

Conference Paper

Opportunity Cost Analysis Sugarcane Cultivation in East Java – Indonesia

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ABSTRACT

The opportunity cost for sugar cane farmers is the choice of cultivating sugar cane as a farming activity to support their livelihoods. Farming of other crops is not chosen, rejected, sacrificed. as opportunity costs. Farmers choose sugar cane as a commodity without choosing alternative crops that can be cultivated in the same location. Alternative crops are rice and corn, which can be competitors considering profits. To find out how much opportunity costs or sacrifices are made by sugar cane farmers, this research was carried out. The research method used is quantitative by calculating the income of sugar cane farmers and the income of rice and corn farming. The research was carried out in 4 districts of Sidoarjo, Tulungagung, Ngawi, Situbondo, with a sample size of 120 respondents. The results of the research show that the Opportunity Cost value for sugar cane farmers in East Java is IDR 31,618,062 if the farmers plant rice and corn. Sugarcane farming is less profitable because it earns lower income, namely IDR 25,993,750,00.

Keywords: Opportunity costs, sugar cane farming, rice and corn farming

Introduction

Opportunity cost is a theory that arises due to scarcity and unlimited human needs and desires (needs & wants). According to Gray et al. (2005), opportunity costs are benefits that are sacrificed because they have chosen to use other activities. Opportunity costs are costs that arise due to lost opportunities to fulfill other needs. Definitely, the definition of opportunity cost is the emergence of costs/risks due to choosing to sacrifice one thing to get another thing. Therefore, opportunity costs usually occur when faced with two or more choices. Case and Fair (2007) argue, that in determining each option, specific judgments will be made about the relative usefulness of the very different options. When someone is faced with several alternative choices and has to choose one of them, the alternative that is not chosen is the opportunity cost (Mankiw et al., 2000).

The opportunity cost for sugar cane farmers is the choice of cultivating sugar cane as a farming activity to support their livelihoods. Farming of other crops is not chosen, rejected, or sacrificed. as opportunity costs. Farmers choose sugar cane as a commodity without choosing alternative crops that can be cultivated in the same location. Alternative crops are rice and corn, which can be competitors considering profits. In Sidoarjo Regency, sugar cane farmers sacrifice not planting rice and corn, Tulungagung Regency does not plant corn which has the potential for 2 crops, in Ngawi Regency, they do not plant corn, in Situbondo Regency they do not plant rice and corn. The amount of opportunity cost can be calculated from the difference in farming results in the form of income between sugarcane commodities compared to rice and corn crops.

Opportunity cost is equal to the value sacrificed (foregone option) minus the value gained (Chosen option). If the Foregone Option (FO) is more valuable than the Chosen Option (CO), then this option is less profitable. Meanwhile, if FO is worth less than CO, then it is the best option to take. FO is the income from rice and corn in Sidoarjo and Situbondo Regencies, corn (2 times) is the income sacrificed in Tulungagung Regency, and corn (1 time) is the income sacrificed in Ngawi Regency. Meanwhile, CO is sugar cane income. So, to find out the opportunity costs in this research, income data from the analysis of sugar cane, rice, and corn farming is needed from the 4 research location districts.

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Material and Methods

This research uses quantitative methods, namely a systematic, planned, measurable type of research regarding a phenomenon or situation by collecting data using statistical, mathematical, and computational techniques. Quantitative research is a measurement process. The measurement process carried out can provide a relationship between empirical observations and mathematical expressions of quantitative relationships. Quantitative research uses survey research methods to obtain data that occurred in the past or currently regarding beliefs, opinions, characteristics, and variable relationships that can be used to test several hypotheses.

The research was carried out in 4 locations in Sidoarjo Regency, Tulungagung, Ngawi, and Situbodo, among groups of farmers who cultivated sugar cane. Data about farming was taken from respondents, regarding sugarcane farming. The number of respondents was 120 people, 30 people from each district. Meanwhile, data on rice and corn farming is in the form of secondary data from field officers. The data was carried out by farming analysis, in order to obtain data on the income from sugar cane, rice, and corn. The difference between rice and corn income compared to sugar cane income is an opportunity cost.

Results and Discussion

The amount of opportunity cost can be calculated from the difference in farming results in the form of income between alternative commodities (rice and corn) compared to the sugar cane crop currently being cultivated by farmers. The formula states that Opportunity cost is the value sacrificed minus the value gained, as in the following Table 1:

Table 1. Opportunity cost formula

Cities in East Java - Indonesia	Value sacrificed - Value gained
Sidoarjo	Income (rice + corn) – Sugarcane income
Tulungagung	Corn income (2 plantings) – Sugar cane income
Ngawi	Corn income (1 planting) – Sugar cane income
Situbondo	Income (rice and corn) – Sugarcane income

To determine the income from cultivating sugar cane and alternative crops (rice and corn), research was carried out. The research results are in the form of analysis of sugarcane farming using primary data, and analysis of rice and corn farming in the form of secondary data.

Results of analysis of sugarcane farming in Sidoarjo, Tulungagung, Ngawi, Situbondo Regencies

Table 2. Analysis of sugarcane farming in Rejeni Village, Krembung District, Sidoarjo District

Number	Description	Volume	Rp	Total
1	Land lease	1 ha	13.000.000	13.000.000
2	Tool depreciation	30 %	4.500.000	1.500.000
3	ZA Fertilizer	600 kg	6.500	3.900.000
4	Ponska	400 kg	2300	920.000
5	Pestisida	3 ltr	100.000	300.000
6	Herbisida	19,5 ltr	200.000	3.900.000
7	Labor	116 hok	50.000	5.800.000
8	The amount of costs			29.320.000
9	Reception	92 ton	60.000	55.200.000
10	Income			25.880.000
11	B/C Ratio			0,88
12	R/C Ratio			1,88

Table 3. Analysis of sugarcane farming in Ringin Pitu Village, Kedungwaru DistrictTulungagung Regency

Number	Description	Volume	Rp	Total
1	Land lease	1 ha	11.000.000	11.000.000
2	Tool depreciation	30%	4.500.000	1.500.000
3	Pupuk ZA	1.000 kg	6.500	6.500.000
4	Ponska	500 kg	2300	1.150.000
5	Pestisida	4 ltr	100.000	200.000
6	Herbisida	15 ltr	150.000	2.250.000
7	Labor	124 hok	50.000	6.200.000
8	The amount of costs			28.800.000
9	Reception	87 ton	65.000	56.550.000
10	Income			27.750.000
11	B/C Ratio			0,96
12	R/C Ratio			1,96

Table 4. Analysis of sugarcane farming in Selopuro Village, Pitu District, Ngawi Regency

Number	Description	Volume	Rp	Total
1	Land lease	1 ha	7.000.000	7.000.000
2	Tool depreciation	30 %	1.500.000	500.000
3	Pupuk ZA	700 kg	6.500	4.550.000
4	Ponska	300 kg	2300	690.000
5	Pestisida	2 ltr	100.000	200.000
6	Herbisida	5 ltr	200.000	1.000.000
7	Labor	117 hok	50.000	5.850.000
8	The amount of costs			19.790.000
9	Reception	72 ton	55.000	39.600.000
10	Income			19.810.000
11	B/C Ratio			1
12	R/C Ratio			2

Table 5. Analysis of sugarcane farming in Duwet Village, Panarukan District, Situbondo District

Noumber	Description	Volume	Rp	Total
1	Land lease	1 ha	11.000.000	11.000.000
2	Tool depreciation	30%	4.500.000	1.500.000
3	Pupuk ZA	1.000 kg	6.500	6.500.000
4	Ponska	500 kg	2300	1.150.000
5	Pestisida	4 ltr	100.000	200.000
6	Herbisida	15 ltr	150.000	2.250.000
7	Labor	124 hok	50.000	6.200.000
8	The amount of costs			28.800.000
9	Reception	87 ton	65.000	56.550.000
10	Income			27.750.000
11	B/C Ratio			0,96
12	R/C Ratio			1,96

The results of the analysis show that sugar cane farming in East Java is worthy of being a livelihood for farmers, because it is profitable. The value of R/C ratio = 1.97 means that every expenditure for production costs of 1 million rupiah, will result in revenue of 1.97 million rupiah. Profitable farming, even though the profits obtained are not as high as the costs incurred. B/C ratio = 0.97, meaning profits are 97% of expenses.

The results of this research are in line with research that has been conducted by previous researchers, including; (1) Satriawan et al. (2023) produces an R/C ratio = 2.5 in sugar cane farming in Pekat sub-district, Dompu district. (2) Hadi's research (2019) on analysis of people's sugar cane plantations in Randu Agung - Lumajang sub-district obtained an R/C ratio = 1.8. (3) Lukita (2017)

states that the R/C ratio = 2.1 in sugar cane farming in Ngantru sub-district, Tulungagung district. (4) The results of Hajar et al.'s research (2019) stated that the R/C ratio = 2.9 in sugar cane farming in Jaticalen sub-district, Nganjuk district. (5) Zulfahri's (2019) research in Polongbangkeng sub-district, Takalar district, obtained an R/C ratio value of 2.97. (6) Paramita (2018) obtained an R/C ratio = 2.03 in research on sugar cane farming in Kunduran sub-district, Blora district. (7) Lukita (2017) stated in the conclusion of his research, that the results of the analysis of sugar cane farming in Pasuruan district produced an R/C ratio = 1.17 for rented land, and R/C = 1.7 for own land. (8) Putri and Aminda (2024) obtained an R/C ratio = 1.83 in her research in Bantul district - DI Yogyakarta. (9) Asmarantaka et al. (2011) obtained a value of R/C = 1.95 in sugar cane farming in North Lampung.

Analysis of rice and corn farming

Table 7. Analysis of rice farming in Sidoarjo Regency

Number	Description	Volume	Rp	Total
1	Land lease	1 ha	6.000.000	6.000.000
2	Seed	60 kg	110.000	660.000
3	Urea	275 kg	2.250	618.750
4	NPK	100 kg	2.300	230.000
5	Insektisida	14 ltr	150.000	1.120.000
6	Rodentisida	2 kg	250.000	500.000
7	Labor	135 hok	75.000	10.125.000
8	The amount of costs			19.253.750
9	Reception	7,2 ton	6.400	46.080.000
10	Income			26.826.250
11	B/C Ratio			1,39
12	R/C Ratio			2,39

Table 8. Analysis of corn farming in Sidoarjo Regency

Number	Description	Volume	Rp	Total
1	Land lease	1 ha	2.000.000	2.000.000
2	Seed	15 kg	50.000	750.000
3	Hippa	-	-	1.000.000
4	Urea	300 kg	2.250	675.000
5	NPK	200	2.300	460.000
6	Pestisida	2 ltr	150.000	300.000
7	Herbisida	2 ltr	150.000	300.000
8	Labor	65 hok	75.000	4.875.000
9	Harvest	-	-	4.000.000
10	The amount of costs			14.360.000
11	Reception	6 ton	5.000	30.000.000
12	Income			15.640.000
13	B/C Ratio			1,09
14	R/C Ratio			2,09

Table 9. Analysis of corn farming in Tulungagung Regency

Number	Description	Volume	Rp	Total
1	Land lease	1 ha	2.000.000	2.000.000
2	Seed	15 kg	50.000	750.000
3	Urea	300 kg	2.250	675.000
4	NPK	200	2.300	460.000
5	Pestisida	2 ltr	150.000	300.000

To be continued...

6	Herbisida	2 ltr	150.000	300.000
7	Labor	65 hok	75.000	4.875.000
8	Harvest	-	-	4.000.000
9	The amount of costs			13.360.000
10	Reception	5 ton	5.000	25.000.000
11	Income			11.640.000
12	B/C Ratio			0,87
13	R/C Ratio			1,87

Table 10. Analysis of corn farming in Ngawi Regency

Number	Description	Volume	Rp	Total
1	Land lease	1 ha	5.000.000	4.000.000
2	Seed	15 kg	50.000	750.000
3	Urea	300 kg	2.250	675.000
4	NPK	200	2.300	460.000
5	Rodentisida	2 ltr	150.000	300.000
6	Herbisida	2 ltr	200.000	400.000
7	Labor	65 hok	75.000	4.875.000
8	Harvest	-	-	4.000.000
9	The amount of costs			15.460.000
10	Reception	6 ton	5.000	30.000.000
11	Income			14.540.000
12	B/C Ratio			0,94
13	R/C Ratio			1,94

Table 11. Analysis of rice farming in Situbondo Regency

Number	Description	Volume	Rp	Total
1	Land lease	1 ha	6.000.000	6.000.000
2	Seed	60 kg	110.000	660.000
3	Urea	275 kg	2.250	618.750
4	NPK	100 kg	2.300	230.000
5	Insektisida	14 ltr	150.000	1.120.000
6	Rodentisida	2 kg	250.000	500.000
7	Labor	135 hok	75.000	10.125.000
8	The amount of costs			19.253.750
9	Reception	7 ton	6.400	44.800.000
10	Income			25.546.250
11	B/C Ratio			1,33
12	R/C Ratio			2,33

Table 12. Analysis of corn farming in Situbondo Regency

Number	Uraian	Volume	Rp	Total
1	Land lease	1 ha	2.000.000	2.000.000
2	Seed	15 kg	50.000	750.000
3	Hippa	-	-	1.000.000
4	Urea	300 kg	2.250	675.000
5	NPK	200	2.300	460.000
6	Insektisida	2 ltr	150.000	300.000
7	Herbisida	2 ltr	150.000	300.000
8	Labor	65 hok	75.000	4.875.000
9	Harvest	-	-	4.000.000

To be continued...

10	The amount of costs			14.360.000
11	Reception	7 ton	5.000	35.000.000
12	Income			20.640.000
13	B/C Ratio			1,44
14	R/C Ratio			2,44

The income of rice and corn commodities as competitors to sugar cane in 4 districts is as follows:

Table 13. Rice and corn income in 4 Regencies in East Java – Indonesia

Regency	Commodity	Income (Rp)/ha	Total Income (Rp)/ha
Sidoarjo	Paddy	26.826.250	42.466.250
	Corn	15.640.000	
Tulungagung	Corn 2 x	11.640.000	23.280.000
Ngawi	Corn	14.540.000	14,540.000
Situbondo	Paddy	25.546.250	46.186.250
	Corn	20.640.000	

In Sidoarjo district, sugar cane income competes with rice and corn with income from both of them amounting to IDR 42,466,250. In Tulungagung district, it competes with 2 plantings of corn, with an income of IDR 23,280,000. In Ngawi district, it competes with one planting of corn with an income of IDR 14,450,000. In Situbondo district, they compete with rice and corn crops with an income of IDR 46,186,250,00.

Opportunity cost value

The opportunity cost for sugar cane farmers is the choice of cultivating sugar cane as a farming business that is currently carried out, in order to support daily life and the welfare of farmers. Farming other crops is not chosen and is sacrificed as an opportunity cost. Farmers choose sugarcane without choosing other alternative crops, which can be cultivated in the same location. Alternative crops are rice and corn, which are competitors with profit considerations in mind. Calculating opportunity costs is done by comparing the income/profits obtained from growing rice/corn with the income/profits from sugarcane farming. Opportunity Cost = rice/corn income – sugar cane income, as in the following Table 14:

Table 14. Opportunity cost values in 4 Regencies in East Java – Indonesia

Regency	Rice/Corn In- come (Rp/ha)	Pendapatan Tebu (Rp/ha)	Opportunity Cost (Rp/ha)	Option
Sidoarjo	42.466.250	25.880.000	16.586.250	Sugarcane farming is less profitable
Tulungagung	23.280.000	27.750.000	-6.693.750	Sugarcane farming is profitable
Ngawi	14,540.000	19.810.000	-5.270.000	Sugarcane farming is profitable
Situbondo	46.186.250	30.535.000	15.651250	Sugarcane farming is less profitable
Average in East Java	31.618.062	25.993.750	5.624.312	Sugarcane farming is less profitable

Table 14 shows the average opportunity cost value for East Java of IDR 5,624,312.-. Sugar cane farming is less profitable compared to rice and corn. The profit obtained from planting rice and corn is IDR 31,618,062,- while the profit from sugar cane is IDR 25,993,750,-

In Sidoarjo Regency, the income of sugar cane farmers is IDR 25,880,000,- compared to if farmers planted rice and corn which would get a profit of 42,466,250,- so that farmers lose income equal to the opportunity value (opportunity cost) of IDR 16,586,250,-. Farmers' income is greater and profitable if they grow rice and corn. However, currently farmers still choose to plant sugar cane, for the reason that they get convenience from the Sugar Factory in the form of working capital, inputs, technical guidance,

mechanization, cutting and transporting. Another advantage is that farmers are able to plant on a large scale (tens of hectares). Changing to rice and corn is difficult because you are not familiar with planting techniques, the work is complicated and requires attention. Sugarcane plants are easy to work with, after the second fertilization (1.5 months after drying) they can be left behind, and allowed to grow until the time for cultivating (8 months of age).

In Tulungagung Regency, sugar cane farmers' income is IDR 27,750,000,- compared to if farmers planted corn which would get a profit of IDR 23,280,000,- for 2 harvests. The condition of the land is sandy soil and limited irrigation, so corn plants can be planted twice during the rainy and dry seasons. Sugarcane crops are more profitable than corn crops.

In Ngawi Regency, the income of sugar cane farmers is IDR 19,810,000,- compared to if farmers planted corn which would get a profit of IDR 14,540,000,-. Sugarcane crops are more profitable than corn crops. The condition of the land is dry land and there is no irrigation, corn plants can only be planted once during the rainy season. During the dry season, corn plant roots cannot tolerate dry conditions due to lack of water.

In Situbondo Regency, the income of sugar cane farmers is IDR 30,065,000,- compared to if farmers planted rice and corn which would get a profit of IDR 42,645,250,- so that farmers lose income equal to the opportunity value (opportunity cost) of IDR -12,580,589,-. Not to mention, if water conditions are sufficient, either from irrigation or groundwater drilling, it can even be planted 3 times. The process of shrinking sugar cane land continues over time. The sugar cane area, which once reached 400 ha, is currently only 85 ha. The nearest Olean Sugar Factory closed earlier (in 2011) because it was inefficient and had difficulty getting raw materials unless it had to go through the struggle in competition with the new Sugar Factory.

Conclusion

The results of the research show that the Opportunity Cost for sugar cane farmers in East Java is IDR 31,618,062 if the farmers plant rice and corn. Sugarcane farming is less profitable because it earns a lower income, namely IDR 25,993,750,00.

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