THE ADOPTION RATE OF SWEET CORN AS AN EFFORT TO INCREASE THE FARMERS' INCOME AND SUSTAINABLE AGRICULTURE DEVELOPMENT IN BALI

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ABSTRACT

The development of agriculture and the food crop sub-sector is directed at increasing food production to create food self-sufficiency. Sweet corn is one of the main secondary crops in Indonesia in terms of the entrepreneur and the use of the results, namely as a raw material for food and feed. The purpose of this study was to determine the level of adoption of sweet corn farmers in increasing farmers' income and to determine the factors that influence the level of adoption of sweet corn farmers to sustainable agricultural development in *Subak* of Padanggalak, Kesiman Kertalangu Village, Denpasar District, Denpasar City. Respondents in this study amounted to 25 people, with the census sampling method. The analysis in this study uses multiple linear analysis. The results showed that the level of adoption of sweet corn farmers on increasing income was influenced by six significant variables, namely: selection of superior seeds (X1), spacing (X2), irrigation (X3), use of organic fertilizers (X5), harvest (X7), and post-harvest handling (X8), while 2 variables that were not significant were the use of organic fertilizers (X4) and pest control (X6). Second, in the results of the study, the factors that influence the level of adoption of sweet corn farmers on sustainable agricultural development are age (X1), land area (X3), farming experience (X5), family members (X6) while the other two variables are not significant. namely education level (X2), land status (X4). It is recommended that the government through the Department of Agriculture is expected to continue to support farmers' activities in providing effective counseling to increase farmers' knowledge in the development of sweet corn, especially in the use of organic fertilizers and pest control.

Key words:Adoption, Sweet Corn, Income, Sustainable Agriculture

INTRODUCTION

The agricultural sector is the mainstay to improve the welfare of the majority of Indonesian people who live in rural areas and work in the agricultural sector. The agricultural sector can also be the basis for developing rural economic activities through the development of agriculture-based businesses, namely agribusiness and agro-industry (Soeharjo, 2010). One of the agricultural sub-sectors is the food crops sub-sector which produces food for survival. The development of agriculture and the food crop sub-sector is directed at increasing food production with the aim of creating food self-sufficiency (especially rice, corn and soybeans. Corn is a community that can be used to meet household needs in consumption activities, namely as food and feed for livestock. Corn is a one of the main raw materials in the poultry feed industry.The development of

the poultry industry is quite fast so that it will encourage an increase in the need for corn feed (Burhansyah, 2006).

Corn (Zea Mays Saccharata Strurt) acts as a source of vitamin B1) which is very important for brain cell health and cognitive function because the vitamin is needed to form acetylcholine, which functions to maximize communication. Corn also contains pentotent acid (vitamin B5) which plays a role in the metabolism of carbohydrates, proteins and fats to be converted into energy (Pamungkas, 2016). Corn is the main secondary food commodity in Indonesia in terms of the entrepreneur and the use of the results, namely as a raw material for food and feed. Today's economic development, aside from being a staple food, other uses of corn are as raw material for making animal feed, raw material for the beer industry, pharmaceutical industry, dextrins including

adhesives and textile industries. One area that has a land area that is still quite potential for the development of corn communities is the Province of Central Sulawesi. Corn plants in Central Sulawesi are very easy to develop, corn is also a commodity whose marketing is not difficult and the price is quite adequate (Lihawa, 2017).

Increased market needs and high prices are factors that can stimulate farmers to be able to develop sweet corn farming. The location in the tropics allows almost all types of plants to grow well. Thanks to the favorable climate and fertile lands scattered throughout the archipelago, farmers can carry out farming activities throughout the year. Another advantage obtained is the low cost of labor. With these advantages, sweet corn products from Indonesia should be able to compete in foreign markets. However, this market opportunity has not been fully utilized by farmers as sweet corn producers due to various obstacles. Sweet corn productivity is currently very low due to the use of seeds and simple pre-harvest and post-harvest technology (Arshad, 2009). Another obstacle is that farmers still use traditional technology. In addition, the production of these results has not yet given a positive impact for farmers to try the innovation, but it is not necessarily accepted directly. In addition to constraints on farmers, packaging and storage technology is an obstacle on the part of entrepreneurs because sweet corn is a plant whose quality is highly dependent on packaging and storage techniques. However, there are often obstacles that become obstacles as well as challenges for farmers and entrepreneurs to be able to improve quality and production to fill existing market opportunities.

The development of the agricultural sector, especially sweet corn in Denpasar, still does not meet market needs. The production per day for sweet corn farmers in Denpasar only produces 1 ton, while for the needs of the city of Denpasar as much as 5 tons per day. In addition, the high price of

seeds is also a problem faced by sweet corn farmers in Denpasar. Where the price per kilo of sweet corn seeds, for now, is around Rp. 160.000 (Burhansyah, 2006). The demand for sweet corn in Denpasar is used more for animal feed than for own consumption. If the farmers grow drastically, the demand for corn will automatically increase. The amount of corn production in Denpasar Regency has decreased. The highest production of sweet corn was in 2010. This is influenced by the increasingly narrow land area. *Subak* of Padanggalak is one of the *subak* organizations located in Kesiman Kertalangu Village, East Denpasar District, Denpasar City is an area where the agricultural land is rice fields so that each year only planting rice is planted once, namely during the rainy season. The rest of the farmers in *Subak* of Padanggalak plant corn as a substitute for rice in the following season, namely during the dry season, considering that corn does not require a lot of water. The problem that is often faced by sweet corn farmers in *Subak* of Padanggalak, Kesiman Kertalangu Village, East Denpasar District, Denpasar City is the lack of skills and knowledge about the level of adoption of farmer innovation and the factors that influence the level of farmer adoption of sweet corn cultivation.

Based on the description above, the objectives of the study are (1) to determine the level of adoption of sweet corn farmers to increase farmers' income in *Subak* of Padanggalak, Kesiman Kertalangu Village, East Denpasar District, Denpasar City Regency. (2) To determine the factors that influence the adoption rate of sweet corn farmers towards sustainable agricultural development in *Subak* of Padanggalak, Kesiman Kertalangu Village, Denpasar District, Denpasar City.

RESEARCH METHOD

This research was conducted in *Subak* of Padanggalak, Kesiman Kertalangu Village, East Denpasar District, Denpasar

City. The time of conducting the research starts from January-March 2021. *Subak* is highly solid farmers organization in Bali which regulates the water irrigation system and crops growing management. The types of data in this study are quantitative and qualitative data. Quantitative data in this study include a selection of superior seeds, spacing, irrigation, use of organic fertilizers, use of inorganic fertilizers, control of plant-disturbing organisms, harvesting, and post-harvest handling. Qualitative data in this study include sweet corn cultivation and an overview of the research. The number of farmer respondents who operate sweet corn farming in *Subak* of Padanggalak is 25 people, which is measured using the census method. Collecting data in writing this research can be done by observation, interviews, questionnaires, documentation, and analytical techniques used are quantitative analysis and descriptive analysis along with a continuum line that aims to measure the level of adoption of farmers.

The analytical method in this study is to measure the level of adoption of sweet corn farmers to increase farmers' income and the factors that influence the level of adoption of sweet corn farmers to sustainable agricultural development in *Subak* of Padanggalak, Kesiman Kertalangu Village, Denpasar District, Denpasar City using multiple linear regression analysis. , described in detail as follows.

1 Normality Test
   Normality testing aims to test whether the distribution of the dependent variable for each value of the independent variable is normally distributed or not. A good regression model is one that has a normal distribution or one that is close to normal, so statistical testing is feasible. Testing the normality of the data using the Kolmogorov-Smirnov test in the SPSS program.

2 Multicollinearity Test
   Multicollinearity test aims to test whether in a regression model there is a correlation between independent variables. If there is a correlation, it is called a multicollinearity problem. If multicollinearity is proven, it is better if one of the existing independent variables is removed from the model, then the regression model is repeated.

3 Heteroscedasticity Test
   The heteroscedasticity test aims to test whether the regression model has variance inequality from one residual to a fixed observation, then it is called homoscedasticity and if it is different it is called heteroscedasticity. A good regression model is Homoscedasticity or there is no heteroscedasticity.1 Coefficient of Determination

4 The value of the coefficient of determination (R2) is a measure that shows the large contribution of the explanatory variable to the response variable. In other words, the coefficient of determination shows the variation of the rise and fall of Y which is explained by the linear influence of X. If the coefficient of determination is equal to one, it means that the regression line in the form fits perfectly with the observed values obtained. In this case, the coefficient of determination is equal to one, meaning that the variance up and down Y is entirely caused by X.

5 Multiple Linear Regression Test
   The analytical method in this study uses the regression method, namely to analyze the effect of the various dependent variables (Y) on the independent variable (X). The analysis was used to analyze the level of farmer adoption between the selection of X1 seeds, X2 spacing, X3 irrigation, X4 use of organic fertilizers, X5 use of inorganic fertilizers, X6 pest control, X7 harvesting, X8 post-harvest handling on farmers' adoption rates in sweet corn development. Data analysis is one of the research activities in the

form of the process of compiling and processing data to interpret the data that has been obtained. According to Yususf (2014) states that data analysis is one of the rarities in research that greatly determines the accuracy and results of research. Activities in data analysis are grouping data based on variables and types of respondents. To test the questionnaire data from the respondents, it is done by testing the validity and reliability.

6   F-*test*

The F test aims to determine the effect of the independent variables simultaneously (simultaneously) on the dependent variable. Significant means that the relationship that occurs can apply to the population. The results of the F test are seen in the ANOVA table with the help of SPSS software. For example, if the probability is <0.05, it can be said that there is a jointly significant effect between the independent variables on the dependent variable. However, if the significant value is > 0.05 then there is no significant effect jointly between the independent variables on the dependent variable.

7   T-*test*

The T test was used partially for each variable. This test can be done using the SPSS program, namely by comparing the level of significance of each variable. If the significance of T <0.05 then the hypothesis proposed in this study is accepted (Abdul, 2010).

RESULTS AND DISCUSSION
Farmer Adoption Rate

The level of adoption of farmers can be seen from the application of farming, namely: selection of superior seeds (X1), spacing (X2), irrigation (X3) use of organic fertilizers (X4), use of inorganic fertilizers (X5), pest and disease control (X6), harvest (X7), post-harvest handling (X8). In *Subak*

of Padanggalak, Kesiman Kertalangu Village, East Denpasar District, Denpasar City Regency.

The level of application of farming to the level of adoption based on the results of regression analysis obtained the following model:

Y = -3.574 + 0.462 + 0.311 + 0.304 + 0.145 + 0.287 + 0.244 + 0.544 + 0.340 based on the results of the regression analysis obtained the following model:

Table 1. Test Results of Sweet Corn Farmers' Adoption Rate on Increasing Income

Model	Unstandarised Coefficients		Standarized Coefficients		
	B	Std. Eror	Beta	T	Sig.
1. (Constant)	-3,574	0,657		-5,436	0,000
X1	0,462	0,089	0,494	5,164	0,000
X2	0,311	0,111	0,301	2,803	0,013
X3	0,304	0,07	0,435	4,432	0,001
X4	0,145	0,098	0,146	1,487	0,156
X5	0,287	0,076	0,354	3,783	0,002
X6	0,244	0,102	0,246	2,397	0,029
X7	0,544	0,108	0,526	5,077	0,000
X8	0,34	0,11	0,308	3,093	0,007

Source: Primary Data Analysis, 2021

Based on the results of the regression test in the table above, it can be concluded as follows:

1   Selection of Superior Seeds (X1) Against Farmer Adoption Rate (Y)

Based on the results of the regression analysis of the selection of superior seeds (X1) on the adoption rate of farmers in the development of sweet corn (Y) obtained the value of sig. of 0.000 with a coefficient value of 0.462. sig.t value 0.000<0.05. This result means that the variable (X1) is significant. This is because the farmers in Subak select superior seeds according to the recommendation, thereby increasing their production.

2 Spacing Setting (X2) Against Farmer Adoption Rate (Y)

Based on the results of the regression analysis of spacing (X2) on the adoption rate of farmers in the development of sweet corn (Y), the sig value is obtained. of 0.013 with a coefficient of 0.462. The value of sig.t is 0.013<0.05. This result means that the variable (X2) is significant. This is because farmers in *Subak* use the recommended spacing of 25 cm x 75 cm so that their production increases.

3 Irrigation (X3) Against Farmer Adoption Rate (Y)

Based on the results of the irrigation regression analysis (X3) on the adoption rate of farmers in the development of sweet corn (Y), the sig value was obtained. of 0.000 with a coefficient value of 0.034. The value of sig.t is 0.001<0.05. This result means that the variable (X3) is significant because the irrigation in *Subak* uses clean water without being polluted by chemicals.

4 Use of Inorganic Fertilizer (X5) on Farmer Adoption Rate (Y)

Based on the results of the regression analysis of the selection of superior seeds (X5) on the level of farmer adoption in the development of sweet corn (Y), the sig value was obtained. of 0.002 with a coefficient value of 0.287. The value of sig.t is 0.002<0.05. This result means that the variable (X5) is significant. This is because farmers use inorganic fertilizers in accordance with the recommendations where the use of urea fertilizer during the growth period and the use of NPK fertilizer during the flowering period to the formation of seeds to increase the yield of corn farming.

5 Harvest (X7) Against Farmer Adoption Rate (Y)

Based on the results of the harvest regression analysis (X7) on the adoption rate of farmers in the

development of sweet corn (Y), the sig value is obtained. of 0.000 with a coefficient of 0.544. sig.t value 0.000<0.05. This result means that the variable (X7) is significant. Because farmers harvest sweet corn when the sweet corn is 70 days after planting, the selling power of sweet corn increases because it has a good texture and is suitable for vegetables.

Factors Affecting Farmers' Adoption Rate of Sweet Corn (t-test)

Statistical test (t) basically shows how far the influence of one independent variable (X) is individually or individually in the application of variable variation (Y). Statistical tests were carried out by comparing the results of the significant value of = and can be explained in Table 2. as follows.

Table 2. Test Results of Factors Affecting the Adoption Rate of Sweet Corn Farmers on Sustainable Agricultural Development

Model	coefficient	t-$_{hitun}$	sig.
1. (Constant)	83,807	5,012	0,000
X1	-0,29	-1,158	0,026
X2	1,012	1,232	0,123
X3	0,085	0,852	0,041
X4	0,955	0,497	0,062
X5	0,472	1,504	0,05
X6	-2,362	-2,67	0,016

Source: Primary Data Analysis 2021

Based on table 2, above shows that the value of the results of testing the influence of each independent variable on the dependent variable can be concluded as follows:

1 Age Factor (X1) Against Sweet Corn Adoption Rate (Y)

Based on the results of the t-test of the effect of Age (X1) on the adoption rate of farmers in the development of sweet corn (Y), the sig value is obtained. of 0.026 with a coefficient value of 0.290.

The value of sig.t 0.026<0.05. This result means that the variable (X1) has a positive and significant effect on the level of farmer adoption in the development of sweet corn.

2 The Effect of Education (X2) on Farmers' Adoption Rate in Sweet Corn Development (Y)

The effect of education (X2) on farmers' adoption rate in corn development (Y). The largest sig.t value is 0.123 with a coefficient value of 1.012. The value of sig.t 0.123 < 0.05. This means that the education variable does not have a positive and significant effect on increasing the level of farmer adoption in the development of sweet corn.

3 The Effect of Land Area (X3) on Farmer Adoption Rate in Sweet Corn Development (Y)

The effect of land area (X3) on farmers' adoption rate in sweet corn development (Y). The largest sig.t value is 0.040 with a coefficient value of 0.085. The value of sig.t is 0.041 > 0.05. This means that the variable area of land has a positive and significant effect on increasing the level of farmer adoption in the development of sweet corn. According to (Suraityah 2011) the area of land will affect production, the wider the area of land cultivated, the higher the production and income per unit area. The size of the farmland area will affect the amount of production obtained.

4 The Effect of Land Status (X4) on Farmers' Adoption Rate in Sweet Corn Development (Y)

The effect of land status (X4) on farmer adoption rate in sweet corn development (Y). The largest sig.t value is 0.025 with a coefficient value of 0.955. The value of sig.t is 0.062 > 0.05. According to (Arsyad 2009), land status is one of the factors that can affect farm production results.

5 The Effect of Farming Experience (X5) on Farmers' Adoption Rate in Sweet Corn Development (Y)

Effect of Farming Experience (X5) on the level of farmer adoption in the development of sweet corn (Y). The largest sig.t value is 0.015 with a coefficient value of 0.472. The value of sig.t 0.050 < 0.05. Experience in running a business is the best predictor of success, especially in the case of a new business that relates to a previous business.

6 Effect of Number of Family Members (X6) on Farmer Adoption Rate (Y)

The effect of the number of family members (X6) on the adoption rate of farmers in the development of sweet corn (Y). The largest sig.t value is 0.016 with a coefficient value of -2.362. The value of sig.t 0.016 < 0.05. According to Hernanto (2011), states that the number of family members is very influential in the management of an economic activity, especially on economic activities in farming.

Factors Affecting Farmers' Adoption Rate on Sweet Corn Development (F Test)

The F test is conducted to determine whether all independent variables simultaneously affect the dependent variable. The results of the F test can be seen in Table 3.

Table 3. Results of Feasibility Test Model (F)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	286.861	6	47.810	1.451	0,052[b]
1 Residual	593.139	19	32.952		
Total	880.000	25			

a. Dependent variable. Tingkat Adopsi

b.Predictors(constant).X6,X5,X4,X3,X2,X1

Source: Primary Data Analysis, 2021

The results of the Anova test or f test in table 5.3 show the calculated f value of

1.451 with a significant 0.052 which is significantly smaller than the 0.05 alpha. This indicates that the model used in this study is feasible. The effect of farmer adoption rate on sweet corn development variable age X1, education X2, land area X3, land status X4, farming experience X5, number of family members X6 on farmer adoption rate in corn development simultaneously together have a significant effect on adoption rate farmer.

CONCLUSION

Based on the results and discussion, the following conclusions are obtained:

1. The level of adoption of sweet corn farmers on increasing income is as many as six indicators that have a significant effect because the Sapta component of farming is carried out according to the recommendations conveyed, namely: selection of superior seeds (X1) , spacing (X2), irrigation (X3), use of fertilizers organic (X5), harvest (X7), and post-harvest handling (X8). And two indicators that are not significant are the use of organic fertilizers (X4) and pest control (X6).

2. The factors that influence the level of adoption of sweet corn farmers on sustainable agricultural development are age (X1), land area (X3), farming experience (X5), number of family members (X6) has a positive and significant effect on sweet corn development, and there are indicators that do not have a positive and significant effect on the level of farmer adoption in the development of sweet corn, namely education (X2), land status (X4).

Things that can be suggested in this research are as follows:

1. It is hoped that farmers will increase their knowledge and ability in increasing production yields with intensive sustainable agricultural development.

2. The government through the Department of Agriculture is expected to continue to support farmers' activities in providing effective counseling in Saptatani, especially the use of balanced fertilizers and organic fertilizers in total and integrated pest control so that the increase in production and income can be achieved optimally.

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