Journal of Current Research in Food Science 2024; 5(1): 13-17

JOURNAL OF CURRENT RESEARCH IN FOOD SCIENCE

E-ISSN: 2709-9385
P-ISSN: 2709-9377
JCRFS 2024; 5(1): 13-17

www.foodresearchjournal.com
Received: 17-11-2023
Accepted: 25-12-2023

Guta Bukero Geyo
Ethiopian Institute of Agricultural Research, Wondo Genet Agricultural Research Center, Agricultural Economics Research Process, P.O. Box. 198, Shashemene, Ethiopia

Melkamu Tilaye
Ethiopian Institute of Agricultural Research, Wondo Genet Agricultural Research Center, Agricultural Economics Research Process, P.O. Box. 198, Shashemene, Ethiopia

Zeyituna Abe
Ethiopian Institute of Agricultural Research, Wondo Genet Agricultural Research Center, Agricultural Economics Research Process, P.O. Box. 198, Shashemene, Ethiopia

Correspondence Author:
Guta Bukero Geyo
Ethiopian Institute of Agricultural Research, Wondo Genet Agricultural Research Center, Agricultural Economics Research Process, P.O. Box. 198, Shashemene, Ethiopia

Economic analysis of medicinal and aromatic plants: The case of financial feasibility analysis of basil cultivation for fresh and dry biomass production in Ethiopia

Guta Bukero Geyo, Melkamu Tilaye and Zeyituna Abe

Abstract
This study was conducted at Wondo Genet Agricultural Research Center experimental field from August 2018 to December 2018. The study was undertaken to examine the financial feasibility of Basil-I, Basil-III, and Basil-V genotypes for dry biomass and fresh biomass production. For this study, each genotype of Basil was planted on 100 m^2 areas of land with an intra and inter-row spacing of 60 cm. All cost and benefit data were collected during the cultivation period by preparing data collection sheets. A simple benefit-cost ratio (BCR) was used to analyze the feasibility of basil genotype production. The simple benefit-cost ratio of production of Basil-I, Basil-II, and basil-V dry biomass production was ETB 1.39 per hectare, ETB 1.44 per hectare, and ETB 1.57 per hectare respectively; which indicates that a 1 ETB outlay for Basil-I, Basil-III and basil-V results to gain a net return of ETB 0.39, ETB 0.44 and ETB 0.57 per hectare respectively. The simple benefit-cost ratio of production of Basil-I, Basil-III, and basil-V fresh biomass production were ETB 15.11, 19.82, and 19.51 per hectare respectively, which indicates that a 1 ETB outlay for Basil-I, Basil-III and basil-V production results to gain a net return of ETB 14.11, 18.82 and 18.51 per hectare. The aforementioned results revealed that the production of Basil genotypes is financially feasible in both dry and fresh biomass productions.

Keywords: Basil genotypes, benefit-cost ratio, Ethiopia

1. Introduction

Sweet basil (*Ocimum basilicum*), a culinary biomass of the family Lamiaceae, is a delicate plant with important medicinal benefits (Pushpangadan and George, 2012) [9]. Sweet basil is one of the most economically important aromatic biomasses of the Lamiaceae family. The plant originates from southern Asia. Nowadays, it is cultivated mainly through the Mediterranean regions of Europe, Asia, and Africa. However, it is also grown in temperate regions. Sweet basil (*O. basilicum*) and holy basil (*O. sanctum*) are the most widely grown species in the world either for fresh market or for essential oil production. The commercial products obtained from Sweet basil are fresh and dry biomass used as a seasoning, while its extracts and essential oil are exploited in the food and perfume industries (Gupta *et al*., 2002; Zheljazkov *et al*., 2008; Balakrishnan *et al*., 2018) [7, 10, 4]. In India and South Asia, it is called sacred Basil and Sweet Basil. It is characterized by an intensive sweet camphoraceous fragrance and good medicinal properties. Sweet Basil is used as fragrance ingredients in perfumes, hairdressing, dental creams, and mouthwashes. The oil has important medicinal properties (Nema *et al*., 2008) [8]. Basil is usually referred to as the “king of the biomass”, being widely utilized due to its economic, culinary, industrial, and medicinal importance. An extract of the biomass is used in preventing cardiovascular diseases through an improved diet and several antioxidant compounds it contains high antioxidant power (Erum *et al*., 2011) [5]. It is used in the treatment of fever, inflammation, swelling, and constipation, and as an antibacterial and antifungal agent (Gajula *et al*. 2009; Ali and Setzer, 2013) [6, 3]. In Ethiopia, the tender stems, leaves, and flowers of basil are dried, ground, and added to sauces either alone or mixed with other spices to provide a fine flavor to stews. It is an important ingredient in berbere and Shiro powders and the preparation of clarified (spiced) butter. The dried leaves can be used for preparing roast beef locally known as “tibs” and both dried and fresh inflorescences and leaves are used as flavoring agents in the preparation of all kinds of stews (Alemu *et al*., 2018) [2]. In Ethiopia, even though Basil has many benefits, there is no information on its economic feasibility of production.

So, this investigation aims to examine the economic feasibility of sweet Basils' genotype production.

1.2 Objectives of the study
- To examine the financial feasibility of sweet basil
- To provide necessary information to stakeholders on the costs and benefits of sweet basil

2. Research Methodology
2.1. Description of the Study Area
The study was conducted at Wondo Genet Agricultural Research Center which is one of the Research centers of Ethiopia of institute agricultural research and is found in Wondo Genet Woreda, Sidama regional state of Ethiopia. It is located about 268 km south of Addis Ababa and 14 km southeast of Shashemene. 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.

2.2. Data Collection and Analysis
The study was conducted at Wondo Genet Agricultural Research Center, Sidama Regional State of Ethiopia experimental field from August 2018 to December 2018. The planting material used in the study was three sweet basil genotypes. The planting material of basil genotypes was planted on 100 m^2 areas on the experimental field with an inter-row spacing of 60 cm for each genotype. The labor in man-days for land preparation, planting, watering weeding, and hoeing and harvesting operation were recorded. Then, the total cost of labor is calculated based on the average wage rate Wondo Genet Surrounding institution rate. In addition, the cost of planting material and initial plowing was recorded. All necessary data were collected from Wondo Genet agricultural research center experimental field with the help of technical assistants. For the data collection process data collection sheet was prepared and entered into a computer. Finally, the overall cost of cultivation was obtained by summing up all these costs. On the other hand, to calculate the total revenue the total yield was recorded and multiplied by the respective price. Finally, all the information was converted into a per-hectare basis for analysis. The financial analysis method is a tool that enables us to evaluate the aggregate of these costs and benefits with common measures including cost-benefit ratio (Ardalan, 2000) [1]. For this study to examine the costs and benefits associated with the cultivation of basil for genotype production simple cost accounting method was used. Thus, to examine the financial feasibility of basil production simple benefit-cost ratio feasibility analysis method was employed. Using the following formulas: The Total Revenue (TR) and simple Benefit-Cost Ratio (BCR) were calculated.

2.3 Total Revenue (TR)
$$TR = Q*P \qquad (1)$$

Where,
- **TR:** Total Revenue.
- **Q:** Total quantity of dry biomass or fresh biomass and basil in kg.
- **P:** Selling price per kg of dry biomass or fresh biomass of basil.

$$NR = TR-TC \qquad (2)$$

Where,
- **NR:** Net return (profit).
- **TC:** Total cost of basil production for fresh biomass or dry biomass.
- **TR:** total revenue of basil production for fresh biomass or dry biomass.

2.4 Simple Benefit Cost Ratio (BCR)
It is the ratio of the present worth of the benefit stream to the present worth of the cost streams, that is:

BCR = Sum of benefit/sum of the present worth of costs mathematically, it can be shown as.

$$BCR = \sum \frac{Bt}{Ct} \qquad (3)$$

Where,
- **BCR =** Benefit-cost ratio.
- **Bt =** Benefit of basil production.
- **Ct =** Cost of basil production.

Using a simple benefit-cost ratio, the production of basil for dry biomass or fresh biomass is feasible if the benefit-cost ratio of each basil genotype is greater than 1. If it is less than one, it indicates that the production of the basil genotype is not feasible.

3. Results and Discussion
In this section, results on the yield of sweet basils, costs, and returns associated with the cultivation of basil genotypes for dry and biomass production, and financial feasibility analysis are presented.

3.1. Yield of Sweet Basils
As presented in Table 1, the total dry biomass yield per harvest of Basil-I, Basil-III, and Basil-V genotypes is 1,220, 1,260, and 1,400 kilograms per hectare respectively. The maximum dry biomass yield of basil was 1,400 kilograms per hectare harvested from the Basil-V genotype and the minimum biomass yield was 1,220 kilograms per hectare which was harvested from Basil-I genotype. On the other hand, the total fresh biomass yield per harvest of Basil-I, Basil-III, and Basil-V genotypes are 15,560, 21,430, and 21,500 kilograms per hectare respectively. The maximum fresh biomass yield of basil was 21,500 kilograms per hectare harvested from Basil-V genotype and the minimum fresh biomass yield was 15,560 kilograms per hectare which is harvested from Basil-I genotype.

Table 1: Quantity of harvest of basil genotypes

Basil genotype	Dry biomass yield (kg/ha)	Fresh biomass yield (kg/ha)
I	1,220	15,560
III	1,260	21,430
V	1,400	21,500

***Source*:** Own computation using field data (2018)

3.2. Costs and Returns of Basil Cultivation

To compute the labor costs of production of Basil genotypes the study used the average wage rate of Wondo Genet surrounding Institutions. In addition to this, the cost of basil seedlings, costs of plowing and disking as well as other input costs of basil production were used in the computation of the total cost of cultivation of basil genotypes.

As shown in Table 2, the total cost of cultivation of basil-I, Basil-III, and Basil-V genotypes for dry biomass production were ETB 52,808.42 per hectare, ETB 52,680.74 per hectare, and ETB 53,355.26 per hectare. The maximum cost in the cultivation of basil genotypes for dry biomass production is the cost of biomass separation and the minimum cost is the cost of loading and unloading. As presented in Table 2, the cost of biomass separation for Basil-I, Basil-III, and Basil-V was ETB 21,900 per hectare, which accounts for 41.47% of total costs of Basil-I cultivation, 41.57% of total costs of Basil-III cultivation, and 41.05% of total costs of Basil-V cultivation respectively. The cost of loading and unloading Basil-I to the nearest marketplace was ETB 122 per hectare which accounts for 0.23% of total costs of Basil-I cultivation. The loading and unloading cost of Basil-III and Basil-V to the nearest marketplace was ETB 126 per hectare which accounts for about 0.24% of the total costs of their cultivation.

The total revenue of Basil-I for dry biomass production was ETB 73,200 per hectare, the total revenue of Basil-III for dry biomass production was ETB 75,600 per hectare and the total revenue of Basil-V for dry biomass production was ETB 84,000 per hectare. The cultivation of Basil-I for its dry biomass production provided a net return of ETB 73,195.24 per hectare, the cultivation of Basil-III for dry biomass production provided a net return of ETB 75,595.24 per hectare and the cultivation of Basil-V for dry biomass production provided a net return of ETB 83,995.24 per hectare. Indicating that investing in the production of basil genotypes for dry biomass production is profitable.

T**able 2:** Costs and returns of cultivation of basil for dry biomass production

Particulars	**Basil genotype**		
	I	**III**	**V**
Fixed cost			
Tractor rent of plowing and disking (ETB/ha)	3,000	3,000	3,000
Variable costs			
Seedling cost	4,583.33	4,583.33	4,583.33
Labor cost land labeling and cleaning (ETB/ha)	1,591.60	1,591.60	1,591.60
Cost of planting and furrow making (ETB/ha)	13,894.40	14,202.80	14,152.80
Labor cost of watering (ETB/ha)	1,700	683.20	1,725.20
Labor cost of weeding and hoeing (ETB/ha)	1,841.60	2,500	2,666.80
Harvesting (ETB/ha)	1,416.80	1,333.20	816.80
Labor cost of biomass separation (ETB/ha)	21,900	21,900	21,900
Transport cost to the nearest market	244	252	252
loading and unloading cost	122	126	126
Miscellaneous expenses (5%)	2,514.69	2,508.61	2540.73
Total cost (ETB/ha)	52,808.42	52,680.74	53,355.26
Yield in kilogram per hectare	1,220	1,260	1,400
Total revenue at (60 ETB/kg)	73,200	75,600	84,000
Net return (ETB/ha)	20,391.58	22,919.26	30,644.74

Source: Own computation using field data (2018)
N.B: ETB indicates Ethiopian Birr

As shown in Table 3, the total cost of cultivation of basil-I, Basil-III, and Basil-V genotypes for Fresh biomass production were ETB 34,330.52 per hectare, ETB 36,039.29 per hectare, and ETB 36,735.86 per hectare. The maximum cost in the cultivation of basil genotypes for fresh biomass production is the cost of planting and furrow making, and the minimum cost is the labor cost of harvesting basil fresh biomass. As presented in Table 3, the cost of planting and furrow making for fresh biomass of Basil-I was ETB 13,894.40 per hectare, which accounts for about 40.47% of the total cost of Basil-I cultivation. The cost of planting and furrow making for fresh biomass of Basil-III was ETB 14,202.80 per hectare, which accounts for about 39.41% of the total cost of Basil-III cultivation. The cost of planting and furrow making for fresh biomass of Basil-V was ETB 14,152.80 per hectare, which accounts for about 38.53% of the total cost of Basil-V cultivation. The labor cost of harvesting Basil-I was ETB 1,416.80 per hectare, which accounts for 4.13% of the total costs of Basil-I cultivation. The labor cost of harvesting of Basil-III was ETB 1,333.20 which accounts for 3.70% of the total costs of Basil-III cultivation. The labor cost of harvesting Basil-V was ETB 816.8 which accounts for 2.22% of the total costs of Basil-V cultivation.

The total revenue of Basil-I for fresh biomass production was ETB 518,614.80 per hectare, the total revenue of Basil-III for fresh biomass production was ETB 714,261.90 per hectare and the total revenue of Basil-V for fresh biomass production was ETB 716,595 per hectare. The cultivation of Basil-I for its fresh biomass production provided a net return of ETB 484,284.28 per hectare, the cultivation of Basil-III for fresh biomass production provided a net return of ETB 678,222.61 per hectare, and the cultivation of Basil-V for fresh biomass production provided a net return of ETB 679,859.14 per hectare. Indicating that investing in the production of basil genotypes for fresh biomass production is highly profitable.

Table 3: Costs and returns of cultivation of basil fresh biomass for biomass production

Particulars	Basil genotype		
	I	III	V
A. Fixed cost			
Tractor rent of plowing and disking (ETB/ha)	3,000	3,000	3,000
B. Variable costs			
Seedling cost (ETB/ha)	4,583.33	4,583.33	4,583.33
Costs of land labeling and cleaning (ETB/ha)	1,591.60	1,591.60	1,591.60
Cost of planting and furrow making (ETB/ha)	13,894.40	14,202.80	14,152.80
Labor cost of watering	1,700	683.20	1,725.20
Labor cost of weeding and hoeing	1,841.60	2,500	2,666.80
Harvesting (ETB/ha)	1,416.80	1,333.20	816.80
Transport cost	3,112.00	4,286	4,300
loading and unloading cost	1,556	2,143	2,150
Miscellaneous expenses	1,634.79	1,716.16	1749.33
Total cost (ETB/ha)	34,330.52	36,039.29	36,735.86
Yield in kilogram per hectare	15,560	21,430	21,500
Total revenue at (33.33 ETB/kg)	518,614.80	714,261.90	716,595
Net return (ETB/ha)	484,284.28	678,222.61	679,859.14

***Source*:** Own computation using field data (2018)

3.3. Financial feasibility of Rosemary production

The financial feasibility of Bail production was examined by using investment analysis criteria. For this study simple benefit-cost ratio (BCR) was utilized to analyze the feasibility of the Basil genotypes for their dry biomass and fresh biomass production.

As shown in Table 4, the benefit-cost ratio (BCR) genotypes of Basil-I, Basil-III, and Basil-V for dry biomass production were ETB 1.39 per hectare, ETB 1.44 per hectare and ETB 1.57 per hectare respectively, all of them are greater than 1; indicating that a 1 ETB investment in Basil genotypes cultivation gives a net benefit of ETB 0.39, ETB 0.44 and ETB 0.57 respectively. On the other hand, the benefit-cost ratio (BCR) genotypes of Basil-I, Basil-III, and Basil-V for fresh biomass production was ETB 15.11 per hectare, ETB 19.82 per hectare, and ETB 19.51 per hectare respectively, all are greater than 1; this indicates that a 1 ETB investment in Basil genotypes cultivation gives a net benefit of ETB 14.11, ETB 18.82 and ETB 18.51 respectively. The result revealed that investing in the production of basil genotypes for dry biomass and fresh biomass production is financially feasible. Moreover, fresh biomass production of basil genotypes is more profitable as compared to dry biomass production.

Table 4: Financial feasibility analysis of Basil for fresh and dry biomass production

Particulars	Basil genotype		
	I	III	V
I. For dry biomass production			
Total revenue (ETB/ha)	73,200.00	75,600.00	84,000.00
Total cost (ETB/ha)	52,808.42	52,680.74	53,355.26
BCR	1.39	1.44	1.57
II. For fresh biomass production			
Total revenue (ETB/ha)	518,614.80	714,261.90	716,595.00
Total cost (ETB/ha)	34,330.52	36,039.29	36,735.86
BCR	15.11	19.82	19.51

4. Conclusion

This study was conducted to analyze the costs and benefits of basil genotypes for dry biomass and fresh biomass production at Wondo Genet, Sidama regional State of Ethiopia. The objective of this study was to analyze the financial feasibility of basil genotypes for dry biomass and fresh biomass production at Wondo Genet. The study was conducted on Wondo Genet Agricultural Research Center's experimental field from August 2018 to December 2018. At the time of cultivation, all the necessary economic data were collected accordingly from the experimental site. Based on this the costs, benefits, and financial feasibility of the production of basil genotypes were analyzed. The results of the study revealed that the production of the Basil genotypes for dry biomass and fresh biomass has a positive net return and is financially feasible. Therefore, the production of the Basil genotypes *viz*. Basil-I, Basil-III, and Basil-V for dry and fresh biomass are important alternatives to generate additional income as well as diversify sources of income for producers in rural areas. Therefore, raising farmers' and investors' awareness of basil technology and providing them with training, by extension agents and other concerned government officials would help to increase the income and well-being of rural households as well as investment opportunities for investors engaged in basil production.

References

1. Ardalan A. Financial analysis methods to evaluate the aggregate of these costs and benefits with common measures included net present value and cost-benefit ratio; c2000.
2. Alemu A, Garedew W, Gebre A. Essential oil yield and yield components of basil (*Ocimum basilicum* L.) as affected by genotype and intra-row spacing at Jimma, SW Ethiopia. Acta Agrobotanica, 2018, 71(3).
3. Ali NAA, Setzer WN. Pharmacological activities of basil oil: A review. In: Govil JN, Bhattacharya S, editors. Recent progress in medicinal plants (RPMP). Essential oils - II. New Delhi: Studium Press (India) PVT Ltd; c2013. p. 285-307.
4. Balakrishnan P, Ramalingam P, Nagarasan S, Ranganathan B, Gimbun J, Shanmugam K, *et al*. A comprehensive review on *Ocimum basilicum*. Journal of Natural Remedies. 2018;8(3):71-85.
5. Erum S, Naeemullah M, Masood S, Khan MI. Genetic variation in the living repository of *Ocimum germplasm*. Pakistan Journal of Agricultural Research. 2011;24:1-4.
6. Gajula D, Verghese M, Boateng J, Walker LT, Shackelford L, Mentreddy SR, *et al*. Determination of

total phenolics, flavonoids and antioxidant and chemopreventive potential of basil (*Ocimum basilicum* L. and *Ocimum tenuiflorum* L). Int J Cancer Res. 2009;5(4):130-143.
7. Gupta SK, Jai, Prakash, Srivastava S. Validation of a traditional claim of Tulsi, *Ocimum sanctum* Linn. as a medicinal plant; c2002.
8. Nema J, Mitra NG, Thakur A, Shrivastava A. Composition and physico-chemical attributes of biomass oil of *Ocimum species*. Biomed. 2008;2(4):319-322.
9. Pushpangadan P, George V. Basil. In: Peter KV, editor. Handbook of Biomass and Spices. Cambridge, UK: Woodhead Publishing; c2012.
10. Zheljazkov VD, Callahan A, Cantrell CL. Yield and oil composition of 38 basil (*Ocimum basilicum* L.) accessions grown in Mississippi. Journal of Agricultural and Food Chemistry. 2008;56(1):241-245.