**PRODUCER SURPLUS AS A MEASURE FOR OPPORTUNITY COST: A CASE OF CORN FARMING ON THE HILLOF MOUNT RINJANI - INDONESIA**

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**ABSTRACT**

Opportunity Cost is a decision making tool to select a more appropriate alternative for a final decision. The usual measure for opportunity cost is farm profit or income.This paper aims at: (1) introducing producer surplus as a measure for opportunity cost; (2) utilizing producer surplus as a determinant in deciding actions that provide the best benefit for farmers.

To achieve the above objectives, a research was conducted on 120 units of corn farming on the hills of Mount Rinjani, i.e. in Bebidas Village and PringgabayaUtara Village. Data were collected through face-to-face interviews guided by a structured questionnaire.

The study concludes the followings: (1) Producer surplus can be applied as an alternative measure for opportunity cost; (2) If the farmers are expected to leave the corn farming, they need to gain a compensation of IDR 2 million/ha in order to maintain welfare; (3) Producer surplus can also be used as a measure for opportunity cost for any other farms.

**Keywords**: producer surplus, opportunity cost, compensation, decision, corn farm.

**I. INTRODUCTION**

* 1. Background

One of the main programs of the local government is the development of corn farming through expansion of the corn farming area (Sadikin, 1999;Sjah, 2011). The expansion of the corn crop is done on dry land in the rainy season (November to April) and on wetlands in the dry season (July-October). Farmers (land owners) have two options, i.e.,planting the corn on their land or lease their land to other farmers (Tanaya,  2010).  When the first option is chosen, then it will certainly requires additional direct costs, such as the costs ofinputs of production and wages of non-family labors, and indirect costs, such as the cost of family-labors, equity interest, land rent and depreciation of equipment that is often overlooked (Bone, 2002). Income and welfare the farmers gained act as a motivation to runcorn farming. However, do farmers obtain a net benefit greater than the entire sacrifice? How much is the benefit? When farmers choose to lease their lands to other farmers, the motivation is to obtain rental income in advance. This article attempts to explore this issue.

Farmers on the hill of Mount Rinjani consist of dryland and wetland farmers. Farmers in dry land can only farm one time in a year, that is in the rainy season. Thus, in the rest of the time land is not cultivated because water is not sufficient (Tajidan, 2014). Farmers in wetlands can farm three times a year, namely in the rainy season (*MusimHujan, MH*), the first dry season (*MusimKemarausatu, MK-1*) and the dry season II (*MusimKemarau 2, MK-2*) (Suharjito, et al., 2010). During November - July, farmers usually grow rice as it provides a net benefit greater than corn (Anwar, et al., 2013). Corn is planted in July to Novemver because it needs less irrigation water than rice.

Although corn can be cultivated in dry land during the rainy season and in wetland in the second dry season, numerous farmers choose to get their land leased by other farmers who are willing to work on the land. To decide a better option, it is necessary to analyze the opportunity cost. Among the variables that are commonly used as a measure for opportunity cost is the biggest income of various alternatives (Bone, 2002; Espenshade, et al., 2005). In this article, producer surplus is being introduced as a measure for opportunity cost, and how it is applied in making option in farming.

By using income as a measure for opportunity cost, any kind of cost spent must be taken into account, including costs that come from within the family, such as wage of family-labors, interest of self-owned capital, and government subsidy on seeds and fertilizers received by farmers (Kurzban, et al., 2012).The weaknesses of the analysis ofincome as a measure for opportunity cost can be overcome by producer surplus. This article attempts to show the advantages of the use of producer surplus as a measure for opportunity cost and its wide range of its uses.

1. Problem Formulation

Net benefit is a variable commonly used in the analysis of opportunity cost. Net benefit can be in the form of farmers' income, profit, net present value, internal rate of return, payback period, etc. This article introduces the use of producer surplus as an alternative measure for opportunity cost and elaborates its wide range of uses in decision-making, so it can be used to analyze a variety of possible alternatives without compromising the welfare of farmers.

* 1. Special Objectives of the Research

This article aims to:

1. Introduce producer surplus as an alternative measure for opportunity cost;
2. Calculate producer surplus earned from farm corn.

II. DATA AND METHOD OF ANALYSIS

* 1. Data

Data used in the analysis of opportunity cost were collected from 45 farmers who farm corn on wetland in Bebidas Village, and from 75 farmers who farm corn on drylandin North PringggabayaVillage. Both villages are located on the hill of Mount Rinjaniin East Lombok Regency. Data analysis included average cost of production per hectare and the average price of corn in the dry season of 2012 (Tajidan, 2014).

* 1. Method of Data Analysis

Producer surplus is net benefit received by farmers by selling products through market mechanism with price is higher than the minimum price that producers are willing to sell (Ali, 2010). Minimum price is counted as equal to minimum average variable cost. According to Koutsoyiannis (1982) and Dumairy (2012) any change in producer surplus is calculated using the equation of price function or supply function as follows:

ΔPS =................................................ ............................................ (2.1)

AC = b 1 - b2q3 + b3q2 .................................... ......................................... (2.2)

BM = b1 - (2 xb2q) + (3 xb3q2)............................... ................................ (2.3)

Note: ΔSP = change in producer surplus (IDR / ha)

AC = average cost of production (IDR/ kg / ha)

BM = marginal cost of production (IDR/ kg / ha)

q 1 = optimum productivity (kg / ha)

q 0 = productivity at the cost of minimum average production (kg / ha).

III. DISCUSSION

3.1. Producer Surplus of Farm Corn

Producer surplus is a measure that describes the welfare for producers with variation of criteria forcompensation or quasi rents (Just, et al., 2004). Producer surplus of farm cornon the hill of Mount Rinjaniof East Lombok Regency in the growing season of 2012 under the integral equation of marginal cost (equation 3.1) is IDR 12 930102.36 / ha.



 Figure 3.1 Producer Surplus of Farm Corn Planted in 2012 seasons

Description: a + d = Producer Surplus of Farm Corn

= IDR1212,930,102.36/ ha

d = IDR 1. 1,951,838.84/ ha

b = Average Variable Cost (IDR/ ha)

S = supply curve at the farmer level

BM =Marginal Cost

BVR = Average Variable Cost

q = Farm Corn Productivity (kg / ha)

IDR 432/kg = minimum average variable cost

IDR 1000 /kg = base price set by the company (avalist)

IDR 1490 /kg = premium price of dried cob corn (annual average price)

IDR3000 / kg = corn price at the consumers/ users level

The extent of the producer surplus describes the magnitude of the welfare received by the owners of production factors,such as land, labor, capital, and entrepreneur. By using the compensation variation approach, if farmers as owners of production factors do not get their land cultivated, they will losswelfare equal to IDR 12,930,102.36/ha/planting season. The interpretation is that if the price of corn fall from IDR1,490/kg to IDR432/kg, then this will not affect the farmers welfare. In the context of corn farming, if productivity increases to IDR12,500 kg/ha of dry cob corn at the market price of IDR 1,490/kg, then the welfare of the owners of production factors increases by IDR 12.93 million/ha/planting season (Just, *et al.,* 2004).

If corn prices continue to fall until it hits the price of IDR432/kg, then no farmers will grow corn and consequently corn supply in the market becomeszero. Farmers will choose to rent their land to others or divert the manpower and venture capital they own for other productive activities.

h& c (Rp/kg)

3000

2000

1000

2408

BM=S

d

1490

432

q (kg/ha)

0 2500 5000 7500

Figure 3.2.  S*upply Curve* and Producer Surplus of Farm Corn in 2012Planting Season

(area d)

Note: h = price;  c = *cost* ;  q = productivity

BM = marginal cost;  S = supply

Figure 3.1 can be simulated by dragging the S curve to the left until it touches the coordinate q = 0 kg/ha and h & c = IDR432/kg (as shown in Figure 3.2).Thus, there is no farmer willing to farm corn and thereforeno supply of corn in the market. Consequently, owners of the production factors will shift to run other productive businesses that provide greater net benefits or consider the compensation they may gain by leasing their land to other farmers. The amount of compensation or the quasi rent received by farmers is at least equal to the opportunity cost. In fact, the amount of lease usually received by farmers in the study sites is around IDR 2 million/ha/planting season, which is nearly equal to the change of producer surplus(Figure 3.2).

3.2 Opportunity Cost

In Figure 3.2, it appears that change of producer surplus in farm corn is as much as area d, equal to IDR 1,951,838.84/ha. This meansthat land owners are willing to voluntarily leave the corn farming if they are given a compensation of IDR 1.95 million/ha per growing season. Viewedfrom transfer of cultivation aspect, farmers will be willing to switch from corn farming to other crop farming if they can get a compensation of, at least,IDR 1.95 million/ha perplanting season. From thisstandpoint of leasing, in order to maintain the level of welfare of farmers, land rent should be at the minimum of IDR 1.95 million /ha perplanting season.

In the context of this article, farmers are considered investors who expect that their investment and inputs will be repaid in the form of income. The amount of income is determined by productivity and the market price when all products are sold out in the market (Figure 3.1). Farmers choose to farm corn, because farmers have the expectation that the farm will produce the largest producer surplus and smaller risks. They also consider the non-financial benefits and disadvantages (Kerins, et al., 2003). For instance, corn leaves and rods are used as cattle feed and organic fertilizer. However, they ignore losses created suchas depletion of nutrients in the soil and irrigation water use (Frederict, et al., 2009). Therefore, the use of opportunity cost in the decision-making of farmers is an appropriate means as farmers does not solely base their decision on money received solely (Kurzban, et al., 2012).The important thing for farmers is that their prosperity does not decrease, and would prefer if the welfare level increased. Mental and psychological burden in farming also becomes consideration in determining branch of farming business. This is a non-material nature, which is difficult to explain in economic calculation. Kurzban, et al. (2012) propos an alternative explanation based on the representation ofcosts and mental benefits associated with task performance. Therefore, the application of producer surplus as the opportunity cost variable approximates psychological considerations of the farmers.

* + 1. CONCLUSIONS AND RECOMMENDATIONS
	1. Conclusions

This paper concludes that:

* + - * 1. The use of producer surplus as a measure for opportunity cost is an alternative that can explain the economic and psychological considerations.
				2. Landowners are willing not to farm corn when given a compensation of IDR 1.95 million/ ha per growing season such that their welfare does not decrease.
	1. Recommendations

Recommendations given by this study are as follows:

1. Producer surplus as a measure for opportunity cost can be used in a wide variety of other productive farming alternatives, in addition to corn farming.
2. Producer surplus do not only consider economic aspect but also psychological aspects for the welfare of the owners of production factors.

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