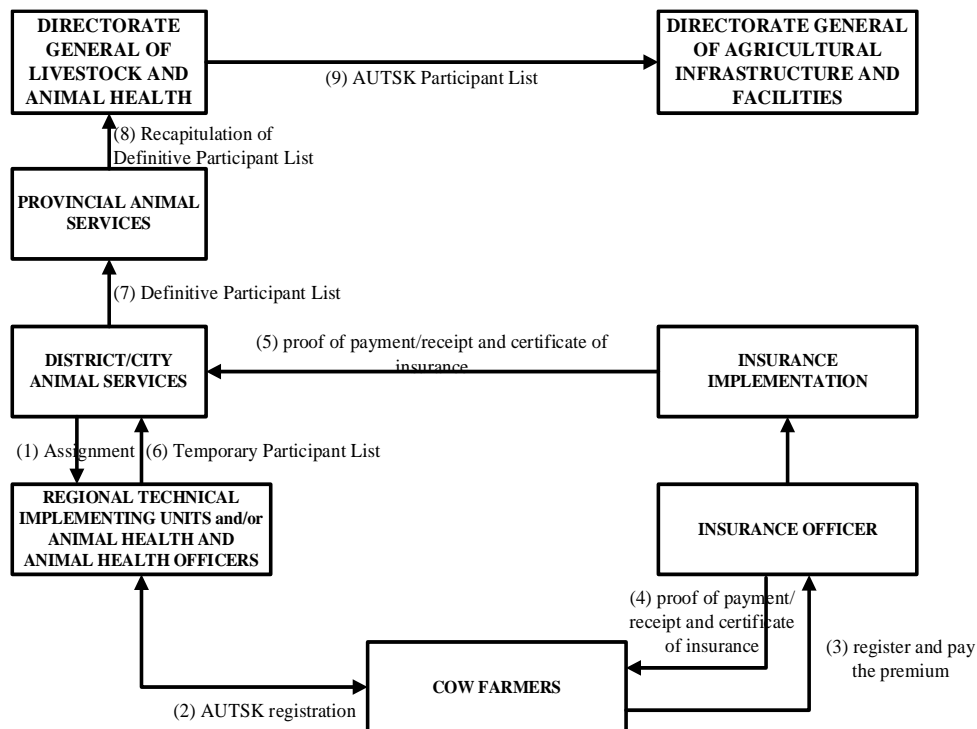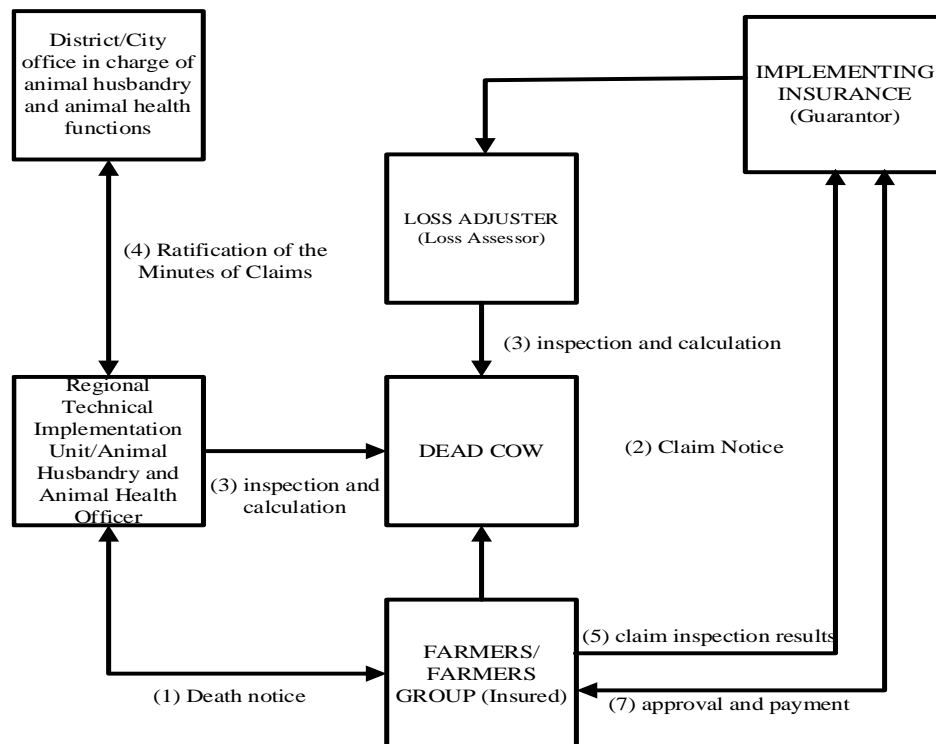
Figure 1. AUTSK Participant Registration Mechanism

Figure 2. AUTSK Claim Payment Mechanism

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There are five tasks and responsibilities of the AUTSK Team in Malang Regency, namely (1) coordinating with relevant agencies in terms of animal health services for insurance participants, assistance in registration and filing of claims, assistance in livestock rearing management, and feed management; (2) program socialization; (3) approve and stipulate the definitive participant list of insurance; (4) upload the determination of definitive participant list on the SIAP (Sistem Informasi Asuransi Pertanian) application; and (5) monitoring and evaluation of insurance activities. Some of the obstacles faced in the field in this program are (1) the location of AUTSK participants with the Office of Animal Husbandry and Animal Health in Malang Regency is too far away, (2) farmers still find it difficult to use the SIAP application (Agricultural Insurance Information System) due to limited human resources, and (3) the insurance company/Jasindo took too long to process the disbursement of the farmer's claim..

The advantage of AUTSK program is that farmers get protection for their livestock business in the event of death and/or loss through an insurance coverage scheme so that they can continue their business. In addition, program participants will get additional points when applying for livestock business credit to the bank. The development of insurance participants and claim submissions from 2017 to 2021 in Malang Regency is presented in Table 1.

During the last five years, AUTSK participants have continued to decline, especially starting in 2019. Aside from the impact of covid 19 pandemic, the decrease in livestock insurance participants is due to several things: (1) the lower level of trust of farmers in insurance because the time for disbursing claims is not appropriate promised (the disbursement time is too long), (2) an application for submitting a mandatory open camera claim where some areas of farmers experience network problems making it difficult to fulfill them, (3) livestock slaughtered at a slaughterhouse must attach a photo at the time of slaughter.

Table 1. Number of Participants and Submission of AUTSK Claims in Malang Regency

Year	AUTSK participants		AUTSK Claim Submission	
	Malang Regency	Ngajum District	Malang Regency	Ngajum District
2017	3.613	433	167	23
2018	4.096	542	118	48
2019	3.565	441	252	47
2020	2.654	194	134	16
2021	484	34	112	6

Source: Department of Animal Husbandry and Animal Health, Malang Regency, 2022

Characteristics of Dairy Farmers in Ngajum District

Characteristics of farmers whose data were collected included their age, education, number of family members, and livestock experience. In detail, it is presented in Table 2. Age as an indicator of a person's physical ability can affect a person's productivity because it is closely related to work ability and mindset in determining the form and pattern of management applied in the business. According to the Central Statistics Agency,

population based on age is grouped into 3 categories, namely (1) 0 - 14 years were classified as young or unproductive, (2) 15 - 64 years of age as working or productive age, and (3) > 65 years as non-productive. Most of the dairy farmers in Ngajum District are of productive, so they can be said to have the ability to accept new innovations such as AUTSK which uses information technology.

Education as an indicator of a person's ability to complete a type of work or responsibility, business management ability, the ability to adopt a technology. Most (55%) breeders with high school and undergraduate education show that the ability of farmers is quite high. This will help many parties in introducing new innovations, including AUTSK.

Number of family members is the number of people who live in one house and eat from one kitchen. It can have a positive impact on livestock raising business because it can be used as labor. Most (95%) farmers have more than three family members.

Livestock experience is the length of time that has been passed by farmers in running a business. The more experience the farmer has, the more: (1) he will be wiser in making decisions, (2) the deeper his knowledge of the business that has been managed so far, so that the greater the opportunity to increase his business productivity. Most (70%) farmers have more than five years of experience in the dairy cattle business.

Table 2. Characteristics of Dairy Farmers Participant in Insurance in Ngajum District

No.	Description	Criteria	Frequency (person)	Percentage (%)
1	Farmer's age (year)	20-29	5	12.5
		30-39	10	25.0
		40-49	16	40.0
		>50	9	22.5
2	Farmer's education	Primary Shool	13	32.5
		Junior High School	5	12,5
		Senior High School	20	50.0
		Bachelor	2	5.0
3	Family members (person)	1-2	2	5.0
		3-4	29	72.5
		>5	9	22.5
4	Farming experience (year)	1-5	12	30.0
		6-10	13	32.5
		11-15	9	22.5
		>16	6	15.0

Factors influencing the income of dairy farmers

Validity and reliability of the data were tested before using it for regression analysis. Validity test is used to measure questionnaire ability to reveal something to be measured. It uses product moment correlation statistic. Correlation coefficient of age, education, number of livestock ownership, number of families, experience raising livestock,

concentrate feed, and forage feed is 0.965; 0.346; 0.857; 0.526; 0.835; 0.759, and 0.921. The calculated r value of each of these variables is greater than r table (0.312), so the data obtained is declared valid. The implication is that any questions in the questionnaire are able to measure income of dairy farmers and their determinants.

Reliability test is used to measure whether a questionnaire is consistent when used repeatedly. This test uses the Cronbach alpha coefficient. A questionnaire is declared reliable if it provides a Cronbach alpha value > 0.60. Cronbach alpha value obtained based on the analysis that has been carried out is 0.893, meaning that all questions are reliable.

To analyze the factors that affect income of dairy farmers participating in the AUTSK program in Ngajum District, multiple linear regression analysis was carried out. The model will meet the criteria as a best linear unbiased estimator if it meets the classical assumptions (data normality, no multicollinearity, and no heteroscedasticity). The results of the classical assumption test are presented in Table 3.

The regression model was classified as BLUE because the data is normally distributed, there is no multicollinearity and there is no heteroscedasticity. Data were said to be normally distributed if the Asymp Sig value > 0.05. The results of the analysis in Table 3 show that the data is normally distributed because the Asymp Sig value is greater than 0.05, which is 0.200. The indicators for the absence of multicollinearity are the tolerance value > 0.10 and the VIF value < 10. Meanwhile, the absence of heteroscedasticity is indicated by sig > 0.05. Thus, analysis with this regression model can be used to identify factors that affect the income of dairy farmers.

Table 3. Results of Classical Assumption Test

Variable	Tolerance	VIF	Sig	Asymp sig
Farmer's age	0.668	1.497	0.177	
Farmer's education	0.665	1.504	0.886	
Number of livestock owned	0.190	5.273	0.703	
Number of family members	0.821	1.218	0.710	0.200
Livestock experience	0.208	4.810	0.788	
Cost of concentrate feed	0.213	4.701	0.286	
Cost of forage feed	0.139	7.210	0.239	

The results of the multiple linear regression analysis were presented in detail in Table 4. Coefficient of determination of 0.860 indicates that the goodness of fit regression model is used. It shows that 86% of variation in dairy cattle business income is explained by age, education, number of livestock ownership, number of dependents, experience in livestock, cost of concentrate, and cost of forage feed. The remaining 10.2% is explained by other variables.

Table 4. Income Determinants of AUTSK Participant Dairy Farmers

Variable	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
Constant	5.338	2.095	2.548	.016
Farmer's age	0.384	0.315	1.219	.232
Farmer's education	0.493	0.207	2.387	.023
Number of livestock owned	0.602	0.179	3.358	.002
Number of family members	-0.014	0.152	-0.091	.928
Livestock experience	0.208	0.199	1.044	.305
Cost of concentrate feed	0.347	0.155	2.242	.032
Cost of forage feed	0.067	0.227	0.297	.769
R^2 : 0.860 F Statistic : 27.250 Sig. F : 0.000 Dependent Variable: Income (Y)				

Cobb Douglas function model based on the results of regression analysis can be written mathematically as:

$$Y = 208.096 X_1^{0.384} X_2^{0.493} X_3^{0.602} X_4^{-0.014} X_5^{0.208} X_6^{0.347} X_7^{0.067} \qquad (3)$$

Simultaneously (F test) shows that farmer's age, farmer's education, number of livestock ownership, number of family members, experience, cost of concentrate, and cost of forage feed affect income of dairy cattle. The indication is sig. F of 0.000. Therefore, the test could be continued by partially (t-test) to find out which variables have a significant effect on the income of dairy cattle in Ngajum District.

Partially (t test), there are three variables that have a significant effect on the income of dairy farmers, i.e. education, number of livestock ownership and the cost of concentrate feed. The effect of each variable on farmer's income is explained below.

a. Farmer's age

Regression coefficient of the variable is 0.384, indicating that income obtained from dairy cattle business will be even greater if the farmer gets older, ceteris paribus. It shows that the farmers are included in the productive age (as explained in the farmer's characteristics). According to the farmer, dairy cattle business requires a lot of energy because it is a tough job. However, age does not have a significant effect on the farmer's income in Ngajum District, participants of AUTSK program.

b. Farmer's education

Regression coefficient of 0.493 indicates that farmers' income will increase if their education is higher, ceteris paribus. An adequate level of education will have an impact on improving performance and management capability of the livestock business being run. It will affect the mindset in making financing decisions for their business. In addition, education will also increase knowledge, develop attitudes and grow the interests of farmers, especially in the face of change, including the existence of AUTSK. It has a significant effect on the income of farmers.

c. Number of livestock ownership

Regression coefficient of 0.602 indicates that each increase in the number of livestock by 1%, will increase income by 0.602%, ceteris paribus. Number of livestock owned has a significant effect on livestock business income. It is due to the high price/value difference between calves and adult cows, both male and female. The increase in added value is usually followed by an increase in the selling price of cattle, so that the income of farmers is greater. However, the increasing added value is not immediately responded to by farmers by selling their livestock on a regular basis, because farmers will only sell cows at certain times such as for children's education costs, parties, or health costs. Income was analyzed only comes from the amount of milk sold, while expenditure on production facilities is used for all livestock, not only those during lactation. Therefore, the percentage increase in income is smaller than the percentage increase in the number of livestock owned. It is in accordance with the results of studies by Ervina et al. (2019) and Wibowo et al. (2020).

d. Number of family members

Regression coefficient of -0.014 indicates an interesting fact, that the income of farmers will decrease, if the number of family members increases, ceteris paribus. Number of family dependents is the number of family members who are financed by farmer, and eat from one kitchen. It indicates that farmers are trying to find additional income from off farms to meet the needs of their families. In other words, the income obtained from livestock business is only sufficient to finance a certain number of family members. Nevertheless, it has no significant effect on farmer's income.

e. Farming experience

Regression coefficient of 0.208 indicates that income obtained from the dairy cattle business will increase, if the farmers' experience is longer, ceteris paribus. In general, respondents have had sufficient experience in managing a dairy cattle business, so that with this experience, farmers will be able to overcome the problems that occur. The longer a person's experience, the higher their skills will be. However, it has no significant effect on farmer's income.

f. Concentrate feed cost

Regression coefficient of 0.347 indicates that an increase in the cost of concentrate by 1% will increase the income by 0.374%, ceteris paribus. Dairy farmers use the addition of feed ingredients in the form of concentrate purchased in groups with payment through deductions from milk deposits. In the morning, concentrate feed is given after milking, while in the afternoon concentrate feed is given before milking. It has a significant effect on the income of farmers. The finding is similar to the research by Adinegoro et al. (2016; Widodo et al. (2020), and Pasaribu et al. (2015).

g. Forage cost

Regression coefficient of 0.067 indicates an increase in forage costs by 1%, will increase income received by 0.067%, ceteris paribus. To obtain forage feed ingredients, farmers do not incur costs because they are obtained directly from nature and taken by themselves. Farmers only incur fuel costs. Forage feeds that farmers are looking for usually comprise grass and leaves weighing around 30-40 kg. But, the variable has no significant effect on the income of farmers.

Conclusions

AUTSK program has been implemented in Malang Regency since 2017 in order to help sustainability of the dairy cattle business. However, due to the submission of insurance claims that are not in accordance with the promise, it has resulted in a decrease in the number of re-submissions or new applications from the AUTSK program. Farmer education, number of livestock ownership, and cost of concentrate feed have a significant effect on farmer's income, while age, number of family members, experience of farmers, and cost of forage feed have no significant effect.

Government needs to re-evaluate the timeliness of submitting claims so that the sustainability of the dairy cattle business is guaranteed. In addition, the number of livestock ownership and the cost of concentrate feed need to be increased because they contribute positively to farmer's income but in relatively small amounts. Limitation of this study is the difficulty of separating the cost of feed for each cow, so it can't be known with certainty with certainty how much each factor of production costs for each lactating cow.

Author Contributions

The first author is in charge of collecting and analyzing data, as well as compiling a draft manuscript. The second author is in charge of compiling tabulation results and data analysis, revising draft articles, adjusting templates, submitting and correspondence. The third author collects articles for reference and drafts articles.

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