

# Cost-Benefit Analysis of *Cymbopogon Martini* (WG-TEJ SAR) Cultivation for Herbal Production the Case of Wondo Genet District, Southern Ethiopia

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## Abstract

As part of the struggle for improving the lively hood of the rural people, Ethiopia has made some efforts to promote the use of improved agricultural technologies to make land and labor more productive. To make this effort successful agricultural research has been developing technologies that can change the situation of farmers. Aiming to this, Wondo genet agricultural research center (one of the centers of Ethiopian institute of agricultural research) is responsible in doing research, promoting and coordinating aromatic, medicinal and bio energy plants at national level including other research activities on soil and water, livestock, forestry, and other food crops. In Ethiopia; other than the traditional aspect, the scientific aspect of aromatic and medicinal plants is not well known and little has been done on their economic contribution to households. Therefore Wondo genet agricultural research center has done cost-benefit analysis for a selected aromatic grass namely *cymbopogon martini* at wondo genet experimental site. The selected plant was planted based on its recommended spacing at wondo genet experimental site and the required data was collected. For the analysis net return to land (birr/ha) was used as a parameter. The analysis shows that the selected aromatic grass *Cymbopogon martini* (palmarosa grass) provide the net return, Net Present Value (NPV) and Benefit-Cost Ratio (BCR) of 151,005.8 birr/ha, 127,804.3 and 3.8 at fresh bio mass price of 3 birr respectively.

**Keywords:** Benefit, BCR, Cost, NPV and Palmarosa grass

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## 1. Introduction

Wondo genet agricultural research center is one of the centers of Ethiopian institute of agricultural research which is mainly responsible in doing research, promoting and coordinating aromatic, medicinal and bio energy plants at national level including other research activities on soil and water, livestock, forestry, and other food crops. Aromatic plants are plants that possess odorous volatile substances which occur as essential oil, gum exudates, balsam and oleoresin in one or more parts, namely, root, wood, bark, stem, foliage, flower and fruit.

**1.2.3 *Cymbopogon Martini* (Palmarosa grass):**- Palmarosa is a tall perennial grass, with flowering tops and foliage of which contain Sweet-smelling oil of rose like odor. *Cymbopogon martini* (Palmarosa grass) yields superior oil which is used in perfumery, particularly for flavoring tobacco and blending soaps due to the lasting rose note it imparts to the blend. In soap perfumes, it has a special importance by virtue of geraniol, being stable to alkali. Geraniol is highly valued as a perfume and as a starting material for a large number of synthetic aroma chemicals like geranyl esters which have a permanent rose like odor.



Figure 1 Palmarosa Grass at WGARC experimental field

In addition to being used by Cosmetic as Beauty Products and Perfume Manufactures, *Cymbopogon Martini* oil is also used in the manufacturing of various medicines. The oil is rich in the active compound geraniol, which makes it suitable for many medicinal and household purposes. *Cymbopogon Martini* oil is antifungal, anti-viral, bactericide and antiseptic. Its application on skin moisturizes the skin, besides balancing the hydration levels and stimulating cell regeneration. *Cymbopogon Martini* oil also helps in clearing up minor infections and prevents ugly scarring in healing wounds. *Cymbopogon Martini* oil calms the mind, yet has an uplifting effect, while clearing muddled thinking. It is used to counter physical and nervous exhaustion, stress-related problems and nervousness. *Cymbopogon Martini* oil could be used with good effect on the skin, for nervous and stress-related problems and for the digestive system.

## 2. Aromatic and Medicinal Plants World Market Trend

In the period 1991-2003, the reported average annual global exports of medicinal and aromatic plant material amounted on average to 467,000 tones, or approximately € 1.06 billion. The international trade was dominated by only a few countries: 80% of the worldwide imports were channeled to just 12 countries. Three international trade centers for botanicals could be recognized: the USA for North and South America, Hong Kong for Asia, and Germany for intra- European trade. Europe was responsible for one third of the annual global imports. Germany accounted for 12% of the total, and four other EU countries (France, Italy, the United Kingdom and Spain) were among the major importers. In these countries, the raw material was mainly processed in each country's industry, and then sold as finished products either on the domestic market or exported (CBI market survey 2008; FAO, 2004). The leading suppliers were Germany, Poland, China and the USA.

### 2.1 Economic Potentials of MAPs

Estimates show that the potential returns to farmer from cultivation of medicinal plants are quite high (*Nautiyal, 1995; Rao and Saxena, 1994*). The cultivation of certain high altitude Himalayan herbs could fetch products price anywhere between Rs. 7,150 to 55,000 per hectare (*Nautiyal, 1995*). Although it is not clear that at which stage of the marketing chain these prices are paid but it is obvious that despite varying returns production of medicinal plants could raise the income of farmers to a great extent. *Rao and Saxena (1994)* reported an average annual income of Rs. 120,000 per hectare through mixed cropping of high altitude medicinal herbs. Even the low altitude MAPs assume significant economic importance and can be judiciously cultivated to bridge the current gap between demand (40 thousand tons) and supply (20 thousand tons) is estimated to be 40,000 to 200,000 tons, which is expected to rise to 152,000 to 400,000 tons by 2005 (*Planning Commission, 2000 & CRPA, 2001*) to improve the income and status of the rural farm household. Including cosmetics and ethical and classical formulations are of Rs 1.2 billion each; whereas traditional medicines of Vaidyas and hme remedial formulations account for about Rs. 400 million and 200 million, respectively (*Exim Bank, 1997*). Medicinal plants cultivation and management therefore, could become highly remunerative both in financial and economic terms for the small-scale growers. Not only the plants are in increasing demand by major herbal drug industries as an essential raw material of their drugs, but also its collection, production, processing, packaging and transportation requires high labor input, which can create job lead growth in job-starved state areas. Collection from wild and selective harvesting in addition to primary processing is mostly done manually, and even at the secondary and tertiary levels, MAPs have substantial labor requirements. Moreover, not only do MAPs-based industries expand jobs, enhancing traditional uses through value added processing can increase cash earnings to the local people. Expanding world markets for MAPs are further opening up new vistas of opportunities. So far, Germany has been the largest market for MAPs but now the European market is growing rapidly at the rate of over 4% per annum for herbal remedies and even faster for herbal supplements. The size of European market for herbal supplements is estimated at over US\$ 2.7 billion and for herbal remedies, a further US\$ 0.9 billion. The US herbal market is, though nearing saturation but it is expected to peak at US\$ 6-8 billion in the next few years. Thus the global demand for medicinal plants is expected to expand continuously, fuelled by the growth of sales of herbal supplements and remedies. Their basic uses in medicine will continue in the future, as a source of therapeutic agents, and as raw material base for the extraction of semi-synthetic chemical compound such as cosmetics, perfumes and food industries.

### 2.2 Objectives:

- To identify the cost and return of palmarosa grass.
- To provide information on costs and returns of palmarosa grass (*Cymbopogon martini*).

### 2.3 Description of study area

The analysis was conducted at Wondo Genet agricultural Research Center which is one of the centers of Ethiopian institute of agricultural research and is found in SNNPRS, in Sidama zone wondo genet woreda. It is situated about 268km south of Addis Ababa and 14 km south east of shashemene. Its geographical location and altitude ranges from 38° 37'13"-38° 38'20" East and 7° 5'23"-7° 5'52" North and 1760-1920 masl respectively. The center has been doing research activities on aromatic & medicinal plants and other crops, soil and water, livestock and forestry with focus on Aromatic and medicinal plants (*Adugna et al 2010*)

### 2.4 Methodology

The study was conducted at Wondo Genet Agricultural Research Center (WGARC), Southern Nations Nationalities and peoples region, Ethiopia in the Aromatic and Medicinal plants experimental field. Planting material used in the study was slips of *cymbopogon martini*. For the determination of production cost and benefit that would be obtained; the amount of labor cost for land clearing, plowing, watering and harvesting operations and cost of fertilizer and other material costs were recorded. In addition to this, yields per each harvest and overall total yields were recorded.

## 2.5 Data analysis

The data was analyzed by using simple cost accounting method. For this analysis all the cost incurred and return obtained was used. The analysis will help us to examine the economic contribution of Palmarosa grass (*Cymbopogon martini*). For this analysis net return to land (birr/ha), Net Present Value (NPV) and Benefit-Cost Ratio was used to determine its profitability.

## 3 RESULTS AND DISCUSSION

The per hectare Economic analysis of Palmarosa grass has been done at Wondo Genet experimental site. Fertilizer (urea) was applied during planting and after each harvest at a rate of 50kg/ha.

For simplicity of analysis the target plants are classified as:

Aromatic grasses:

✓ *Cymbopogon Martini* (Palmarosa grass)

Table 1 Quantity and frequency of harvest for citronella grass (per ha for 3 years)

Frequency and quantity of harvest	Palmarosa grass harvest in (kg)
1st	770
2nd	1400
3rd	1100
4th	2630
5th	5300
6th	6400
7th	7200
8th	8000
9th	4800
10 <sup>th</sup>	3400
11 <sup>th</sup>	4500
12 <sup>th</sup>	6800
13 <sup>th</sup>	10300
14th	6050
<b>Total</b>	<b>68650</b>

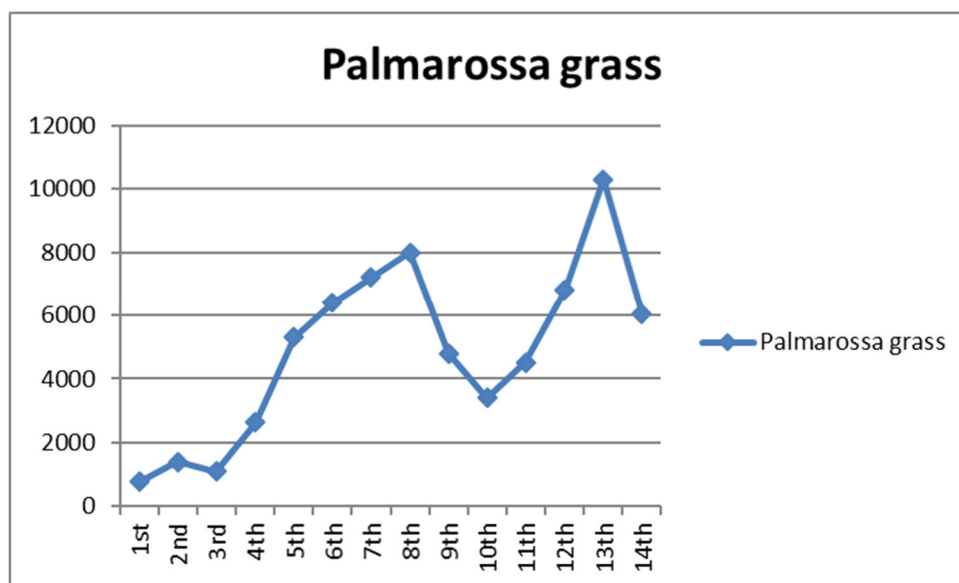


Figure-2 Quantity and Frequency of Harvests for Selected Aromatic Grass.

As indicated above, the bio mass productivity of palmarosa grass increases till the 8<sup>th</sup> harvest and then falls till 10<sup>th</sup> and rises again. The first harvesting time after planting for Palmarosa grass was 3 month and the rest consecutive harvests were made after 2 months. The leaf quality of palmarosa grass highly decreases as time of harvesting increases. Therefore to avoid/reduce this quality loss the harvesting was made every two months and that is why their frequency of harvest is higher.

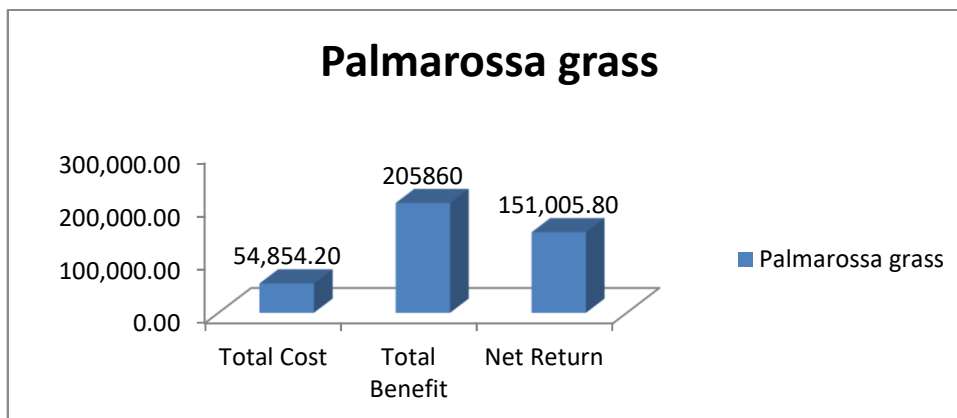


Figure 3 comparison of Cost and profit of the Palmarosa grass

From the fig. above we can observe that Palmarosa grass provides the net return of 151,005.8 at bio mass price of 3 birr. On the other hand, of the different costs of cultivating aromatic grasses weeding and hoeing cost share the largest production cost (on average 30% of the total production cost) in the case of wondogenet agricultural research center. But this may vary from place to place depending on the severity of weed in the area.

Table 2 Herbal yield and Total Return from Palmarosa grass during its economic life

Items	Palmarosa grass			
	year 1	Year2	Year3	Total
Production in (kg)	17570	34700	16350	68620
Price/kg(in birr)	3	3	3	3
Total Revenue	52710	104100	49050	205860

Table 3: Costs from cultivating Palmarosa grass

Particulars	Economic Life(year)			Sub total
	1	2	3	
Fixed cost:				
Rental value of a hectare of land @5000 Birr for one year for 3 years	5000	5000	5000	15000
Rental value of tractor @1700birr/ha ( For Plowing and disking)	1700			1700
material cost:				
Seedling cost @ 10 birr/kg @ 90kg/ha	900			900
Fertilizer cost @ 8.4 birr/kg @ 50kg/ha per each harvest for 5 harvest per each year	2100	2100	2100	6300
Labor charge for:				
land preparation @ 14.7 birr/man day @ 62 man days/ha	911.4			911.4
seedling preparation and planting @14.7 birr/man-day @ 90 man days/ha	1323			1323
Watering @ 14.7 birr/man day @ 17man-days/ha/single round for 14 round in 1st year and 6 man-days/ha/single round for 15 round in 2nd year and @ 5 man-days/ha/single round for 13 round in 3rd year	3498.6	1323	955.5	5777.1
Weeding and hoeing @ 14.7 birr/man day @25 man-days/ha/single round for 17 round in 1st year and @ 7 man-days/ha/single round for 17 round in 2nd year and @ 11 man-days/ha/single round for 15 rounds in 3rd year	6247.5	1749.3	2425.5	10,422.3
Harvesting @ 14.7 birr/man-day @ 9 man-days/ha/single round for 5 round in 1st year and @ 7 man-days/ha/single round for 5 round in 2nd year and @ 9 man-days/ha/single round for 5 rounds in 3rd year	661.5	514.5	661.5	1,837.5
Fertilizer application @ 14.7 birr/man-day @12 man-days/ha/single round for 5 round in 1st year and @ 13 man-days/ha/single round for 5 round in 2nd year and @ 13 man-days/ha/single round for 5 round in 3rd year	1176	1176	1176	3,528
Total cost of herbage cultivation	23518	11862.8	12318.5	47,699.3
Miscellaneous costs (15%)	3527.7	1779.4	1847.8	7,154.9
Overall cost of herbage cultivation	27045.7	13642.2	14166.3	54,854.2

The Cost & Benefit and the discounted profit for Palmarosa Grass

Items	Economic Life in Years			Total
	1	2	3	
Herbal yield(kg/ha)	17570	34700	16350	68,620
Total value	52710	104100	49050	205,860
Overall cost of herbage cultivation	27045.7	13642.2	14166.3	54,854.2
Net return from herbage cultivation	25664.3	90457.8	34883.7	151,005.8
Discounted total value	48580.6	88428.3	38401.6	175,410.6
Discounted overall cost of herbage cultivation	24926.9	11588.5	11090.9	47,606.3
NPV				<b>127,804.3</b>
BCR				<b>3.8</b>

NB: - the fresh biomass price of Palmarosa grass is 3 birr/kg

#### 4 Conclusions and Recommendation

Even though the price of this aromatic grass was not set by the market, at this contractual price, it is profitable. If there is a good and sustainable market, this aromatic grass is more profitable. The major production cost for this aromatic grass is weeding and hoeing but it may varies from place to place This aromatic grass is profitable but it doesn't mean that it is economically viable. Because viability is related with not only profitability but competition too. Due attention has to be given for marketing of aromatic and medicinal plants

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