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Economics of Enset (Ensete ventricosum) Cultivation and Constraints Faced by Cultivators in Doyogena District, SNNPR, Ethiopia

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Abstract
Enset is a traditional staple food crop in many parts of the densely populated south and south-western highlands of Ethiopia. Doyogena district is one of the major producers of *enset* in southern Ethiopia. *Enset* (Ensete Ventricosum) cultivation provides supplementary income for growers in the study area. The purpose of this paper was to study cost and return associated with *enset* cultivation and identify major constraints faced by *enset* growers. A total of 154 farm households were selected randomly for the survey. Data were obtained through face to face interview and focus group discussion by using pre-tested questionnaire and checklist respectively. The cost of human labor was the most important cost item within the total cost of *enset* cultivation (33.64%) followed by cost of planting material which accounted 14.41% in the total cost of *enset* cultivation. The cost and return analysis shows that *enset* cultivation is profitable. Land shortage, lack of processing technology, absence of cooperatives, disease and limited government attention are the major constraint faced by farmers in *enset* production and its products marketing in the study area. Therefore, the government should take initiation for improving the infrastructural facilities, which is a must for improving the production and marketing of *enset* products.
Keywords: Constraints, Doyogena, Economics, *enset*, Southern Ethiopia

1. INTRODUCTION

Enset (*Ensete ventricosum*), a plant which looks like banana, is a multi-use crop domesticated and grown as food crop only in Ethiopia. It is one of the most important perennial food security crop of southern nations nationalities and peoples regional state of Ethiopia. Due to its multi-use and high economic returns it is referred to as a plant for everything (Valentina, 2015). *Enset* can be grown regardless of the size of land holding in areas where it is cultivated. Even a families with no land for crop cultivation have enset around their residence (Birmeta *et al*., 2004). *Enset* cultivation system widely differ from other perennial crops cultivation system due to the complexities such as growth period, age structure, repeated transplanting of a single plant, processing and storage etc. For instance, bulk storage of *kocho* and/or *bulla* for long duration is mostly possible at producer level because these products are stored traditionally in the pit lined with *enset* leaves. These products are also packed traditionally by the plant's dried pseudo-stem and leaves.

In recent years, there has been a rise in demand for *enset* food in hotels and restaurants. To capture the increased demand, *enset* growers are processing enset for its food and non-food products. Processing *of enset* into its main products (*kocho* and *bulla*) is expected to utilize a much more diverse set of resources. Management of resources for maximizing the returns and minimizing costs as well as improving the overall efficiency of farmers is the major concern of all the institutions involved in uplifting agricultural livelihood. That is, allocation of farm resources among alternatives is based on relative profitability of the farm which is determined by the value of output and the cost of cultivation (George, 1988). Therefore, studying economics of crop cultivation provide an essential information for formulation and evaluation of economic policies both at micro and macro levels. However, in depth investigation of cost of cultivation for perennials is very costly and cannot be conducted as an annuals. Keeping in view these aspects, this study attempts to compute cost of *enset* cultivation and analyze its relative profitability of in Doyogena district of southern Ethiopia.

2. RESEARCH METHODOLOGY

2.1. Description of Study Location

This study was conducted in Doyogena district which is one of the seven districts in Kembata Tembaro zone, Southern Ethiopia. The administrative center of Doyogena district is Doyogena town which is located at a distance of 258 km away from Addis Ababa in South-west direction. The total area coverage of the district is about 17263.89 hectare. The district is bordered on the south by Kacha Bira, on the west and north by Hadiya Zone and on the east by Angecha district. The total population of the district is about 101, 618 of which 49,889 (49.09%) are male and 51,729 (50.91%) are female (DFEDO, 2016).

The district is approximately 2585 meter above sea level and its altitude ranges from 1900 to 2748 meter. The district has two major agro-ecologies, Dega (70%) and Woyina dega (30%). The average temperature of the district is 22°C, and receives average annual rainfall of 1400 mm. Regarding land use of the district, about 86 percent of

the total cultivated area is used for crop cultivation, 11.8 percent is forest and bush land, 2 percent is grazing land, and 0.2 percent is degraded land. The maximum, average and minimum land holding per household is 2.75 ha, 0.75 and 0.25 ha respectively (DFEDO, 2016).

The primary occupation of the district is both crop cultivation and livestock production. The major crops grown in the district are *enset*, cereals (wheat, barley and maize), pulses (beans and peas), vegetables and root crops. Livestock production in the district includes oxen, milking cows, sheep, equines and poultry (DFEDO, 2016). The important marketable crops grown in the district are wheat, barley, field peas, faba bean, maize, *enset*, potato and cabbage. In general, Doyogena district is the major producer of *enset* in Kembata Tembaro zone and *enset* production is considerable sources of cash in the district (DFEDO, 2016)

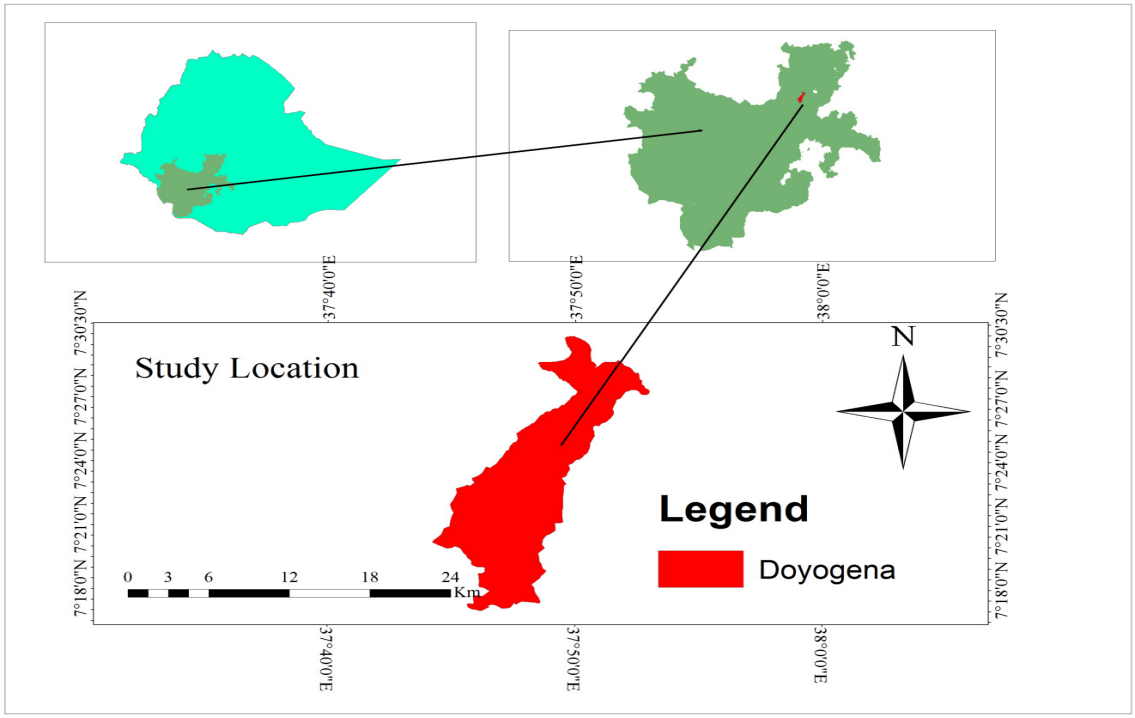


Figure 1. Location of the study area

2.2. Sample design and sampling procedure

To conduct household survey with *enset* producers, a two-stage random sampling technique was employed to draw representative sample households from the population under consideration for the study. First, out of thirteen kebeles producing *enset*, three kebeles such as Hawora, Gomora and Mare kebeles were selected for the survey on the basis of area of *enset* production in consultation with the District Agricultural Development Office (DADO). In the second stage, the household lists of the sampled kebeles were updated and sample size was determined based on population proportional to size of household in the kebeles. Thus, out of the total 2031 *enset* farmers in the selected kebeles, 154 sample *enset* farm households were randomly selected for the survey.

2.3. Data type and method of data collection

This study was based on primary as well as secondary data. The primary data were collected from sampled farmers. The data were collected by the help of pre-tested interview questionnaire by face to face contact of the sampled farmers. The data collected relate to 2016 agricultural year. Secondary data were collected from different sources such as government and non-government institutions, reports, articles and websites. In addition, published and unpublished documents were reviewed. All inputs and outputs are evaluated at 2016 market prices. The researcher is very much aware of the limitations, which are encountered at the time of data collection, tabulation, data processing and analysis. It was done within the limitation of an individual researcher. The researcher is responsible for the shortcomings if any.

2.4. Methods of cost estimation

Before formulating method of cost estimation for *enset* cultivation, it is important to discuss about procedures of *enset* growing starting from phases of vegetative propagation to its harvesting. Compared to other crops, production of *enset* involves many more steps. Planting materials (suckers) are produced by vegetative propagating the mother corm of three years old *enset* plant. These suckers grow for one year before transplanting. Some farmers

left the suckers to grow until the next year transplanting. Based on the farmers tradition of *enset* field management a single sucker may be transplanted only once or up to four times, at ever wider spacing. As the crop matured it is removed from the field and processed for its products. This is the unique nature of the crop which make it differ from other perennials.

In this study, it is assumed that the suckers produced from the mother corm are transplanted once in the field where they stay until they become fully matured for harvesting. In addition, it is also assumed that it takes seven years to have well matured *enset* for processing. Although *enset* provide main products after 7 years from vegetative propagation of the mother corm, farmers harvest leaves from the stand plants to feed their livestock and use as a wrapping material during the growth period of the plant. The dried leaves on the stand plants are harvested to make mats and tying material for house construction and fencing.

Based on the tradition of *enset* growing, costs associated with *enset* cultivating includes paid out cost and imputed cost. The cost items that constitute paid out cost are expense on material inputs, hired labor, repair and maintenance expense on farm implements, depreciation on farm implements, land revenue, interest on working capital and miscellaneous expenditure. The cost items of imputed cost consists of value of family labor, rental value of owned land, value of manure and interest on owned fixed capital for which the farmer incur any cash expense. The value for inputs especially family labor is justified on the basis of opportunity cost. The existing market wage rate was used to value imputed family labor. Similarly, rental value of owned land and interest on owned capital were valued based on the prevailing market price. Finally, the cost of production was worked out by dividing net cost (total cost minus value of by-products) by the output produced.

Cost of production

The cost of production can be worked out by dividing net cost of cultivation by total output produced. Net cost is obtained by deducting the value of by-products from gross cost of cultivation. The average value of by-products were obtained as expressed by producers. In the study area, both *kocho* and *bulla* are the most important main products of growing *enset*. During calculating production cost of *kocho* the value of *bulla* was deducted from the net cultivation cost; and vice versa. Accordingly, per quintal cost of *kocho* production was obtained by dividing net cost of *kocho* production (net cost of *enset* cultivation less value of *bulla)* by the total output of *kocho* produced.

Total cost: The summation of both variable and fixed cost. It includes costs incurred in cash and kind including opportunity cost of family labor throughout the production period.

Variable cost: Costs incurred at market price level on items such as human labor, bullock labor, planting material, farm yard manure, fertilizers, plant protection, land rent, interest on working capital, repair and maintenance cost, watch and ward cost, processing equipment and other miscellaneous cost. The level of these costs varies depending on production locations, technology and scale of production.

The market wage rate paid by the sample farmers towards hired human labor worked eight hours per day was taken to compute the cost of human labor (hired labor and imputed value family labor). The value of bullock labor was taken zero as the use of bullock labor in enset cultivation is negligible. Also, plant protection chemicals and fertilizer costs were taken zero as farmers did not incur these costs. The value of farm yard manure was calculated on the basis of the cost of chemical fertilizer if applied in *enset* field. The interest on total value of suckers, human labor and farm yard manure was calculated at the rate of seven per cent for the duration of *enset* growing.

Farmers pay for those who provide services of repair and maintenance of agricultural tools and implements in rural areas. The total repair and maintenance cost in enset cultivation was taken as expressed by each farmers.

Fixed cost: Costs that do not vary with size of farm and have no bearing upon decisions to increase or decrease production. It includes land revenue, interest on fixed capital, depreciation on farm tools and implements, imputed rental value of land and other taxes.

A reduction in monetary value of a given farm implement over time due to use, wear and tear or obsolescence. Calculation of this value give some fraction of farm investment to each unit of product made. It involves distributing the original cost of an asset over its useful life (Johl and Kapur, 2001). Depreciation for each farm implement was calculated on the basis of purchase price, junk value and life of an implements by using straight line method. The purchase price, economic life of an implement and junk value were taken as spoken by farmers. Interest rate of 0.10 is used to calculate interest on the total value of fixed capital.

3. Results and Discussion

3.1. Cost structure in enset cultivation

The total per hectare cultivation cost of *enset* was worked out to birr 53966.85. Since, *enset* being a perennial crop that can be harvested for *kocho* and *bulla* after seven years from its sucker plantation, the average annual per hectare cultivation cost was estimated to be birr 8994.48. The annual per hectare cultivation cost was obtained by dividing the total per hectare cultivation cost by the number of years *enset* stay in the field (Table 1). Human labor was the most important cost item within the total cost of cultivation (33.64%) followed by cost of planting material which accounted 14.41 percent in the total cost of *enset* cultivation. The cost incurred on farm yard manure, farm implements, repair and maintenance, watch and ward, processing equipment and land value were 8.27%, 5.18%,

5.33%, 8.60%, 7.03% and 10.94% of total cultivation cost respectively.

Table 1. Cost structure in *enset* cultivation

Cost items	Cost /ha (in birr)	Percentage
Human labor	19826.2	33.64
Cost of planting material	8493	14.41
Farm yard manure cost	4873	8.27
Cost of farm implements	3053.5	5.18
Rental value of own land	6448	10.94
Repair and maintenance cost	3143.4	5.33
Watch and ward	5067.6	8.60
Interest on working capital	2259.65	3.83
Interest on fixed capital	1634	2.77
Processing equipment cost	4143.5	7.03
Total cost of cultivation	58941.85	
Value of intercrop and by-product	4975	
Net total cost of cultivation	53966.85	
Cost/ha/year	8994.48	

Source: Own survey computation, 2016

3.2. Profitability of *enset* cultivation

Per quintal production costs of *kocho* and *bulla* were calculated for sample households and presented in Table 2. The average yield of *kocho* was found to be 31Q/ha/year and that of *bulla* was found to be 7qt/ha/year for the sample households. Since both *kocho* and *bulla* are important main products of *enset*, the production cost of *kocho* was obtained by deducting the value of *bulla* from the net cultivation cost; and vice versa. Accordingly, per quintal production cost for *kocho* was estimated at birr 115.64; and the per quintal production cost of *bulla* was estimated at birr 126.28. Gross profits were estimated based on the prevailing market price of *kocho* and *bulla* at the producer's level. Based on market observation (Figure 2), the average farmer price of *kocho* was birr 354.2 per quintal whereas that of bulla was birr 758.07 per quintal. On average, a gross profit of birr 11817.89 per hectare was obtained from *enset* cultivation.

Table 2. Profitability of *enset* production

Items	Cost/profit (ETB/qt)
Net cost of cultivation (Cost/ha/year)	8994.48
Kocho output (qt/ha/yr)	31
Bulla output (qt/ha/yr)	7
Kocho production cost	115.64
Bulla production cost	126.28
Average price of *kocho*	354.2
Average price of *bulla*	758.07
Revenue from *kocho*	10980.2
Revenue from *bulla*	5306.49
Total revenue	16286.69
Profit from *kocho* production (A)	7395.36
Profit from bulla production (B)	4422.53
Gross profit(loss)/ha (A+B)	11817.89

Source: Own survey computation, 2016

3.3. Constraints faced by *enset* growers

Focus group discussions were held with *enset* growers in each of the selected kebeles. During the discussion with these groups, one of the discussion agenda was "list and discuss the major constraints in *enset* cultivation and its products marketing". Accordingly, constraints such as lack of processing technology, lack of market information, absence of cooperatives, low market price, poor transport facilities, disease, limited government attention, drought and land shortage were listed and explained by the discussion groups. These listed constraints were included in the formal interview questionnaire to identify major constraints in *enset* cultivation in the study area. By following these procedures, disease (*Enset* Bacterial Wilt), land shortage, lack of processing technology, absence of cooperative organization and limited government attention were identified and ranked as major constraints in *enset* cultivation and its products marketing in the study area.

Disease (*Enset* Bacterial Wilt): Disease was one of the identified constraints in *enset* cultivation during focus

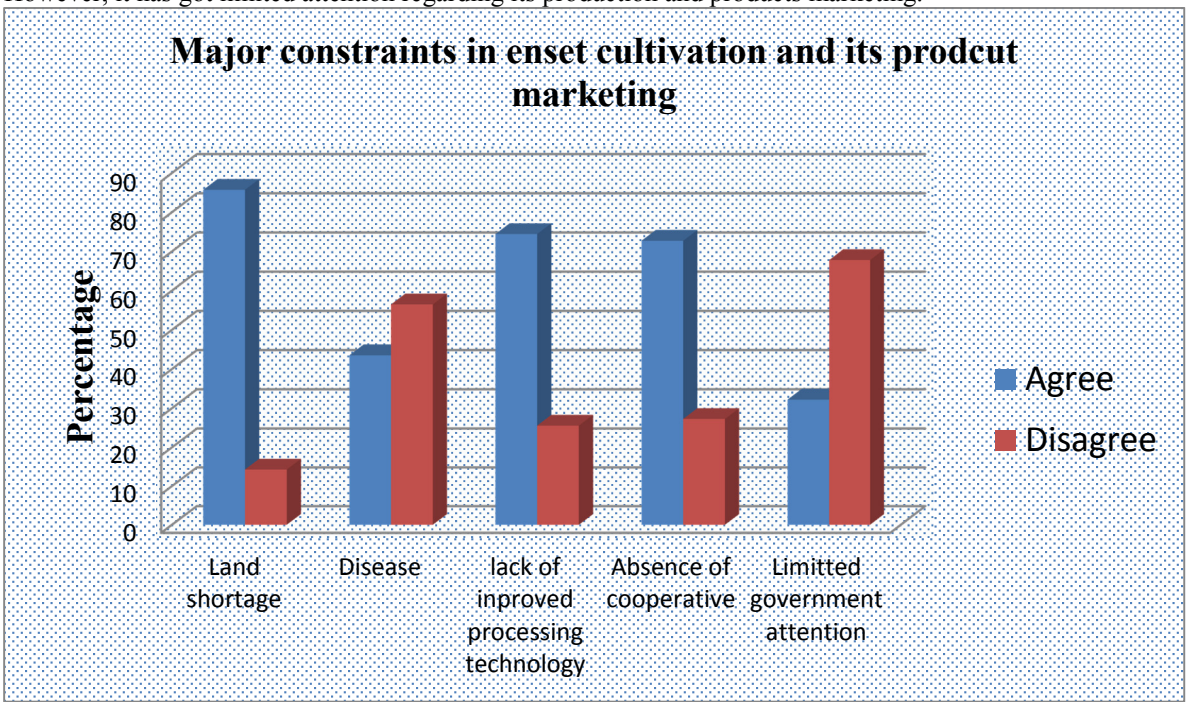
group discussion. It is known to cause severe damage as it attacks and kills the plants at any growth stages including the plant which is ready for harvest. During formal interview producers were asked whether they agree or disagree that *enset* bacterial wilt was their major constraint in *enset* cultivation and its products marketing. Accordingly, 43.51 percent of the sample respondents reported *enset* bacterial wilt as the fourth most important constraint in the study area (Figure 3). They reported that once the plants are attacked by the disease, the whole system of the plant is affected and maximum yield loss from the farm will occur. Although they ranked the constraint in the fourth level, they fear that it become threat for *enset* cultivation and its products marketing in the future.

Land shortage: Land shortage was reported as the first most important constraint in *enset* cultivation and its product marketing in the study area. Of all the respondents, 85.71 percent agreed that land shortage being their major constraint (Figure 3). According to the respondents, land shortage become constraint in two dimensions. It became a constraint because it limits expansion of *enset* cultivation as hectare of land per household is low in the study area. On the other hand, *enset* is the most important livestock feed in the study area. This may be due to shortage of land to grow forage crops or to leave portion of the land as livestock grazing land. The respondents reported that although livestock keeping and *enset* cultivation are complementing each other, limited access to other livestock feed due to land shortage has contributed to decrease in yields of *enset* products. This is because, in the study area, *enset* serve as an important livestock feed.

Lack of processing technology: It can be observed from figure 3 below that lack of the improved processing technology is the second most important constraint in *enset* cultivation and its products marketing. Out of the total respondents, 74.43 percent reported that lack of improved processing technology was one of the major constraint in production and marketing of *enset* products. They reported that *enset* processing is carried out by using traditional tools.

Absence of cooperative organizations: Absence of cooperatives was the third most important constraint in production and marketing of *enset* products in the study area. Of all respondents, 72.73 percent agreed absence of cooperatives in *enset* processing and its products marketing as one of the limiting factor. It was a strong argument during focus group discussion that farmers like to increase *enset* production if cooperatives encouraged regarding enset processing and its products marketing.

Limited government attention: The survey result (Figure 3) revealed that limited government attention was found to be one of the constraints in production and marketing of *enset* products. Accordingly, 32.21 percent of respondents believe that government's attention to promote *enset* production and its products marketing remains limited when compared with other crops. They argued that *enset* serve their livelihood more than any other crops. However, it has got limited attention regarding its production and products marketing.



Source: Own survey computation, 2016

4. Conclusion

In this study an effort was made to analyze economics of *enset* cultivation based on primary survey conducted among *enset* growers in Doyogena district of southern Ethiopia. The net total per hectare cultivation cost of *enset*

was worked out to birr 53966.85. The average annual per hectare cultivation cost was estimated to be birr 8994.48 for one year. The cost of human labor was the most important item within the total cost of cultivation (34.64%) followed by planting material cost which accounted 14.41 percent in the total cost of *enset* cultivation.

Land shortage, lack of processing technology, absence of cooperatives, disease and limited government attention are the major constraint faced by farmers in *enset* cultivation. The survey result of can serve as a guideline for policy makers and researchers. Therefore, the government should take initiation for improving the infrastructural facilities, which is a must for improving the production and marketing of *enset* products.

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