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Analysis of cabbage production in Batunya Village, Baturiti Sub-district, Tabanan Regency

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Abstract. Generally, people make use cabbage as mixed ingredients in making soup, *capcay*, etc, and it is consumed raw as *lalapan*. The variety of cooks that can be mixed with cabbage causing the increasing of cabbage needs. In addition, the change in people's life style from the instant towards the healthy life style has impact on the increasing of vegetables consumption. Healthy life style does not only need protein and calorie but it also needs vitamin and mineral consist in vegetables and fruits. The increasing needs of vegetable causing the increasing of the selling price and this is an opportunity and potential to make profit for the vegetable cultivator. Purpose of this research is to find out the feasibility of cabbage cultivation business, production analysis, and needed investment. Subject or respondent in this research are the cabbage cultivator in Batunya Village, Baturiti Sub-district, Tabanan Regency, with respondent amount of 12 people. This research is carried out by using interview and survey methods. Data collected consists of the primary and secondary data. The primary data related to the social economy condition and the condition of the business until today is collected through interview and filling in the questionnaire directly. The secondary data is obtained from the Head of Village office, Baturiti Sub-district in Number, and the Central Bureau of Statistics of Tabanan Regency, and other references related to the research. This research result is expected to become a reference for people in performing business in cabbage cultivation field, and it is able to increase the production and working productivity to the farmer.

1. Introduction

1.1. Background

In National Research Main Plan, the Bali State Polytechnic through the Central Research and Service to People included the Economy and Business as one of research topics that has been determined in Renstra PNB 2016-2019. This economy and business research topic raised the strategic issue in developing business especially the micro and small business (UMK).

Related to this topic, it is conveyed the concept of mind that the establishment of micro and small business needs to be assisted in order to increase the production capacity which is started from the processes of land preparation, nursery, planting, and maintaining until the marketing. In this research topic wants to be raised is the Analysis of Cabbage Production in Batunya Village, Baturiti Sub-district, Tabanan Regency.

The Batunya Village is one of villages in Baturiti Sub-district, Tabanan Regency, which is as a central of cabbage production. Cabbage is vegetable that many people looking for to be used as a mixture in soup, capcai, etc., and it also be consumed uncooked as lalapan. Various kinds of food that can be mixed with cabbage make the need for cabbage continue to increase [1]. In addition, there is a change in lifestyle of people from instant to healthy lifestyle which has impact in the increasing of vegetable consumption. Healthy lifestyle does not only need protein and calorie but also vitamin and mineral contained in vegetable and fruits to carry out balanced nutrition consumption system [2]. The increasing needs for vegetable make the selling price also higher and this is an opportunity and profitable potency for vegetable cultivator.

Vegetable consumption of Indonesian people is still very low and fluctuated from year to year with average value of 38 kg/capita/year or it's about 52% from FAO's recommendation of 73 kg/capita/year (The Ministry of Agriculture of the Republic of Indonesia 2011). This gap is a good opportunity to develop agri-business in vegetable supply sector which includes the cabbage. Rahim and Hastuti stated that the agri-business has elements that have very important role in agri-business and those are the agriculture land, manpower, capital and management [3].

1.2. Problem

Based on the description above, the problem formula in this research is that how the cabbage production can be increased through process analysis that influences total production in Batunya Village, Baturiti Sub-district, Tabanan Regency.

1.3. Special purpose

Purpose of this research is to find out the process of cabbage production and factors that influence the production in Batunya Village, Baturiti Sub-district, Tabanan Regency.

1.4. Research urgency

Research of home scale cabbage cultivation agri-business production in Batunya Village, Baturiti Sub-district, Tabanan Regency will give a description of small business type that can be developed by the local people to be able to increase cabbage cultivator's income which is directly related to the people's welfare. This research also has function to educate the cabbage cultivator about the method to manage the production process so the cabbage produced will remain in a good quality and the price is stable and even increase. In additional, the small business of the cabbage cultivator has potency in increasing the people's income and expanding the job opportunity.

2. Literature review

2.1. Vegetable

Agriculture sector is the major livelihood for Indonesian people. The agriculture sectors include the crops, horticulture, fishery, livestock, plantation, and forestry. The horticulture includes the fruits plant, vegetables plant, herbs, and decoration plants. Of the four horticulture products the vegetable has very important role for human life whether as source of food and nutrition as well as the family's income [4]. According to [5] stated that vegetables are the horticulture commodity which becomes the important part of menu in Indonesian family.

Vegetable is horticulture commodity which is needed by the people. Beside as the essential commodity to fulfill basic needs of human in supplying vitamin and mineral, it also give contribution for 38.07% in 2008 to horticulture sub sector [2]. Vegetable products are potential to be developed considering that total vegetable consumption of Indonesian people keep increasing according to the high total population growth from year to year. On site data shows that vegetable consumption of Indonesian people during 2005-2010 which is shown in Table 1.

Table 1. Level of indonesia's vegetable consumption 2005-2010.

No	Year	Consumption Level (kg/capital/year)	Recommendation FAO (kg/capital/year)
1	2005	35.30	
2	2006	34.06	
3	2007	40.90	
4	2008	36.50	73
5	2009	40.10	
6	2010	41.90	

Source: ⁶The ministry of agriculture of the Republic of Indonesia 2011

As seen from Table 1 it is known that the vegetable consumption of Indonesian people is still very low and fluctuated from year to year with average value of 38 kg/capita/year or it's about 52% from the FAO's recommendation. This gap is a good opportunity to develop the agri-business in sector of vegetable supplying which include the cabbage. The agri-business has elements that play very important role in the agri-business activities which are the agriculture land, manpower, capital, and management [3].

2.2. *Planting and taking care*

The cabbage (*Brassica*) is vegetable that has round and rather flat shape like a ball which consists of layers of leaves. Cabbage is sub-tropical vegetable plant which is many planted in plateau. Baturiti Sub-district Plateau in Tabanan Regency is a central production of cabbage to supply local needs in Bali Province which is sold in the traditional market of Baturiti. What should be noticed in carrying out cabbage cultivation are the following [1]:

- Growth conditions of cabbage. Cabbage is one of plant types that can be planted during the year so it can be planted during rainy season or dry season. In order the cabbage can grow properly you can plant cabbage at 800 m above sea level height with enough rainfall and at climate temperature between 15 to 20 Celsius degrees. Land that efficient for planting cabbage is the land with loose texture with PH of 6 – 6.5.
- To Cultivate the Land and Water. Before planting cabbage seeds the initial step that should be done is to clean all weeds and remaining plants on the land that will be used. If the weeds and remaining plants are not to be cleaned it will make more plant diseases on the cabbage such as swollen root, rotten and soft, seedling, etc.
- Land Preparation. The land wanted to be used as cabbage planting place should be ploughed with 20 to 30 cm depth. The land used should be mixed with fertilizer in order to keep it fertile.

The above conditions should be noticed in carrying out cabbage cultivation business in order to give optimum result with high productivity. In addition to notice above conditions it also needs business feasibility study in carrying out cabbage cultivation business.

2.3. *Marketing*

Actually the commodity of Indonesian vegetable has good competitive and comparative superiority because of natural resources support. But the fact is that it is still hard to compete to fulfill export market to neighborhood countries such as Singapore and Malaysia due to the quality and continuity of the supply and the high exploitation during the transportation process [6]. Cabbage price in the level of local farmer is fluctuated from Rp 2,000 to Rp 4,000 per kg depends on the season. If harvest time the price is relatively low and during holidays and other than harvest time the price will increase.

2.4. Calculation of Total Sample

Total sample counted based on Colton formula [7] is as the following:

$$n = \left[\frac{(Z\alpha - Z\beta)\sigma}{\mu_1 - \mu_0} \right]^2 \quad (1)$$

where:

n = total sample

Z α = upper limit of significance at level of confidence 95%, Z α = 1.96

Z β = lower limit of significance at level of confidence 90%, Z β = -1.645

σ = deviation standard

μ_0 = average of initial research variable

μ_1 = average of research variable with treatment

Fluctuation of production is about 20%. Thus, total sample needed is n = 12 people.

2.5. Production analysis

Production function is the correlation between physical output and physical input. Mathematically the correlation shows the correlation between maximum quantities of output that can be resulted from a series input given [8]. The production function is as the following formula:

$$Q = f(K, L) \quad (2)$$

Q = output level per unit period,

K = service and reserve flow or capital supply per unit period,

L = service flow from company's worker per unit period

Purpose of every company is to change input to be output. Farmer combines their power with seed, land, equipments to harvest crops, etc. [9]. In economy field the Cobb-Douglas approach is a functional form of production function which is broadly used to represent the correlation between the output and input. Mathematically the Cobb-Douglas function is

$$Q = AK^\alpha L^\beta \quad (3)$$

Q = Output

K = Capital input

L = manpower input

A = parameter of technology efficiency/ coefficient

α = elasticity of capital input

β = elasticity of manpower input

Completion of correlation between dependent variable and independent variable uses the regression method, where variation of independent variable will be influenced by the variation of dependent variable. Thus, the principles in regression line are also valid in completion of the Cobb-Douglas function [10].

3. Methodology

This research was carried out in Batunya Village Baturiti Sub-district Tabanan Regency. Subjects or respondents in this research are the cabbage Cultivators with total respondent of 12 people. This research was performed by using survey method. Data collected consists of the primary and secondary data. The primary data related to social economy and business conditions until today is collected by interview and filling in the questionnaire directly. The secondary data is collected from

the office of the head of village, Baturiti Sub-district in Number, and the ⁷Central Bureau of Statistics of Tabanan Regency and other references related to the research. The primary data obtained from cabbage cultivators as subjects or respondents furthermore is processed and analyzed descriptively.

The dependent variable in this research is the production of cabbage, whereas the independent variable consists of the land width, total fertilizer, pesticide, and manpower. Variable involved in this research is shown in Table 2.

Table 2. Research variable.

Variable	Notation	Definition
Dependent variable:		
Cabbage Production	Y	Amount of cabbage production (kg) that yield in production massa that are amount of cabbage reach that resulted in one year.
Independent Variable:		
1. Wide of area	X1	Wide of aret planted of cabbage in unit of are
2. Fertilizer	X2	Fertilizer amount needed per wide unit in one period (kg)
3. Labour	X3	Amount of labor in one month (people)

In this research the independent variable is more than two variables to one dependent variable so it will use the multiple linear regression by using ordinary least square regression (OLS) method. The function of output value of cabbage production to be researched can be formulated as follow:

$$Y = f(X_1, X_2, \dots, X_n) \quad (4)$$

Furthermore it is described in equation of:

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + e \quad (5)$$

Where:

Y = Output value of cabbage production

X_1 = Land width

X_2 = Total fertilizer

X_3 = Manpower employed

a = Constant

b_1, b_2, b_3 = regression coefficient

e = Error estimation

Correlation model between input and output in the form of independent variable and dependent variable is shown in Figure 1.

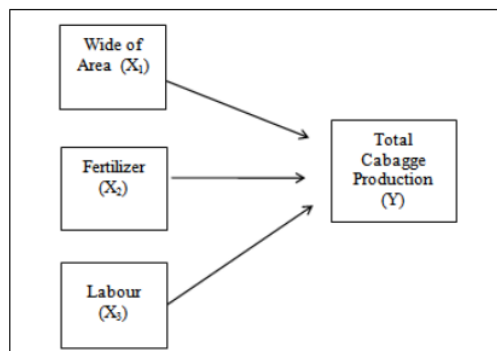


Figure 1. Correlation of input and output.

4. Results and discussion

4.1. Description of production process

Cabbage cultivation is started from the land preparation, treat the soil so it is loose, planting cabbage seed, fertilizing, and spraying plant disease by using pesticide. Fertilizing is carried out twice which is the first time when the plant age is 0-15 days and the second time is when the plant age is 15-60 days. Whereas the spraying is carried out according to condition on site, if there was any plant disease then spraying is immediately done. One period goes on during 60 days or 2 months..

4.2. Financial analysis

Cost to be analyzed in this research covers all cost expended by farmers for production process during one period or for two months. The cost is the variable cost that consists of cost for fertilizer supply, pesticide purchase, and wage for manpower. The cost and average income of cabbage cultivator is presented in Table 3.

Total cost needed by cabbage cultivator with land width of one acre in one period is as shown in Table 3. This business cost is mostly used for manpower wage which reaches for Rp 2,000,000 or 75% of total cost, whereas the other 25% is cost for fertilizer and pesticide supply.

Manpower is a very important production factor in carrying out business activity whether in home scale business (family business) or other small industries. The cabbage cultivator in Batunya Village, Baturiti Sub-district, Tabanan Regency is still traditional by using simple hand tools and it is a family business where it utilizes relatives as the manpower. Average of manpower used is for 50 HOK (day people work) per period (two months).

Table 3. Cost and cabbage cultivator's income in one period.

No.	Description	Quantity		Price Unit (Rp)	Total (Rp)
1	The result of harvest	1.600	kg	3.000	4.800.000
2	Cost				
	a. Fertilizer	1½	zak	350.000	525.000
	b. Pesticide	3	bottle	50.000	150.000
	c. Labour	50	hok	40.000	2.000.000
	Cost Total				2.675.000
3	Income				2.125.000
4	R/C ratio				1,79

Income of cabbage cultivator came from cabbage sale. Cabbage price in the market today is vary between Rp 2,500/kg – Rp 3,500/kg. By taking average price of Rp 3,000/kg, cabbage cultivator's income is for Rp 4,800,000/period. The net income of the cultivator is calculated based on the revenue deducted by cost expended that is for Rp 2,125,000/period. Ratio between revenue and cost expended (R/C ratio) is for 1.79 which means that every cost expending will have revenue for 1.79 times of cost expended.

4.3. Production analysis

Analysis production of cabbage cultivator is carried out by multiple linear regression method that is a model to find out the influence of independent variable which consists of total cabbage and fertilizer given, to dependent variable that is total cabbage production. This multiple linear regression statistics analysis uses the SPSS (Statistical Package for the Social Sciences) program for windows V.21. The conclusion of data processing result is presented in the following Table 4.

Table 4. Multiple linear regression analysis result.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-10.981	83.410		-.132	.898
	Jml Pohon	-1.316	.687	-1.181	-1.915	.088
	Pupuk	10.396	2.960	2.165	3.512	.007

a. Dependent Variable: Produksi

By entering the value of $a = -10.98$; $b_1 = -1.31$; and $b_2 = 10.39$ in linear regression equation $Y = a + b_1 X_1 + b_2 X_2$ it is found out the following equation:

$$Y = -10,98 - 1,31 X_1 + 10,39 X_2 \quad (6)$$

The interpretation of this regression equation can be explained as the following:

- Constant/intercept is for -10.98; mathematically it stated that if the independent variable value which is the total cabbage plant (X_1) and fertilizer given (X_2) has the same value of zero, then the cabbage production (Y) is -10.98, this does not influence significantly where the value of $p = 0.898$ ($p > 0.05$).
- The regression coefficient total cabbage plant (X_1) is -1.31 which means that the increasing of one unit of cabbage plant with assumption of other independent variable the constant will cause the decreasing of cabbage production for 1.31 kg, and it does not have significant influence either with value of $p = 0,088$ ($p > 0.05$).
- Regression coefficient of total fertilizer given (X_2) is for 10.39 which means that the increasing of supplying one unit of fertilizer variable with assumption of other independent variable the constant will cause the increasing of cabbage plant production for 10.39 kg and it has significant influence where $p = 0.007$ ($p < 0.05$). Total fertilizer given has obvious influence to total cabbage production, which means that if the cabbage cultivator increases the fertilizer giving it will increase the total cabbage production.

5. Conclusions

Based on the analysis result and discussion carried out it can be concluded as the following:

- Ratio between the revenue and cost expended in cabbage production process (R/C ratio) is for 1.79 which means that every cost expended will get revenue for 1.79 times of cost expended, so it is quite reasonable to be developed.

- Variable of total fertilizer given has significant influence to the increasing of cabbage production result which means that it can increase the cabbage cultivator's income.

6. Suggestion

To increase the cabbage production the cultivator needs to notice the fertile soil, enough fertilizer, so the cabbage yield increases and it will increase the people's income and family's welfare is fulfilled.

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