

# **Producer Surplus as a Measure for Opportunity Cost: The Case of Corn Farming on the Hill of Mount Rinjani – Indonesia**

**Tajidan<sup>1</sup> and Taslim Sjah<sup>2</sup>**

## **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.

**JEL classification numbers:** H62

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

## **1 Introduction**

One of the main programs of the local government is the development of corn farming through expansion of the corn farming area ([1]; [2]). 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 ([3]). When the first option is chosen, then it will

---

<sup>1</sup>Faculty of Agriculture, University of Mataram.

<sup>2</sup>Faculty of Agriculture, University of Mataram.

certainly requires additional direct costs, such as the costs of inputs 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 ([4]). Income and welfare the farmers gained act as a motivation to run corn 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 ([5]). Farmers in wetlands can farm three times a year, namely in the rainy season (*Musim Hujan, MH*), the first dry season (*Musim Kemarau I, MK-1*) and the dry season II (*Musim Kemarau 2, MK-2*) ([6]). During November - July, farmers usually grow rice as it provides a net benefit greater than corn ([7]). Corn is planted in July to November because it needs less irrigation water than rice, and water is insufficient for planting 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 ([4]; [8]). 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 ([9]). The weaknesses of the analysis of income 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.

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.

This article aims to: (1) Introduce producer surplus as an alternative measure for opportunity cost; and (2) Calculate producer surplus earned from farm corn.

## 2 Preliminary Notes

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 dryland in North Pringgabaya Village. Both villages are located on the hill of Mount Rinjani in East Lombok Regency. Data analysis included average cost of production per hectare and the average price of corn in the dry season of 2012 ([4]; [10]).

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

([11]). Minimum price is counted as equal to minimum average variable cost. According to [12] and [13] any change in producer surplus is calculated using the equation of price function or supply function as follows:

$$\Delta PS = \int_{q_0}^{q_1} MC \tag{1}$$

$$AC = b_1 - b_2q_3 + b_3q^2 \tag{2}$$

$$BM = b_1 - (2 \times b_2q) + (3 \times b_3q^2) \tag{3}$$

Note:

$\Delta SP$  = 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).

### 3 Main Results

#### 3.1 Producer Surplus of Farm Corn

Producer surplus is a measure that describes the welfare for producers with variation of criteria for compensation or quasi rents ([14]). Producer surplus of farm corn on the hill of Mount Rinjani of East Lombok Regency in the planting season of 2012 under the integral equation of marginal cost (equation 3.1) is IDR 12 930102.36 / ha.

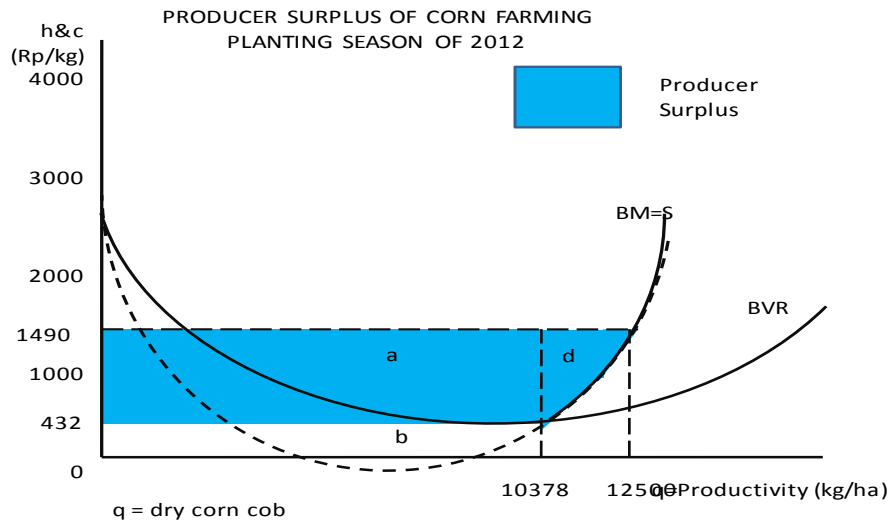


Figure 1: Producer Surplus of Farm Corn Planted in 2012 seasons

**Description:**

$a + d$  = Producer Surplus of Farm Corn

= IDR 12,930,102.36/ ha

$d$  = IDR 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

Figure 1 can be simulated by dragging the  $S$  curve to the left until it touches the coordinate  $q = 0$  kg/ha and  $h \& c = \text{IDR}432/\text{kg}$  (as shown in Figure 2). Thus, there is no farmer willing to farm corn and therefore no 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 2).

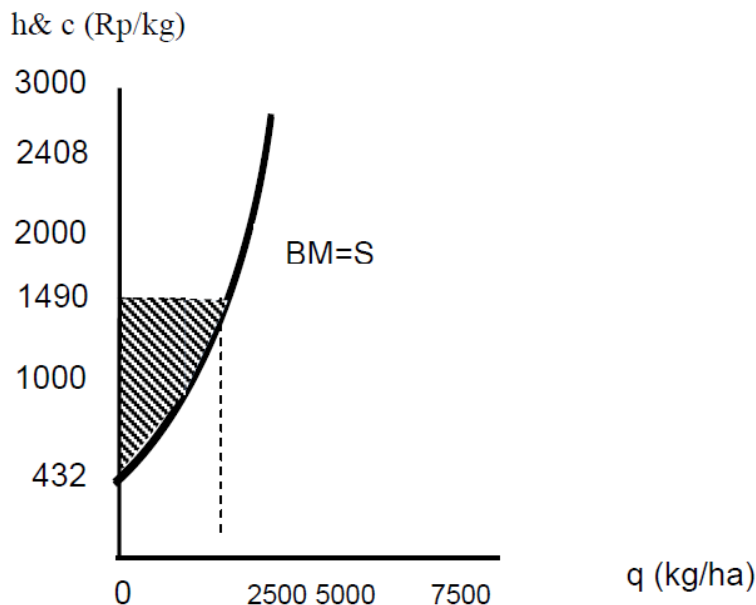


Figure 2: *Supply Curve and Producer Surplus of Farm Corn in 2012 Planting Season (area d)*

### 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 means that 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. Viewed from 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 per planting season. From this stand point 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 per planting 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. For instance, corn leaves and rods are used as cattle feed and organic fertilizer. However, they ignore losses created such as depletion of nutrients in the soil and irrigation water use ([15]). 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 ([9]). 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. Propose an alternative explanation based on the representation of costs and mental benefits associated with task performance([9]). Therefore, the application of producer surplus as the opportunity cost variable approximates psychological considerations of the farmers.

## **4 Conclusions and Recommendations**

### **4.1 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.

### **4.2 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.

**ACKNOWLEDGEMENTS:** Thanks to Hairuman from PT Sang Hyang Seri and K.Widodo from the PT Pertani for their help with obtaining the data, B.Setiawan and A.W.Muhaimin for their guidance on this paper, and the many others who provided useful comments.

## References

- [1] Sadikin, I., *Analysis of Competitive Power of Corn Commodity and Impact of Government Policy for Corn Agribusiness in West Nusa Tenggara Economy after the Crisis*. Research Centre and Agricultural Economics and Social Development, Research and Development Agency, Department of Agriculture Republic of Indonesia, Bogor, (1999).
- [2] T. Sjah, 2011. Increasing Opportunity of Corn Production in West Nusa Tenggara. *Agroteksos. Journal of Agriculture Sciences*. Volume 21. Number 2-3. ISSN 0852-8286. p.158-164.
- [3] Tanaya, IGLP, *Inclusion Small-Scale Farmers in Supply Chain Management: Empirical Evidence from dryland Farmers in Lombok*. Department of Agribusiness – University of Mataram, (2010).
- [4] A. Bone, *Pursuing a master's degree: opportunity cost and benefits*, *Education Quarterly Review*, **8 (4)**, (2002), 16-27.
- [5] Tajidan, *A Supply Chain Management and Business Process Integration as an Attempt to Improve Corn Farmers' Welfare in West Nusa Tenggara Province*. Agricultural Faculty, Brawijaya University, Malang, (2014).
- [6] Suharjito, Machfud, B.Haryanto and Sukardi, *Time Schedule of Corn Farming Risk Models Using Integration of Supply Chain*. *Journal of Agriculture Industry Technology*, 20 (1) (2010), 48-56.
- [7] Anwar, H. Hamidi, M. Zubair, *Policy Analysis of PIJAR Commodities for Priority Development and Contribution to Household Economy: A Study of the Corn Farmers' in East Lombok Regency*. Faculty of Agricultural, University of Mataram, (2013).
- [8] T. J. Espenshade, and C. Y. Chung, The Opportunity Cost of Admission Preferences at Elite Universities, *SOCIAL Science Quarterly*, **86(2)**, (2005), 293-305.
- [9] R.Kurzban, A. Duckworth, J.W. Kable, and J. Myers, *An opportunity cost models of Subjective effort and task performance*, *Behavioral and Brain Sciences (in press)*, Cambridge University, (2010), 1-77.
- [10] Tajidan, B. Setiawan, M.M. Mustadjab, A.W. Muhaimin, *The Strategy of Business Process Integration and Competitive Advantage in a Supply Chain Collaboration with the Outcome Corn Farmers' Welfare in West Nusa Tenggara Indonesia*, *International Journal of Science and Research*, **2(11)**, (2013), 43-50.
- [11] S.Ali, *Surplus Producent (Firms) Theory*, *Syukronali.files.wordpress.com/2010/05/teori-surplus-company-produsen.docx*, (2010).
- [12] Koutsoyiannis, A. *Modern Microeconomic*. Second Edition. The Macmillan Press, Ltd. Hong Kong, (1982).
- [13] Dumairy, *Applied Math for Business and Economics. Second edition*. BPFR, Gadjah Mada University. Yogyakarta. 1991.
- [14] R.E. Just, D.L.Hueth and A.Schmotz, *The Welfare Economics of Public Policy*. Edward Elgar, Northampton, (2004).
- [15] S. Frederick, N.Novemsky, J. Wang, R.Dhar and S.Nowlis, *Opportunity Cost Neglect*, *Journal of Consumer Research*, **36(10)**, (2009), 000-000.