

# PRODUCTION, PREFERENCE'S AND MARKET OF SOY PRODUCT IN SOLOK REGENCY

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## Abstract

This study aims to mapping the problem of Soybean farmers in Solok, optimization of soybean production in Solok Regency, the existence of soybean farmers and markets in Solok Regency. The study used survey methods to soybean farmers and consumers in Solok Regency. This research using descriptive quantitative and qualitative approach of the various aspects of economic concepts. This study was analyzed using descriptive analysis that aims to see problem of Soybean farmers in Solok and the level of consumer preferences to processed soy products in Solok Regency. Furthermore, inductive analysis was analyzed using multiple linear regression analysis with OLS method that aims to look at the determinants of the production and demand for processed soy products in Solok Regency. The study shows that (1).The Problems of the soybean farmers in Solok are capital, seedlings, land, fertilizer, maintenance, harvesting, post-harvest, labor and government policies. (2). Seedlings and fertilizer has significant infact soybean production in Solok but with the condition of decreasing returns to scale (3) Soybean farm in Solok as economically unprofitable. (4) the processed soy products most in demand by the society in Solok Regency are tofu and tempeh. (5) The number of household members, education of wife and job sector of husband affect significantly on the demand for tempeh in Solok Regency, while income, marital status, education of husband and job sector of wife do not affect significantly on the demand for tempeh in Solok Regency. (6). The number of household members and job sector of husband affect significantly on the demand for tofu in Solok Regency, while income, marital status, education of husband, education of wife and job sector of wife do not affect significantly on the demand for tofu in Solok Regency.

**Keywords:** *Production, Consumer Preferences, Demand, Soy*

## I. Introduction

Soybean is a plant that originated from Manchuria and parts of China where there are many types of wild soybean. Then, it spread to tropical and subtropical areas. After breeding, many types of superior soybeans produced were cultivated. The harvesting age of soybean plants varies depending on the variety but generally range between 75 and 105 days.

In terms of food and nutrition, soybean is the most inexpensive source of protein in the world, in addition to producing oils with good quality. The varieties of soybean that exist in Indonesia include Otau, Ringgit, Sumbing, Merapi, Shakti, Davros, Taiching, TK-5, Orba, Galunggung, Lokon, Guntur, and others, have a protein content of 30,53 until 44 percent while fat content of 7,5 until 20,9 percent.

Currently, the demand for soybean experiences an increase. This is because soybean has many benefits. Increase in the demand for soybean causes the producers to increase the number of soybean production. On the other hand, the production of local soybean has a decrease; this is caused by the lack of interest of farmers to grow soybeans in addition to the insufficient land to cultivate them. Therefore, to meet the uncontrollable demand for soybeans, the government imports soybeans. This is exactly what caused the dependence of imported soybean in Indonesia higher.

This is supported by the study of Aimon et al (2013) that showed that various problems were faced by soybean farmers in Solok Regency. The problems ranged from

problems of capital, production process, harvest and post-harvest as well as government policy issues. Post-harvest problem faced by soybean farmers in Solok Regency was the relatively low selling price of soybean which caused the profit obtained by farmers relatively small. As a result, soybean farmers chose to grow other crops resulting in the decline of soybean production. Furthermore, the production of local soybean also could not meet the local demand, hence triggering the increase of soybean import into the country. This condition is actually an opportunity to increase the production of soybean with better quality so it can meet local demand.

In addition, to resolve the problems of post-harvest it is necessary for creation of new home industries in order to increase added value of soybeans as well as increasing the economy of families of soybean farmers. Moreover, these activities can create soy product differentiation (product differentiation) so it has added value economically with a high quality of output with regards to downstream industries/home industries as user of soybean as raw material of the industry, as well as making them as new home industries. Furthermore, the market response on the demand for processed soy products in Solok Regency needs to be seen in advance.

On the other hand, in terms of production based on the study conducted by Faculty of Economy Research Team, Universitas Negeri Padang (2011) in cooperation with Bank Indonesia branch Padang concluded that soybean is one of the superior KPJu across sectors in Solok Regency. The elected superior KPJu across sectors shows that the orientation of economic activities in Solok Regency, which is based on agricultural sector, can develop small and medium industry sectors in the region. The result of this study also shows that soybean in Solok Regency has good prospect and potential to be developed in the future. Potential areas of agriculture, plantation and farm covers sub-districts of IX Koto Sungai Lasi, Junjung Sirih, X Koto Diatas, Payung Sekaki and Tigo Lurah. The GRDP of Solok Regency in 2009 at current prices amounted to Rp 4.639.066,332 billion or an increase of 14,75% compared to 2008 of Rp 4.042.808,21 billion. The economic structure of Solok Regency when viewed based on GRDP at current prices in 2007 is still dominated by agricultural sector (44,73%), especially from food crop and horticulture sub sectors.

In addition, this study is based on the study by Putra (2009) which showed that the relatively low welfare of farmers will determine the prospect of the development of agricultural sector in the future as one of the sector which contributes quite substantially to the economy. This welfare is determined by several factors, among others (1) Most farmers do not have productive factors, (2) Narrow land area of farmers, (3) Limited access to financial services support, (4) Limited access to information and technology, (5) Inadequate infrastructure of production, (6) Unfair and exploitative market structure due to very weak bargaining position, (7) Inability, weakness or unawareness of the farmers themselves. Without a fundamental and comprehensive solution to the above, the welfare of farmers will be threatened and very difficult to achieve. Thus, here lies the role of community empowerment which is managed starting from households.

This article aims to look at the determinants of the soybean production, consumer preferences to processed soy products in Solok Regency, and the determinants of the household demand for processed soy products in Solok Regency.

## **II. Teoritical Framework**

### **Production and Production Optimization**

According to Dabertin (2002), production function explains the technical relationship that transforms input (resource) into output (commodity). Mathematicians define a function as a rule to determine every value in a set of variables (domain) function

with a single value of set of other variables which becomes the function range. In general, the function is written mathematically as following:

$$y=f(x) \dots\dots\dots(2.1.)$$

Where y is output and x is input. Domain function is the whole value of x that is greater than or the same as zero. Range function consists of output level (y) that is obtained from the use of each input level (x).

Meanwhile, according to Burket (2006) production function is the equation that describes maximum output producible from each combinations of input. In general, production function describes net output or value added from each combination. Based on this opinion, it shows that production function is the relationship between input and output in the production process.

Variable input is the production input which usage level can be controlled by farmers as the farm managers. This implies that farmers have sufficient time to adjust the amount of variable input used. On the other hand, fixed input is defined as the production input which usage level can not be fully controlled by farmers. In agricultural production process land is often categorized as fixed input due to a number of reasons farmers are not able to increase their land area in a short time. The categorization of fixed input and variable input is closely related with the concept of time. Economists typically use the term *long run* to define the fairly long time period so that all production inputs (including fixed input) can be treated as variable inputs.

*Short run* is defined as the fairly short time period so that all production inputs are fixed inputs. The periodization of other agricultural production is intermediate run that shows a fairly long time period so that several production inputs can be categorized as variable inputs but are still considered short, thus several production inputs with high economic value (such as land and agricultural machinery) can be considered as fixed inputs.

Moreover, another important concept in production context is *the law of diminishing returns*. According to Dabertin (2002), *the law of diminishing returns* states in accordance with the addition of a variable input, after a certain point, additional production output will decrease. *The law of the diminishing returns* does not imply that the addition of variable input will result in the lessening of total product. The total production remains to increase along with the addition of production input but the amount of this additional production will decrease. Based on graphical approach, *the law of diminishing returns* can be represented as *the rate of change in the slope of the production function*. The degree or rate of change in the slope of this production function is a curvature or curve of production function.

## Demand

According to Case and Fair (2007), demand is the quantity of goods/services that consumers are requesting or willing to purchase at a certain price level. The demand curve is a curve/graph that illustrates the relationship pattern between quantity of goods/services requested by consumers and the price level.

Demand Function is a function that states the relationship between price and quantity of goods/services requested or purchased by consumer, if the other variables remain constant [*ceteris paribus*].

$$\text{Formula: } Q_d = f(P_x, Y, P_y) \quad (1)$$

Where  $Q_d$  is the quantity of demand for goods,  $P_x$  is the price of the goods in question,  $Y$  is the income and  $P_y$  is the price of substitute goods.

Asumption: only the price variable of the goods is considered, while other variables are assumed constant [*ceteris paribus*], hence the above formula becomes:  $Q_d = f(P)$  or  $P = f(Q_d)$ .

In the theory of demand, price affects negatively on demand, while price of other goods and income affect positively on the demand for goods and services. Graphically the influence of prices of other goods and income can be seen in Figure 1.

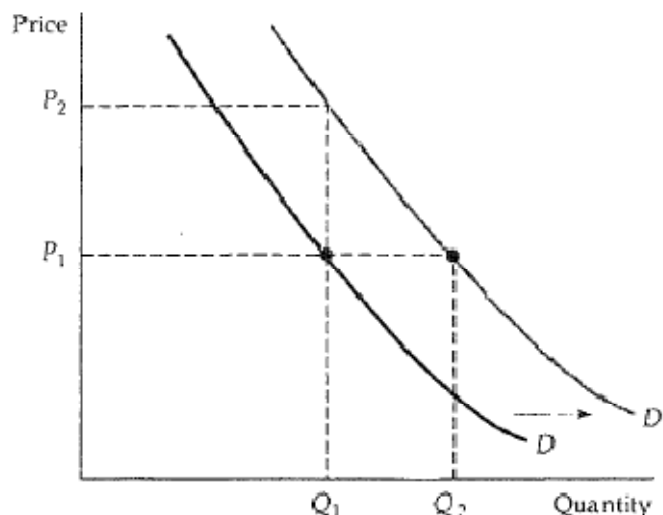


Figure 1. Shift of Demand Curve

Figure 1 shows that when income increases it will lead to the demand for goods and services, thereby causing the demand curve to move from  $D$  to  $D'$ . Meanwhile, if the income of the society decreases then the demand curve will shift to bottom left; so is the case with the prices of other goods.

### III. RESEARCH METHOD

#### Data and Source of Data

Data in this study consists of primary data and secondary data. The primary data was obtained directly from the main sources, namely the soybean farmers and consumers of soybean and the households of soybean farmers in Solok Regency, as well as the home industries that use raw material of soybean as the main raw material of their products and the bureaucracy in Jorong, District and Regency. Meanwhile, the secondary data was obtained from literature review and related institutions that can support this study. The implementation of this study referred to the information of agricultural statistical data in Solok Regency, results of the previous studies, and data obtained in the field.

#### Technique of Data Analysis

##### Soybean Production

This study used survey methods on the soybean farmers in the center of soybean production located in Solok Regency. The location chosen as the place of study is sub-district of Pantai Cermin, Payung Sekaki, Kubung. The method of determining the sample in this study used *purposive random sampling* technique. Data was analyzed using (1) Cost Analysis, covering variable costs namely seed and fertilizer, as well as fixed costs which consist of land and labor. (2) Production Model of Soybean Farming by using *Cobb-Douglas* function with model  $Y = aX_1^{b1}X_2^{b2}e$ . Furthermore, data was analyzed using OLS (*Ordinary Least Square*) technique. (3). Analysis of Economic Efficiency of the Usage of Production Factors and Determination of Optimal Production by using various combinations of input. Efficiency test is used to see whether the input or production factors used in soybean farming in Solok Regency are already efficient or not. The efficiency used

in this study is economic efficiency. Meanwhile, the determination of optimal output is based on the use of production input of soybean in Solok Regency.

### **Demand for Soybean**

Data analysis was performed by descriptive quantitative and qualitative through the approach of economic concepts from various aspects, and also adapted to the condition of physic and economic, as well as government policy. To see the demand of society for the processed soy products, multiple linear regression analysis was used by using several variables of demand function that can be seen from the consumer preferences in Solok Regency.

The demand model used is:

$$\text{Log } Q = b_0 + b_1 \log(\text{Inc}) + b_2 \text{Pop} + b_3 \text{Married} + b_4 \text{EDUH} + b_5 \text{EDUW} + b_6 \text{SPUH} + b_7 \text{SPUW} + e \quad (2)$$

Where Q is the demand for processed soy products, Inc is the income of the household, Pop is the number of household members, Married is the marital status of the household head, EDUH is the last education of the husband, EDUW is the last education of the wife, SPUH is the job sector of the husband and SPUW is the job sector of the wife.

More details can be seen in the following table:

**Table 1. Operational Definition**

Variable	Definition
1. Demand (Q)	Household demand for processed soy products measured in kg
2. Income (inc)	Total income obtained by household per month
3. Married	Marital status of the household head 1. Married 0. Others
4. EDUH	Last education of husband measured in years
5. EDUW	Last education of wife measured in years
6. SPUH	Job sector of husband with following category: 1. Formal 0. Others
7. SPUW	Job sector of wife with following category: 1. Formal 0. Others

## **IV. Result and Discussion**

### **Problems in Soybean Farming In Solok Regency**

Soybean farming in Solok Regency also faces many problems including capital, seed, land, fertilizer, maintenance, harvest, post-harvest, labor and government policy. In terms of capital the dominant issue faced by soybean farmers in Solok Regency is the difficulty to obtain capital loan from banks and non-bank institutions. This problem is also in line with the establishment of a high interest rate making it not profitable for the farmers and the high amount of return to be paid by the farmers.

Furthermore, the problem that arises in terms of seed is the difficulty to obtain the seed so the quality used is also not good. This needs to be addressed by developing soybean seed industry system so that the quality of seed planted by farmers can optimize the soybean production. Problems in land and fertilizer also become problems for soybean farmers in Solok Regency. Problem in land management in Solok Regency is also a major issue faced by the farmers. Based on interviews with the farmers, most of them cultivate soybean in hilly areas and need to open up new lands thus requiring longer time before the growing season. Moreover, the high prices of fertilizer and pesticide are also dominant problems for soybean farmers in Solok Regency. These problems are associated with

government policy in the provision of fertilizer subsidies for farmers as to reduce production cost.

Based on the survey result conducted that the maintenance process is the main problem faced by farmers, namely pest and plant diseases, irrigation and also weather effect so that farmers frequently faces crop failure which leads to losses. In addition, the problem of labor training is also one of the major problems faced by soybean farmers. This is related to the problem of skill and knowledge in managing soybean farming in Solok Regency.

In addition, the post-harvest problem also becomes an obstacle for soybean farming in Solok Regency. This problem emerged as effect of the lack of quality of seed and soybean produced by farmers, causing the price to be low. Moreover, government policy becomes a problem that needs to be faced by farmers including lack of partisanship from government policy on soybean commodity since the focus is more on rice self-sufficiency, fertilizer subsidies and seed aid. This matter impacts to the problem of marketing of soybean products in Solok Regency and the entry of imported soybean into Indonesian territory. This problem is in line with the elimination of customs duties of imported soybean thereby resulting in the decline of domestic soybean production; since imported soybean price is cheaper, planting soybean leads to losses for farmers thus the government should establish a fair price which will benefit national soybean farmers.

Along with these problems, a strategic step that should to be done immediately is to boost increase in local production. Soybean production should be increased with ensuring incentive for farmers who grow soybean. Increase the production land area and provide training as well as support input for soybean farmers. This has to be supported with infrastructure development such as road, irrigation and bridges accompanied with good quality of seed, agricultural technology and a reasonable price guarantee for small producers/farmers.

Based on the problems faced by soybean farmers then important strategies that should be done to ensure the achievement of optimal soybean production are: (1) Improvement of Selling Price, (2). Utilization of Land Potential, (3) Improvement of Production Process, (4). Consistency of Program and Seriousness of Officials.

### **Soybean Production in Solok**

Factors that influence the soybean production (output) in this study are land area, labor, seed and fertilizer by using *Cobb Douglas* production function. Nevertheless, this production function uses the assumptions; (a) that the production (output) is per hectare of land. Thus, the variable of land area becomes constant so for each respondent (farmers) the use of seed and fertilizer in generating output becomes per hectare of land, (b) labor is also constant since for almost all respondents the total labor used in this study are husband and wife, making the variable of labor also constant.

In accordance with these assumptions then the production function of this study becomes  $Y = f(X_1, X_2)$  which is transformed into *Cobb Douglas* structural equation  $Y = AX_1^\alpha X_2^\beta$ , then transformed again into the form of *Double Log* structural equation which is  $\log Y = \log A + \alpha \log X_1 + \beta \log X_2 + \varepsilon$  where  $Y$  is the production (output) of soybean per hectare of land,  $A$  is a constant (intercept) that represents technology and climate,  $X_1$  is the use of seed per hectare of land, and  $X_2$  is the use of fertilizer per hectare of land.

Furthermore, before the estimation result above is discussed further some prerequisites classic assumption tests were conducted including; Residual Normality Test, Autocorrelation Test, Heteroscedasticity Test and Multicollinearity Test

The classic assumption tests results show that based on residual normality test, the distribution data is not normal. However, since the data of this study are from 62



respondents then this condition can be continued. Meanwhile, the result of autocorrelation, heteroscedasticity and multicollinearity tests did not violate the rules of the test results.

The estimation result of soybean production function above can be written mathematically in the form of structural equation as follows;

$$\text{Log Output (Y)} = 2,5 + 0,6 \log \text{Seed (X}_1\text{)} + 0,2 \log \text{Fertilizer (X}_2\text{)} + \varepsilon$$

$$\text{Or} \\ Y = 2,5 X_1^{0,6} X_2^{0,2}$$

The structural equation of soybean production (output) above shows that the production condition of soybean is “*decreasing return to scale*”, where every additional inputs of 1 (one) percent will only increase the output by 0,8 percent. Additionally, the coefficient of seed ( $X_1$ ) of 0,6 is significant on  $\alpha = 1$  persen, and the coefficient of fertilizer ( $X_2$ ) of 0,2 is significant on  $\alpha = 10$  persen. Both variables have contribution to the soybean output by 22,73 percent while 77,37 percent is the contribution of other variables not included in the production estimation (output) of soybean.

The coefficient of seed of 0,6 means that every additional input of seed of 1 percent will increase the output of soybean by 0,6 percent and the coefficient of fertilizer of 0,2 means that every additional input of fertilizer of 1 percent will increase the output of soybean by 0,2 percent. In addition, technology and climate have shares on the production (output) of soybean of 2,5 percent which is reflected by a constant.

### Production Cost of Soybean

Production cost of soybean that is examined here is specifically for variables of seed and fertilizer per 1 hectare of land of soybean which will be explained through identity equation of production cost of soybean for both variables as follows

$$C = P_{X1} X_1 + P_{X2} X_2$$

where C average production cost per 1 hectare of land,  $P_{X1}$  average price of seed per kg per 1 hectare of land,  $X_1$  use of fertilizer per 1 hectare of land,  $P_{X2}$  price of fertilizer per kg per 1 hectare of land and  $X_2$  use of fertilizer per 1 hectare of land

Based on the collected data, the average total production cost of soybean per 1 hectare of land is Rp. 5.020.000,- which consists of fixed cost Rp. 4.500.000,- (labor cost of spouses Rp. 4.000.000,- and land cost Rp. 500.000,-), while variable cost is Rp. 520.000,- which consists of the cost of seed ( $X_1$ ) and the cost of fertilizer ( $X_2$ ). Seed input with an average price of seed per kg of Rp. 6.750,- and an average price of fertilizer per kg of every type fertilizer used is Rp. 4.500,-. Accordingly, the identity equation of soybean production cost per hectare of land is as follows;

$$5.020.000 = 7000 X_1 + 4500 X_2$$

This means that every hectare of soybean land requires production cost of Rp. 5.020.000,- with an average seed price per kg of Rp. 6.750,- and an average fertilizer price per kg of Rp. 4.500,-.

### Optimal Production of Soybean

If the soybean farmers aim to maximize output of soybean per hectare of land, with a constraint in production cost, then by using *Langrangian* principle the amount of seed input and input used per hectare to obtain optimum output can be calculated;

$$L = 2,5 X_1^{0,6} X_2^{0,2} + \pi (5020 - 6,75X_1 - 4,5X_2)$$

The production cost value is reduced by dividing a thousand. Then, the result of differential on  $X_1$ ,  $X_2$ , and  $\lambda$  is;

$$\frac{dL}{dX_1} = 1,5 \frac{X_2^{0,2}}{X_1^{0,4}} - 6,75\pi = 0$$

$$\frac{dL}{dX_2} = 0,5 \frac{X_1^{0,6}}{X_2^{0,8}} - 4,5\pi = 0$$

$$\frac{dL}{d\pi} = 5020 - 6,75X_1 - 4,5X_2 = 0$$

By dividing the differential result it is obtained;

$$\frac{X_2^{0,2}}{4,5X_1^{0,4}} = \frac{X_1^{0,6}}{9X_2^{0,8}}, \text{ Thus } 9X_2 = 4,5X_1 \text{ or } 2X_2 = X_1 \text{ or } X_2 = \frac{1}{2} X_1$$

Furthermore, to obtain the quantity of seed input ( $X_1$ ) and fertilizer input ( $X_2$ ) used to generate optimal production (output) of soybean, the result is substituted alternately to obtain the number of each input used in the production.

Use of seed input ( $X_1$ );

$$5020 - 6,75 X_1 - 4,5 X_2 = 0, \text{ substitute } X_2 \text{ with } X_1$$

$$5020 - 6,75 X_1 - 4,5 (1/2 X_1) = 0$$

$$5020 - 6,75 X_1 - 9 X_1 = 0, \text{ Thus, } 5020 = 15,75 X_1 \rightarrow X_1 = 318,73 = 319 \text{ kg}$$

Use of fertilizer input ( $X_2$ );

$$5020 - 6,75 X_1 - 4,5 X_2 = 0, \text{ substitute } X_1 \text{ with } X_2$$

$$5020 - 6,75 (2X_2) - 4,5 X_2 = 0$$

$$5020 - 13,5 X_2 - 4,5 X_2 = 0, \text{ Thus, } 5020 = 18 X_2 \rightarrow X_2 = 278,89 = 279 \text{ kg}$$

Therefore, to obtain the output per hectare of land, a seed input of 319 kg and fertilizer input of 279 kg are used. If the input use is carried according to the findings of this study, the soybean output will be optimal with  $Y$  (output) =  $2,5 X_1^{0,6} X_2^{0,2}$ , with use of input then equation  $Y$  (output) =  $2,5 [(319)^{0,6} (279)^{0,2}] = 2,5 \times 31,79 \times 3,08 = 244,78$  or 245 kg per hectare. If the average price of soybean output per kg is Rp. 12.000,- then the revenue per hectare becomes Rp. 2.940.000,-.

### Determination of Efficiency of Use of Input

To see the use of input of seed and fertilizer per hectare of land then the cost included in the calculation is the variable cost of Rp. 520.000,- as this cost can be made efficient. Accordingly,

Use of seed input ( $X_1$ );

$$520 - 6,75 X_1 - 4,5 X_2 = 0, \text{ substitute } X_2 \text{ with } X_1$$

$$520 - 6,75 X_1 - 4,5 (1/2 X_1) = 0$$

$$520 - 6,75 X_1 - 9 X_1 = 0, \text{ Jadi, } 520 = 15,75 X_1 \rightarrow X_1 = 33,02 = 33 \text{ kg}$$

Use of fertilizer input ( $X_2$ );

$$520 - 6,75 X_1 - 4,5 X_2 = 0, \text{ substitute } X_1 \text{ with } X_2$$

$$520 - 6,75 (2X_2) - 4,5 X_2 = 0$$

$$520 - 13,5 X_2 - 4,5 X_2 = 0, \text{ Jadi, } 520 = 18 X_2 \rightarrow X_2 = 28,89 = 29 \text{ kg}$$

Therefore, the use of seed input per hectare of land is 33 kg and fertilizer input is 29 kg. In one period of soybean planting per hectare of land, the farmers will be able to optimally produce soybean output per hectare of land with the amount of 245 kg with an average price of @ Rp. 12.000,-, and hence the total revenue is Rp. 2.940.000,-. Meanwhile, the variable cost (seed and fertilizer) is Rp. 520.000 so there is a margin of Rp.



2.420.000,- while the fixed cost (labor and land) is Rp. 4.500.000,- so the margin earned can not cover the fixed cost of Rp. 2.080.000, -. This means that it is not economically profitable to plant soybeans for soybean farmers in Solok Regency.

The result of this study is not in line with the study conducted in 2010 in Solok Regency. The result of the study in 2010 stated that soybean was one of the superior commodity in Solok Regency. However, after conducting a financial analysis, it is found that soybean farming is not economically profitable. This is due to the efforts undertaken by soybean farmers have not been maximal in the cultivation of soybean in Solok Regency. In addition, it is also caused by various problems faced by the soybean farmers in the cultivation of soybean. Moreover, the level of education and training of the soybean farmers in the Solok Regency is relatively low; mostly are graduates of elementary school so the ability to adopt technology is quite low and as a result the production has not been able to be optimized.

### Consumer Preferences

Consumer preference is a choice to like or dislike by someone to consumed products (goods or services). Consumer preference shows consumer liking from a wide variety of products available. This study looks at the consumer preference to the processed soy products in Solok Regency.

Table 2 shows that there are no respondents who dislike tofu, 4,52 percent of respondents are less fond of tofu compared with tempeh. Respondents prefer tofu and tempeh compared with other processed soy products. Respondents equally like tofu and tempeh which can be seen from the consumer preference to tofu and tempeh of 57,29 percent. In addition, 30,65 percent of respondents like tofu more than tempeh, and only 7,54 percent of respondents who really like tofu compared with tempeh. Furthermore, this is also shown by the amount of budget spent by households to buy tofu and tempeh compared with other processed soy products. In average all households buy these two products for consumption. Additionally, based on the average answer of respondents, a value of 3,40 percent was obtained; this means that the respondents in Solok Regency equally like tofu and tempeh.

**Table 2. Consumer Preference to Processed Soy Products in Solok Regency**

Preference	TOFU				
	tempeh	Tauco	Soy Milk	Soy Flour	Beancurd
Dislike	-	0.50	1.01	1.51	1.09
Less likely	4.52	2.01	4.02	3.02	3.80
Moderate	57.29	30.65	31.16	12.56	10.33
Likely	30.65	50.75	49.75	56.78	47.83
More likely	7.54	16.08	14.07	26.13	36.96
Total	100.00	100.00	100.00	100.00	100.00
Average	3.40	3.78	3.70	4.01	3.83

Moreover, judging from consumer preferences to the choice of tofu and tauco, only 0.50 percent of respondents who dislike tofu but really like tauco and 2.01 percent are less fond of tofu but like tauco, while 30,65 percent equally like tofu and tauco. Nevertheless, 50.75 percent of respondents like tofu and are less fond of tauco and only 16.08 percent of respondents really like tofu and dislike tauco. By looking at the average value of 3,78 this means that the respondents like tofu more than tauco.

Furthermore, judging from consumer preferences to the choice of tofu and liquid soy milk, soy flour and beancurd, the respondents like tofu more dominantly than liquid

soy milk, soy flour and beancurd with an average value each of 4. Therefore, it can be concluded that in overall the consumers in Solok Regency equally like tofu and tempeh but prefer tofu compared with tauco, liquid soy milk, soy flour and beancurd.

**Table 3. Consumer Preference to Processed Soy Products in Solok Regency**

Preference	Tempeh			
	Tauco	Soy Milk	Soy Flour	beancurd
Dislike	2.03	1.52	2.04	2.76
Less likely	5.58	8.12	4.59	4.42
Moderate	34.01	28.93	17.35	13.81
Likely	48.22	50.76	59.18	50.28
More likely	10.15	10.66	16.84	28.73
Total	100.00	100.00	100.00	100.00
Average	3.54	3.56	3.77	3.60

In addition, when seen from Table 3 about the preference of society on tempeh compared with other products, it appears that the respondents prefer tempeh compared with tauco, soy milk, soy flour and beancurd. This proves that tempeh is the product more in demand by the society in Solok Regency. Out of the five processed soy products, tofu, tempeh and tauco are the more desirable products by the society compared with soy milk, soy flour and beancurd.

**Table 4. Consumer Preference to Processed Soy Products in Solok Regency**

Preference	Tauco			Soy Milk		Soy Flour
	Soy Milk	Soy Flour	Beancurd	Soy Flour	Beancurd	Beancurd
Dislike	14.05	13.19	12.21	14.79	16.46	20.49
Less likely	19.46	21.43	16.86	15.38	17.68	27.05
Moderate	24.86	15.93	16.28	16.57	11.59	18.85
Likely	38.38	41.21	39.53	43.79	37.80	31.15
More likely	3.24	8.24	15.12	9.47	16.46	2.46
Total	100.00	100.00	100.00	100.00	100.00	100.00
Average	2.75	2.82	2.83	2.69	2.63	1.64

Result of the study shows that the processed soy products most desirable by the society of Solok Regency are tofu and tempeh. The society prefers these two products compared with other processed soy products such as tauco, soy flour, soy milk and beancurd. This means that tofu and tempeh can be used as comestibles of society that are rich in vegetable protein. Additionally, tofu and tempeh can be used as side dishes that can be consumed with rice as staple food. On top of that, the high demand of society for both of these products is due to the relatively low selling price so it can be affordable by the entire society.

This can be seen from the amount of budget spent by households for tofu and tempeh. From 200 respondents, more than 90 percent only allocate budget to buy tofu and tempeh without buying other processed soy products.

Nevertheless, the other processed soy product that is quite attractive to the society is tauco. The use of tauco is only as an ingredient in the making of curry/goulash. However, the use of this product is very small except for breakfast merchants or during

religious holidays. Soy flour and soy milk are also food that is not regularly consumed by the society. This means that most of the society is less interested in these processed products; so is the case with beancurd which is very rarely consumed by society.

Based on the consumer preferences, it can be seen that tofu and tempeh are the products more in demand by the society. Thus, the derivation of processed soy products that needs to be developed in Solok Regency is the development of home industries that process soybeans into tofu and tempeh, thereby increasing the added value of soybeans produced by local farmers. Additionally, it can improve the welfare of farmers and resolve the post-harvest problems often faced by farmers. The development of home industry is also expected able to absorb workforce as well as reducing the unemployment rate in rural areas which is identical to the agricultural sector and also reducing poverty.

### Demand for Processed Soy Products

The following is the regression analysis result of the demand of the society for processed soy products in Solok Regency

**Table 6. Result of Regression Analysis of the Demand for Processed Soy Products**

Variable	TEMPEH		TOFU	
	Coefficient	Prob.	Coefficient	Prob.
LOG(INCOME)	0.057	0.4769	0.121	0.1749
MARRIED	0.090	0.5650	0.045	0.7947
POP	0.101	0.0011**	0.163	0.0000*
EDUH	0.007	0.6952	-0.011	0.5845
EDUW	-0.042	0.0288**	-0.0002	0.9904
SPUH	-0.311	0.0115**	-0.265	0.0487**
SPUW	0.078	0.5150	0.054	0.6873
C	-1.545	0.1443	-2.526	0.0316
R-squared	0.1251		0.1575	
F-statistic	3.7184		5.0734	
Prob(F-statistic)	0.000873		0.000027	

*Description:*

\* : significanton  $\alpha = 0,01$

\*\* : significanton  $\alpha = 0,05$

### Utility of Processed Soy Products

Table 5 shows that in terms of utility, 57 percent of respondents in Solok Regency equally like tofu and tempeh. However, if seen from the amount of consumption of tofu and tempeh, the respondents consume in greater amount than the median value which is 3,6 kg per month for tofu and above 2 kg per month for tempeh with each value of 31,5 percent and 40,50 percent.

**Table 5. Utility of Tofu and Tempeh**

		q tofu		q tempeh		Total
		<3.6	>=3.6	<2	>=2	
Utility	More Likely	3.0%	4.5%	3.50%	4.00%	7.50%
	Likely	15.5%	15.5%	22.00%	9.00%	31.00%
	Moderate	25.5%	31.5%	16.50%	40.50%	57.00%
	Less likely	4.0%	.5%	2.50%	2.00%	4.50%
Total		48.0%	52.0%	44.50%	55.50%	100.00%

**Classic Assumption Test**

Based on the classic assumption test, it was obtained that the equation model of multiple linear regression for the demand for tempeh and tofu is free from heteroscedasticity problem. For the regression analysis result for the demand for tofu, the value of Prob. Chi-Square = 0.6450 was obtained and Prob. Chi-Square = 0.4301 for the demand for tempeh. Thus, the model is free from the problem of heteroscedasticity.

**Multiple Linear Regression Analysis and Hypotheses Testing on the Demand for Processed Soy Products**  
**Demand for Tempeh**

Based on the output from table 6, the regression equation of demand for tempeh is as following:

$$\text{Log } Q = -1,545 + 0,057 \log(\text{Inc}) + 0,101 \text{ Pop} + 0,090 \text{ Married} + 0,007 \text{ EDUH} - 0,042 \text{ EDUW} - 0,311 \text{ SPUH} + 0,078 \text{ SPUW} \quad (1)$$

$$R^2 = 12,51 \%$$

Based on equation 1, it is shown that the income of household affects positively but not significantly on the demand for tempeh in Solok Regency with a regression coefficient of 0,037, which means that an increase in the income of household of 1 percent will increase the demand for tempeh by 0,037 percent.

Moreover, the number of household members affects positively but insignificantly on the demand for tempeh in Solok Regency; if the number of household member increases by one person then it will increase the demand for tempeh by 0,101 percent.

So is the case with marital status; marital status affects positively and significantly on the demand for tempeh in Solok Regency. If a household is married then it will increase the demand for tempeh by 0.090 percent.

Furthermore, the education of husband affects positively but not significantly on the demand for tempeh; if the education of husband increases by 1 year then it will increase the demand for tempeh by 0.007 percent, while the education of wife affects negatively and significantly on the demand for tempeh in Solok Regency. If the education of wife increases by one year then it will decrease the demand for tempeh by 0,042 percent.

Next, the job sector of husband (formal/non formal) affects negatively and significantly on the demand for tempeh in Solok Regency; if the husband works in the formal sector then it will decrease the demand for tempeh by 0,311 percent. Meanwhile, the employment status of wife affects negatively but not significantly on the demand for tempeh in Solok Regency; this means if the wife works in the formal sector then it will increase the demand for tempeh by 0.078 percent.

**Demand for Tofu**

Based on the output from table 6, the regression equation of demand for tofu is as following:

$$\text{Log } Q = -2,526 + 0,121 \log(\text{Inc}) + 0,163 \text{ Pop} + 0,045 \text{ Married} - 0,011 \text{ EDUH} - 0,002 \text{ EDUW} - 0,265 \text{ SPUH} + 0,054 \text{ SPUW} \quad (2)$$

$$R^2 = 15,75 \%$$

Based on equation 2, it is shown that the income of household affects positively but not significantly on the demand for tofu in Solok Regency with a regression coefficient of 0,121, meaning that an increase in household income by 1 percent will increase the demand for tofu by 0,121 percent.

Furthermore, the number of household members affects positively and significantly on the demand for tofu in Solok Regency; if the household member increases by one person then it will increase the demand for tofu by 0,163 percent.

Marital status affects positively but not significantly on the demand for tofu in Solok Regency. If a household is married then it will increase the demand for tofu by 0.045 percent.

Moreover, the education of husband affects negatively but not significantly on the demand for tofu; if the education of husband increases by 1 year then it will decrease the demand for tofu by 0.011 percent, and the education of wife affects negatively but not significantly on the demand for tofu in Solok Regency. If the education of wife increases by one year then it will decrease the demand for tofu by 0,002 percent.

Next, the job sector of husband (formal/non formal) affects negatively and significantly on the demand for tofu in Solok Regency; if the husband works in the formal sector then it will decrease the demand for tofu by 0,265 percent. Meanwhile, the employment status of wife affects positively and insignificantly on the demand for tofu in Solok Regency; this means if the wife works in the formal sector then it will increase the demand for tofu by 0.054 percent.

## V. Discussion

### Analysis of Consumer Preferences to the Processed Soy Products in Solok Regency

The result of the study shows that the society in Solok Regency prefer tofu and tempeh compared with other processed soy products such as tauco, soy milk, soy milk flour and beancurd. This indicates that these products can be developed as downstream products of soybean in Solok Regency. Accordingly, this means that it is necessary for the development of home industries among the farmers that aims to increase added value of processed soy products in Solok Regency.

This is consistent with the theory of consumer behavior that the behavior of consumer demand for goods and services will be influenced by several factors, among others: income, consumer's taste, and price of the goods, when other conditions are not changed (*ceteris paribus*). This consumer behavior is based on the theory of consumer behavior that explains how a person with earned income can buy a variety of goods and services in order to reach a certain satisfaction according to what is expected.

### Analysis of Demand of Society for the Processed Soy Products in Solok Regency

The result of the study shows that the number of household members affects significantly and positively on the demand for tempeh and tofu in Solok Regency. This means that the greater number of household members, the greater the demand for tempeh and tofu in Solok Regency and vice versa; the smaller number of household members then the smaller demand for tempeh and tofu in Solok Regency with the assumption of *ceteris paribus*.

The education of wife affects significantly on the demand for tempeh in Solok Regency but the effect is not significant on the demand for tofu in Solok Regency.

The job sector of husband affects significantly on the demand for tempeh and tofu in Solok Regency. If the husband works in the formal sector, the demand for tempeh and tofu will decrease in Solok Regency. Job sector is closely related to the level of income received by a household so it will impact to the size of a person's demand for goods and services. This result is consistent with the views expressed by Kotler (2000) that states demand for goods and services is influenced by personal factors, namely job and economic environment. This means that the type of work will determine a person's decision in consuming goods and services available.

Nevertheless, income does not affect significantly on the demand for tempeh and tofu in Solok Regency. It means that the size of income level earned by a household will not give meaningful effect to changes in the society's demand for tempeh in Solok Regency. The insignificant effect of income on the demand for tempeh and tofu is caused by the relatively low selling price of tempeh and tofu so that it can be reached by the whole society in Solok Regency.

This result of study is not in accordance with the theory advanced by Case and Fair (2008) that the size of the demand is determined by income. If the goods are normal goods, the increase in society's income will cause the increase in society's demand for goods and services. But if the goods are inferior goods, the increase in society's income will decrease the demand for goods and services.

Furthermore, marital status, education of husband and job sector of wife do not affect significantly on the demand for tempeh and tofu in Solok Regency. The insignificant effect of marital status, education of husband and job sector of wife indicates that tempeh and tofu are products that are well known by the whole society so these products are in high demand by the society. Therefore, changes to these variables will not affect the consumer's decision to consume the goods and services available in the society.

## VI. Conclusion

The results of the study found that (1). The problems faced by soybean farmers in Solok Regency ranged from problems of capital, seed, land, fertilizer, maintenance, harvest, post-harvest, labor and government policy. (2). Factors that influence the production of soybean in Solok Regency are seed and fertilizer with a contribution of 22,73 percent, but with the condition of *decreasing return to scale*, which means that increase of input is greater than the increase of generated output, (3). The average total production cost of soybean per 1 hectare of land in Solok Regency is Rp. 5.020.000,- which consists of fixed cost of Rp. 4.500.000,- (labor cost of spouses Rp. 4.000.000,- and land cost Rp. 500.000,-), while variable cost is Rp. 520.000,- which consists of the cost of seed ( $X_1$ ) and the cost of fertilizer ( $X_2$ ). Seed input with an average price of seed of Rp. 6.750,- per kg and an average price of fertilizer per kg of every type fertilizer used is Rp. 4.500,-. (4). The analysis result of input efficiency of soybean farming in Solok Regency is the use of seed input per hectare of land of 33 kg and fertilizer input of 29 kg. In one period of soybean planting per hectare of land, the farmers will be able to optimally produce soybean output per hectare of land with the amount of 245 kg with an average price of @ Rp. 12.000,-, and hence the total revenue ie Rp. 2.940.000,-. Meanwhile, the variable cost (seed and fertilizer) is Rp. 520.000 so there is a margin of Rp. 2.420.000,- while the fixed cost (labor and land) is Rp. 4.500.000,- so the margin earned can not cover the fixed cost of Rp. 2.080.000,-. This means that soybean farming in Solok Regency is economically unprofitable. (5). The processed soy products most in demand by the society in Solok Regency are tofu and tempeh. (6) The number of household members, education



of wife and job sector of husband affect significantly on the demand for tempeh in Solok Regency, while income, marital status, education of husband and job sector of wife do not affect significantly on the demand for tempeh in Solok Regency. (7). The number of household members and job sector of husband affect significantly on the demand for tofu in Solok Regency, while income, marital status, education of husband, education of wife and job sector of wife do not affect significantly on the demand for tofu in Solok Regency.

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