

# Profitability and Financial Feasibility of Peppermint (*Mentha piperita* L.) Cultivation for Herbal Production in Ethiopia

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**Abstract:** Though, Ethiopia has great potential for aromatic and medicinal plants cultivation, the country does not get benefit so far as per its potential. Other than the traditional aspect, the scientific aspect of aromatic and medicinal plants in general and *Mentha Piperita* L. commonly known as peppermint in particular is not well known. As a result nothing has been done on the costs, returns, profitability, and financial feasibility of peppermint cultivation. Therefore, the study was aimed at estimating the costs, returns, profitability, and financial feasibility of peppermint cultivation for herbal production to provide the information to concerned body. The study was conducted at Wondo genet agricultural research center experimental field, Ethiopia. For this study stolons of peppermint was planted on an area of 100m<sup>2</sup> with an inter-row spacing of 60cm and all the required cost and benefit data were collected. For the estimation of profitability net return to land was used whereas cost benefit analysis was used for financial feasibility analysis and the two popular measures namely net present value and cost benefit ratio were applied for final decision making. The result of analyses shows that, peppermint cultivation for herbal production requires a total cost of 50299.85 birr/ha and provides total revenue of 80300 birr/ha. The finding also shows that due to absence of initial costs like cost of ploughing, planting material and labour cost for planting material preparation, planting and land preparation; the second year cost of cultivation is 41.54% lower than the first year and labour cost accounts the largest share of the total cost of cultivation which is 75.11%. Moreover, in the cultivation of peppermint the first year total revenue shares the largest amount which is 71%. Furthermore, given the current output and input prices used, involvement in cultivation of peppermint is profitable and can provide a net return of 30000.15 birr/ha. Finally, the result shows that the value of net present value and benefit cost ratio is 27305.70 birr/ha and 1.61 respectively indicating that involvement in cultivation of peppermint is financially acceptable.

**Keywords:** cost benefit ratio, net present value, net return, peppermint.

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## 1. INTRODUCTION

As part of the struggle for improving the lively hood of the rural peoples, 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 [1].

Medicinal and aromatic plants (MAPs) are receiving considerable attention all over the world because of their vast untapped economic potential, especially in the use of herbal medicines. Medicinal and aromatic plants (MAPs) are receiving considerable attention across the world because they offer a wide range of safe and cost-effective, preventive and curative therapies, which are useful in achieving the goal of 'health for all' [2]. The international market for herbal products is estimated to be of US\$ 62 billion, and it is poised to grow to US\$ 5 trillion by the year 2050 [3]. Phytopharmaceuticals, also some pharmaceuticals, herbal remedies, dietary supplements, homeopathies, medicinal and herbal teas, liqueurs, spirits, sweets, aromas and essences, perfumes, cosmetics, colouring agents, varnishes, fireworks, and detergents-plant-based products offered in a wide variety on the market [4].

Aromatic herbs have been used as flavour enhancers and seasonings throughout the world for thousands of years. Many herbs have been recognized to have medicinal properties and have many beneficial effects on health. Mint is one such herb, belonging to family lamiaceae, which is not only used for aroma and flavour, but also has many potential health benefits. Mint leaves are used for culinary and medical purposes [5].

*Mentha* is the most important genus in the Labiatae (Lamiaceae) family because it contains a number of taxa the essential oils of which have achieved high economic value. These oils are corn mint (the source of natural menthol), peppermint, Scotch peppermint, and Native peppermint. The amount of the oils produced annually is in excess of 23,000 metric tons with a value exceeding \$400 million. This makes them the most economically important essential oils produced [6]. Several mints of *Mentha* species are industrial crops that are widely used in food, flavor, cosmetics, and pharmaceutical industries. Different species of mint are used across the globe for their medicinal and culinary properties. Mint is usually taken after a meal for its ability to reduce indigestion and colonic spasms by reducing the gastrocholic reflux [7]. Mints are aromatic perennial herbs with quadrangular stem and bearing leaves with essential oil [8]. The genus *Mentha* has a large number of species that differ widely in their characteristics and ploidy level. Since they are often perennial and produce suckers, the species reproduce both by reproductive and vegetative means Several mints of *Mentha* species are industrial crops, a source of essential oils enriched in certain monoterpenes that are widely used in food, flavor, cosmetic, and pharmaceutical industries [9]. It includes 25 to 30 species that grow in the temperate regions of Eurasia, Australia and South Africa [10].

Some of the species with commercial and medicinal uses include *Mentha arvensis* L., *Mentha piperita* L. and *Mentha spicata* L. and is well known for its great medicinal and economic values [11] but this study is limited to *Mentha piperita* L. Its Latin name, *Mentha piperita*, comes from the Greek *Mintha*, the name of a mythical nymph thought to have metamorphosed into the plant, and the Latin *piper*, meaning pepper. It is one of the world's oldest medicinal herbs, and is used in both Eastern and Western traditions [12]. It is used for medicinal and food purposes [13] and is commonly known as peppermint which is a hybrid plant obtained by crossing peppermint (*Mentha spicata* L.) with water mint (*Mentha aquatica* L.). The raw material of the plant is used in medicine, cosmetics and food industry, therefore this plant is widely grown around the world [14].

In Ethiopia other than the traditional aspect, the scientific aspect of aromatic and medicinal plants in general and peppermint in particular is not well known. As a result, there is no information on the costs, returns, and profitability of aromatic and medicinal plants cultivation in general and peppermint in particular. Therefore, the study was designed with the objective of estimating the costs, returns, and profitability of peppermint cultivation for herbal production.

## 2. 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 for two years (2010-2012). The geographical location of the study area ranges from 38° 37'13"-38° 38'20" East and 7° 5'23"-7° 5'52" North with an altitude range of 1760-1920 masl [15]. Planting material used in the study was stolons of *Mentha piperita* L. The planting material was planted on an area of 100m<sup>2</sup> on the experimental field with inter- raw spacing of 60cm. For the determination of costs; the amount labour in terms of man-days for land preparation, planting, watering, weeding and hoeing, fertilizer application and harvesting operations were recorded. Then after, the total amount of labour cost was calculated based on the specified wage rate. In addition to this, cost of fertilizer, planting material and initial ploughing was recorded. Finally, the overall cost of cultivation was obtained through addition of all these costs. On the other hand, in order to calculate the total revenue obtained, the total output were recorded and multiplied by output price. Finally, all the cost and benefit information was converted in to a per hectare basis for the final analysis. To estimate the net return associated with cultivation of peppermint cultivation, net return to farm was used as the summary measure. Since the commercial issue of aromatic and medicinal plants in Ethiopia is at infant stage there is no as such continuous and consistent market for such kind of products, due to this the price was setted based on cost plus price pricing method. The necessary data for the study were collected from wondo genet agricultural research center experimental field with the help of technical assistants. For data collection process; data collection sheet was prepared and encoded in to computer. In addition to this, making a decision on whether to invest on a given business or not requires a common measure of performance. Costs and benefits occur at different points in time and, hence, have different values. Financial analysis methods are tools that will enable us

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to evaluate the aggregate of these costs and benefits with a common measure and the common measures include net present value and benefit - cost ratio [16]. Therefore, net present value (NPV) and benefit cost ratio (BCR) was used for financial analysis and the market interest rate which is 8.5% was used for discounting. The formula used to calculate total revenue (TR), total cost (TC), net return (NR), NPV and BCR was as follows:

$$TR=Q*P \dots\dots\dots(1)$$

Where TR: Total Revenue

Q: Total quantity of fresh herb in kg

P: Selling price per kg of fresh herb

$$TC: CPD+CM+CL+MC \dots\dots\dots(2)$$

Where TC: Total Cost

CPD: Cost of /first Plowing and disking

CM: Cost of Materials (Seedling and Fertilizer)

CL: Cost of Labor (For major farm operations).

$$NR= TR- TC \dots\dots\dots(3)$$

Where NR: Net return

TR and TC are as defined above.

$$NPV= \sum_{i=0}^t \frac{B_t}{(1+r)^t} - \sum_{i=0}^t \frac{C_t}{(1+r)^t} \dots\dots\dots(4)$$

Where NPV: Net Present Value

B<sub>t</sub>: Benefits at time t

C<sub>t</sub>: Costs at time t

t: Time in years

r: Market interest rate

Then, after having the value of NPV, the decision was: a NPV greater than zero indicates that investing on peppermint for herbal production is acceptable, a NPV less than zero indicates it is not acceptable and a value of zero shows the decision will depend on the interest of the investor.

$$BCR= \frac{\sum_{i=0}^t \frac{B_t}{(1+r)^t}}{\sum_{i=0}^t \frac{C_t}{(1+r)^t}} \dots\dots\dots(5)$$

Where BCR: Benefit Cost Ratio

B<sub>t</sub>: Benefits at time t

C<sub>t</sub>: Costs at time t

t: Time in years

r: Market interest rate

According to this measure, BCR value of greater than one indicates that investing on peppermint cultivation for herbal production is feasible, and a value of less than one shows it is not feasible.

### 3. RESULTS AND DISCUSSION

In this section results on yield of peppermint, costs, and returns associated with cultivation of peppermint for herbal production and financial feasibility analyses is discussed.

#### 3.1 YIELD OF PEPPERMINT

Fresh leaf output is an important indicator required by growers to judge the economic value of peppermint cultivation and its fresh leaf accounts 49% of the total above ground fresh bio mass (Including the stem). Therefore, the fresh herb yield was obtained by multiplying the total above ground biomass by its leaf proportion. Based on this as presented in Table1, the first and second year total bio mass yield is 29070 and 11900 kg respectively. This implies that the first and second year herbal yield is 14244.3 and 5831 kg respectively. The figure shows that, of the total annual biomass and herbal output, the first year output accounts the largest share (71%) whereas the second year accounts only 29%. Moreover, there is 59.06% total bio mass and herbal output reduction from first year to second year of production. Furthermore, the average total bio mass yield per single round during the first and second year of production is 7267.5 and 2975 kg respectively indicating that the average herbal yield per single round in the first and second year is 3561.08 and 1457.75 kg respectively.

**Table 1: Total biomass and leaf output of peppermint**

Year	Total bio mass	Frequency of harvest	Average total biomass/single round	Total leaf bio mass (49% of the total bio mass)	Average leaf bio mass/single round
1	29070	4	7267.5	14244.3	3561.08
2	11900	4	2975	5831	1457.75
Total	40970			20075.3	

Source: Field data

In addition to this, as presented in Table 2, though there are different factors that influence the yield of any crop, the maximum yield of peppermint was obtained at the second harvest and its yield shows a declining trend in the next consecutive harvests.

**Table 2: Bio mass and herbal yield of Peppermint per each harvest (kg/ha)**

Plant name	Frequency of harvest	Bio mass yield	Leaf yield (49% of biomass yield)
Peppermint	1 <sup>st</sup>	6150	3013.5
	2 <sup>nd</sup>	10730	5257.7
	3 <sup>rd</sup>	8190	4013.1
	4 <sup>th</sup>	4000	1960
	5 <sup>th</sup>	3500	1715
	6 <sup>th</sup>	3400	1666
	7 <sup>th</sup>	3200	1568
	8 <sup>th</sup>	1800	882
Total/ha		40970	20075.3

Source: Field data

#### 3.2 COSTS AND RETURNS OF PEPPERMINT CULTIVATION

As presented in Table3, annual costs, revenues and net returns of peppermint were calculated at the specified wage rate, material and output price. The first year cost of cultivation of peppermint for herbal production was Birr 31742.99 which accounts 63.11% of the overall total cost. Similarly, the second year cost of cultivation was Birr 18556.86 which accounts 36.89% of the overall total cost of cultivation. The per hectare cost of cultivation of peppermint has been found maximum during the initial year, because of the presence of initial costs such as cost of ploughing, planting material, labour cost for planting and land preparation but declined substantially in the next year due to the reduction of those initial costs. Due to

this, the second year cost of cultivation was 41.54% lower than the first year cost of cultivation. Moreover, the overall cultivation cost of peppermint for herbal production over the two years of production life was Birr 50299.85 and labour cost takes the largest share (75.11%).

On the other hand, the first year total revenue of peppermint was Birr 56976 which accounts 71% of the overall total revenue. Similarly, the second year total revenue was Birr 23324 which is 29% of the overall total revenue. This shows the second year revenue was 59.06% less than the second year revenue indicating that the herbal yield of peppermint declines from year to year. Moreover, the overall total revenue was Birr 80300.

Finally, the cultivation of peppermint for herbal production provides a net return of 25233.01 and 4767.14 birr /ha in the first and second year of production respectively. In addition to this, the overall net return obtained from cultivation of peppermint was Birr 30000.15 indicating that involvement in cultivation of peppermint generates a positive net return.

**Table 3: Costs and returns of Peppermint cultivation for herbal production**

Items	Economic life (Years)					
	1			2		
	Unit charge (Birr)	Frequency	Sub-total cost (Birr)	Frequency	Sub-total cost (Birr)	Total Cost (Birr)
Fixed cost:						
Rental value of tractor ( For Plowing and disking)	1700	1	1700		0	1700
material cost:						
Seedling @90 kg per ha	10	1	900		0	900
Fertilizer @50 kg per ha	8.4	5	2100	3	1260	3360
Labor (in man-days) for:						
land preparation @ 48 man-days per ha	14.7	1	705.6		0	705.6
seedling preparation and planting @ 90 man-days per ha	14.7	1	1323		0	1323
Watering @ 20 man-days per ha	14.7	9	2646	8	2352	4998
Weeding and hoeing @ 36 man-days per ha	14.7	10	5292	9	4762.8	10054.8
Harvesting @ 40 man-days per ha	14.7	5	2940	3	1764	4704
Leaf separation @ 120 man-days per ha	14.7	5	8820	3	5292	14112
Fertilizer application @ 16 man-days per ha	14.7	5	1176	3	705.6	1881.6
Total cost			27602.6		16136.4	43739
Miscellaneous cost (15%)			4140.39		2420.46	6560.85
Overall cost			31742.99		18556.86	50299.85
Herbal yield(kg/ha)			14244		5831	20075
Total Revenue @ 4 birr/kg			56976		23324	80300
Net return from Peppermint cultivation			25233.01		4767.14	30000.15

Source: Field data

### 3.3 FINANCIAL FEASIBILITY

The financial feasibility was worked out by comparing costs and returns over the economic life of peppermint in terms of net present value (NPV) and benefit cost ratio (BCR). For this purpose the market interest rate was used to discount the future value of costs and benefits to their present value which is 8.5%. Based on this, as presented in Table 3, the NPV was Birr 27305.70 indicating that investing on peppermint cultivation for herbal production is financially acceptable. Similarly, the BCR was 1.61 showing that a 1 birr investment in peppermint cultivation results 1.61 birr returns. This again tells the financial feasibility of peppermint cultivation. Therefore, in both measures the decision to invest in peppermint cultivation for herbal production is financially acceptable.

**Table 4: Results of financial feasibility analysis**

Items	Year		Total
	1	2	
Total cost	31742.99	18556.86	50299.85
Total revenue	56976	23324	80300
Discounted total cost	29256.21	15763.22	45019.43
Discounted total revenue	52512.44	19812.70	72325.14
		NPV	27305.70
		BCR	1.61

Source: Field data

#### 4. CONCLUSIONS AND RECOMMENDATION

Cultivation of peppermint for herbal production yields a positive net return which is 30000.15 birr/ha. Therefore, the plant can be seen as an alternative source of livelihood in the rural areas of Ethiopia.

In peppermint cultivation, cost of labour for major operations takes the largest share of the total cost of cultivation which is 75.11%. Hence, means has to be devised to reduce the cost of labour specifically in leaf separation so that the net return will be improved.

Though, Ethiopia has potential for peppermint production and the plant is profitable, the market situation in the country is poor. Therefore, strengthening the linkage between different stakeholders is very important to create sustainable and favourable market condition for the product.

Even if peppermint has a perennial nature, it can be cultivated as an annual crop in the case of the study area because the output shows a reduction of 59.06% from first year to second year.

Finally, the results of financial feasibility analysis indicate that decision to invest on peppermint cultivation for herbal production is financially acceptable.

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